

Twenty-Five Years
of
HEALTH
PROGRESS

METROPOLITAN LIFE INSURANCE COMPANY

To

Tom

with high hopes
of a fine career
in medicine

Mr. J. Dublin

Oct 15, 37



Twenty-Five Years of Health Progress

*A study of the mortality experience among
the Industrial policyholders of the
Metropolitan Life Insurance
Company 1911 to 1935*

by

LOUIS I. DUBLIN, Ph.D.
Third Vice-President and Statistician

and

ALFRED J. LOTKA, D.Sc.
Assistant Statistician

With the collaboration of
the staff of the Statistical Bureau



METROPOLITAN LIFE INSURANCE COMPANY

HOME OFFICE: NEW YORK

Pacific Coast Head Office: San Francisco

Canadian Head Office: Ottawa

1937

Copyright 1937
METROPOLITAN LIFE INSURANCE COMPANY

Dedicated to

FREDERICK H. ECKER

Chairman of the Board

LEROY A. LINCOLN

President

and

THE BOARD OF DIRECTORS

OF THE

METROPOLITAN LIFE INSURANCE COMPANY

UNDER WHOSE GUIDANCE

THE COMPANY HAS CONTRIBUTED GREATLY

TO THE HEALTH AND WELFARE

OF THE AMERICAN PEOPLE



PREFACE

The time has come to present a review of the mortality experience of the Industrial policyholders of the Metropolitan Life Insurance Company during the quarter century from 1911 to 1935. This period has witnessed an extraordinary development both in the advancement of the public health and in the business of Life insurance. In 1911 the Metropolitan had just launched its new Health and Welfare program as an integral part of Industrial Life insurance. Workers in the field of insurance, as in the field of life conservation, were animated by a new approach to their task and by a consciousness of great opportunities waiting to be explored. Many new activities were initiated which have taken hold and have given color and content to the Industrial Life insurance business. The enormous growth in the number of policyholders has brought an increasing proportion of the population within the benefits of the Company's Welfare program. The purpose of this volume is to present a richly documented source of information regarding the mortality experience among this large body of insured persons since the inauguration of this program, and also to throw light on what has transpired during the same period among the people of the United States and Canada, of whom these policyholders constitute a large and representative sample.

As one reviews this experience, he is impressed by the extensive gains in life expectation which have followed the development of a planned and concerted program of public health activity. It is hoped that the present volume will stimulate further effort in life conservation. The body of facts given here may serve as a guide to the formulation of a working program; the data will reveal the best points of attack and make possible the concentration of effort where it will yield the most good. Throughout the volume are indications of what yet remains to be accomplished in the prevention of sickness and premature death. To this end investigators interested in extending the boundaries of medical knowledge will find in the pages which follow many suggestions for further research.

These insurance records are in some respects unique. Nowhere else can a similar mass of data be found regarding the mortality experience of so large a group of insured persons over so long a

period of time. And, as regards American experience in particular, these insurance data do more than merely supplement the statistics collected by government agencies, because in 1911 the Death Registration Area of the United States comprised only ten States, and it was not until 1933 that the whole of the Union was included in Federal mortality statistics. The millions of Industrial policyholders of the Metropolitan Life Insurance Company, on the other hand, have throughout the period been widely distributed and have constituted a homogeneous group.

It has been found expedient, however, to supplement the information derived from this insurance experience by parallel data from general population statistics, especially in those cases in which peculiarities of a body of policyholders render the information scant or inadequate, as, for example, when the discussion touches on the mortality of infants. Aside from this, there is obvious interest in a comparison between the observations among policyholders and in the population at large, and such comparisons have been made throughout the volume in order to throw light on the effect of economic status on the mortality from the various causes of death.

The volume is addressed to health officers, physicians, sociologists, Life insurance officials, and others interested in the health and welfare of the wage-earning population—to the large group, in other words, which for 25 years has oftentimes utilized our extensive data to shed light on some of the dark areas in their respective fields. It was this audience that so favorably received our volume, *Mortality Statistics of Insured Wage-Earners and Their Families* when it was published almost 20 years ago. Our hope is that the present work will be accorded a similar welcome.

It is obviously inexpedient to publish in detail the entire mass of basic data used in preparing this report. Much of the detail has already received publication in the *Statistical Bulletin* of recent years. The Company will also, on request, supply to interested persons figures available from manuscript sources, both for causes of death selected for detailed treatment in the text, and also for causes which, on account of their numerically less significant role, have not been discussed here. Although the contents of this study are copyrighted, permission to reproduce portions of the text will be freely granted upon request.

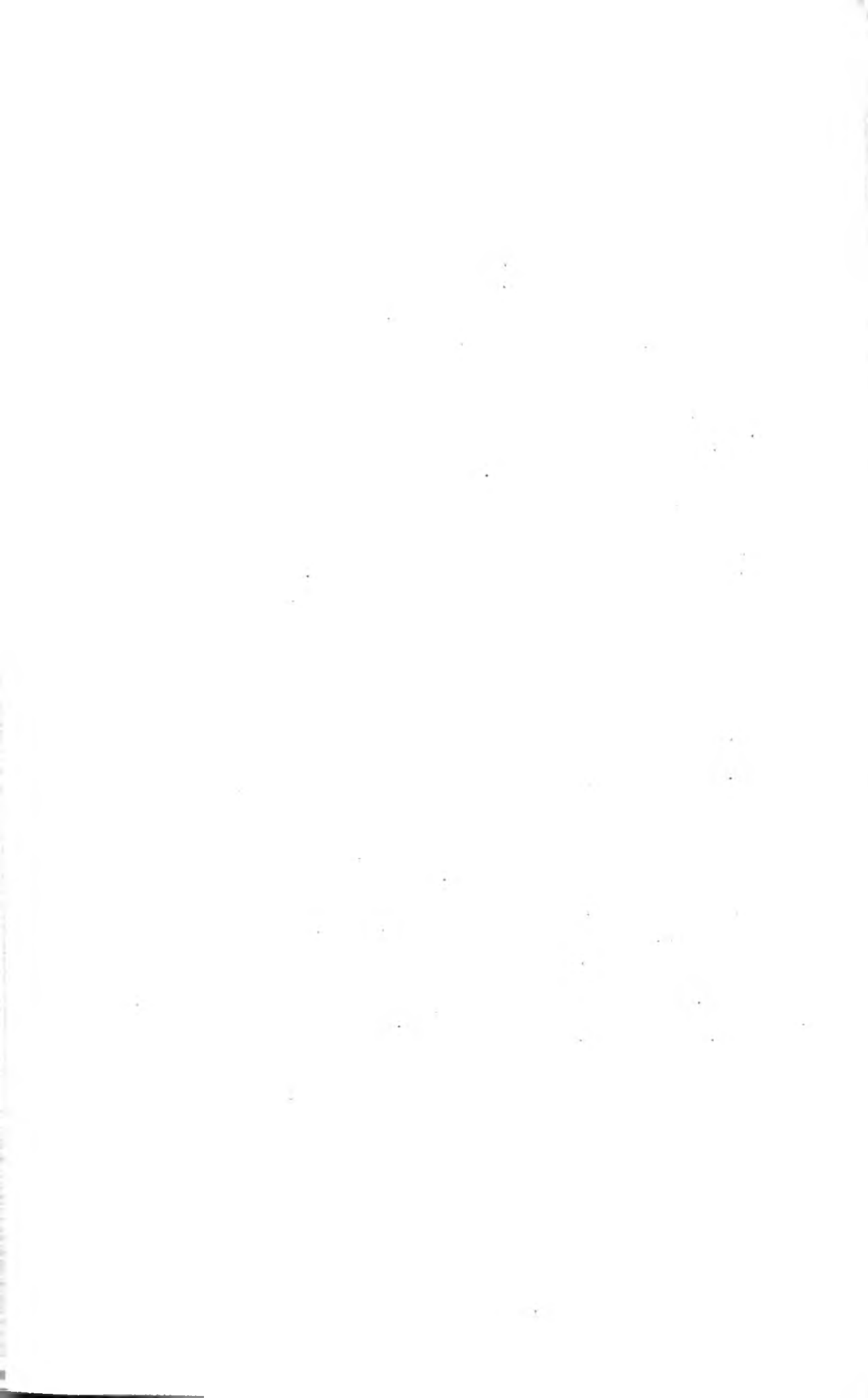
Many readers of this volume will be gratified to know that they

themselves have contributed to bringing to a very high degree of accuracy the data here published. Thousands of physicians, coroners, medical examiners, and hospital superintendents have, in the course of these 25 years, been interested enough to supply, in response to special inquiries, such supplementary data as were necessary to aid in the proper classification of causes of death. It is a pleasure to thank all those who have in one way or another helped to make this volume possible. Particular acknowledgment is due to Dr. Halbert L. Dunn, Chief Statistician for Vital Statistics in the Bureau of the Census, who has liberally supplied us with official data.

It is unnecessary to say that the preparation of this volume, covering as it does an experience among millions of lives and over a long period of years, has not been a one-man task. The study represents the combined effort of a considerable group of trained people on the staff of the Statistical Bureau of the Company. It is the desire of the authors to give credit to their staff, who, over a quarter of a century, have compiled the daily records of mortality and who have helped to analyze the results. It must be a satisfaction to them to see their routine efforts become the source material for this living document. It is a pleasure to give special credit, however, to George H. Van Buren, whose expert knowledge of the field of nomenclature and classification has guided this, as well as other technical publications of the Bureau; to Robert J. Vane, whose long experience in the special field of accident statistics has been capitalized in the chapter on external causes of death; to Herbert H. Marks, who has similarly given us the benefit of his rich experience in the chapters on diabetes and the cardiovascular-renal diseases; to Maurice L. Goldstein, Henry J. Klein, Mortimer Spiegelman, Elizabeth J. Steele, and Bessie Bunzel, who have also taken responsible parts in the production of the volume; and finally to Jacob Baar, through whose hands all the material has passed in an editorial capacity, and who, in addition, has seen the work through the press.

LOUIS I. DUBLIN
ALFRED J. LOTKA

September 1937.



CONTENTS

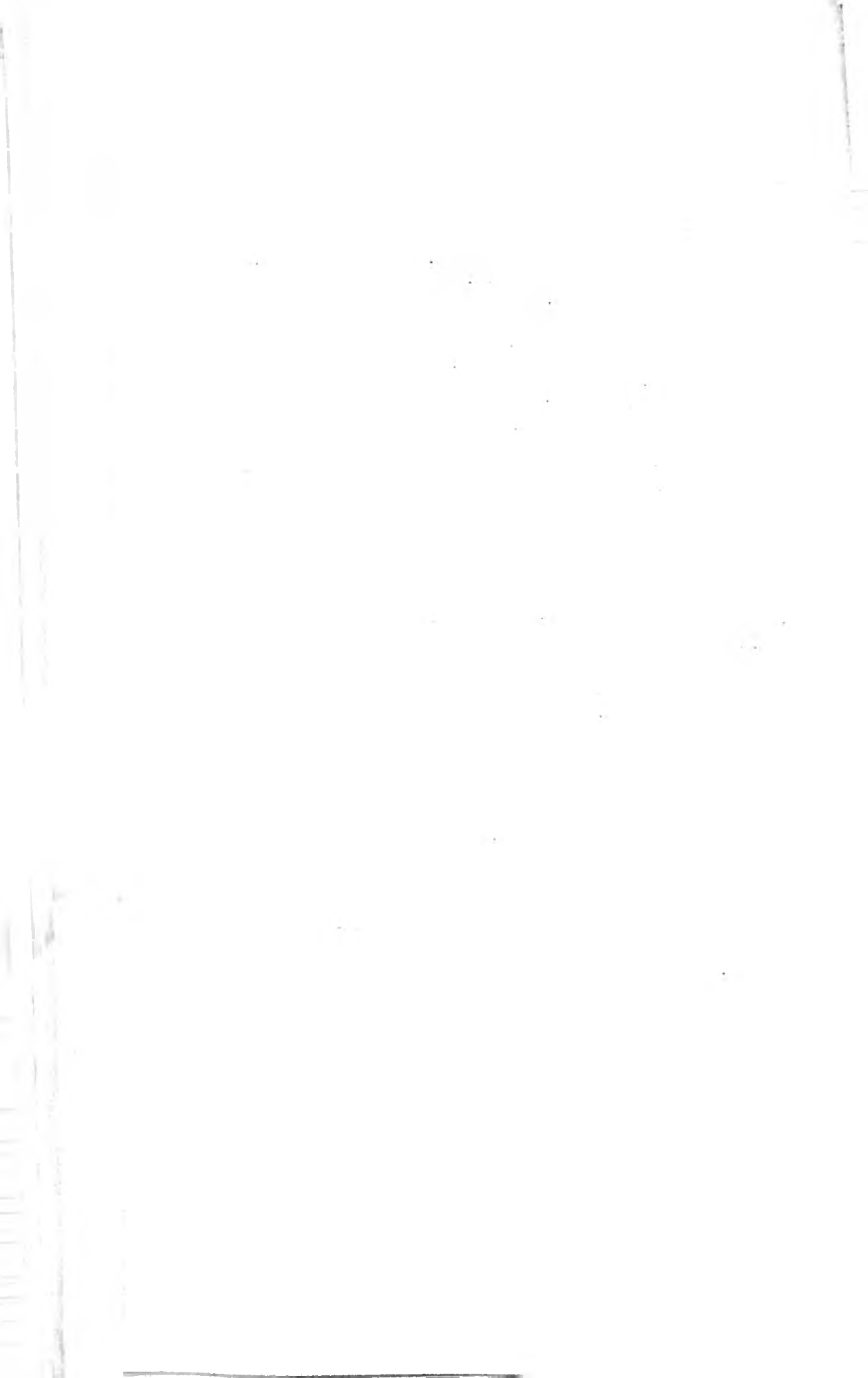
CHAPTER	PAGE
PREFACE	V
I. AN ERA OF HEALTH PROGRESS	1
II. THE GENERAL MORTALITY FROM ALL CAUSES	13
III. THE TREND OF LONGEVITY THROUGH A QUARTER CENTURY	31
IV. THE PRINCIPAL COMMUNICABLE DISEASES OF CHILDHOOD	43
The Diseases as a Group	45
Diphtheria	54
Measles	61
Scarlet Fever	67
Whooping Cough.	73
V. TUBERCULOSIS	79
Tuberculosis—All Forms	81
Tuberculosis of the Respiratory System	97
Tuberculosis of the Meninges and the Central Nervous System	105
Tuberculosis of the Intestines and Peritoneum	109
Tuberculosis of Other Organs and Chronic Disseminated Tuberculosis.	113
VI. INFLUENZA AND PNEUMONIA.	115
The Diseases as a Group	117
Lobar Pneumonia	145
Bronchopneumonia	152
Influenza	157
VII. CANCER.	163
Cancer—All Forms	165
Cancer of the Stomach, Liver	186
Cancer of the Peritoneum, Intestines, and Rectum	194
Cancer of the Female Genital Organs	200
Cancer of the Breast	206
Cancer of the Buccal Cavity.	210
Cancer of the Skin	214
Cancer of Other or Unspecified Organs	219

CONTENTS (*Continued*)

CHAPTER	PAGE
VIII. THE PRINCIPAL CARDIOVASCULAR-RENAL DISEASES	227
The Diseases as a Group	229
Organic Diseases of the Heart	248
Diseases of the Coronary Arteries and Angina	
Pectoris.	267
Chronic Nephritis	285
Cerebral Hemorrhage and Paralysis	300
Diseases of the Arteries	312
IX. DIABETES MELLITUS	317
X. DISEASES OF THE PUERPERAL STATE	343
The Puerperal State—Total	345
Puerperal Septicemia	354
Puerperal Albuminuria and Convulsions	357
Other Diseases of the Puerperal State.	359
XI. MISCELLANEOUS DISEASES OF SPECIAL INTEREST	363
Typhoid Fever.	365
Acute Poliomyelitis.	369
Syphilis.	371
Acute Rheumatic Fever.	375
Exophthalmic Goiter	377
Pernicious Anemia	379
Ulcer of the Stomach and Duodenum.	382
Diarrhea and Enteritis	386
Appendicitis,	388
Hernia	392
Intestinal Obstruction	394
Cirrhosis of the Liver	397
Biliary Calculi	399
XII. EXTERNAL CAUSES OF DEATH	401
External Causes as a Group	403
Suicide	407
Homicide	420
Accidental and Unspecified Violence	431
Automobile Accidents	443
Railroad Accidents	457
Streetcar Accidents	461

CONTENTS (*Continued*)

CHAPTER	PAGE
Accidental and Unspecified Violence (<i>Continued</i>)	
Traumatism by Other Vehicles	465
Traumatism by Fall	468
Drowning	475
Burns (Conflagration Excepted)	480
Conflagration	486
Traumatism by Firearms	490
Traumatism in Mines and Quarries	494
Traumatism by Machines	497
Electricity (Lightning Excepted)	500
Absorption of Poisonous Gas	504
Poisoning by Food	509
Other Acute Accidental Poisonings	512
Excessive Heat	517
APPENDIX I. METHODS OF COMPILATION AND ANALYSIS	
OF DATA	521
APPENDIX II. TABLES: Mortality Experience, Metro-	
politan Life Insurance Company, Industrial Department	529
TABLE A. Number of Deaths and Crude Death Rates, by Color and Sex, for Each Title of the 1920 Inter- national List of Causes of Death. 1911 to 1935	531
TABLE B. Annual Death Rates from All Causes Com- bined, by Color, Sex, and Age. 1911 to 1935	541
TABLE C. Standardized Annual Death Rates for Speci- fied Causes, by Color, Sex, and Broad Age Periods. 1911 to 1935	545
TABLE D. Percentage Distribution of Deaths from Acci- dental and Unspecified Violence by Origin of Hazard, for Principal Means of Injury, by Sex and Age. 1926 to 1935	591
INDEX	597



CHAPTER I

AN ERA OF HEALTH PROGRESS



AN ERA OF HEALTH PROGRESS

The quarter century from 1911 to 1935 covered by this report was one of extraordinary progress in public health, as will abundantly be made clear in our text, tables, and diagrams. If one were asked to summarize in a single figure the remarkable advances made in these 25 years, one might reply that within this short period the average duration of human life in the group here studied had been extended by nearly 14 years; that is, by approximately 30 percent. But no single figure is adequate to measure the achievements and successes of this period, which in the retrospect of future years will surely stand out for its phenomenal development in man's control over his environment, as measured by the prolongation of life.

It is unnecessary to point to the obvious truth that it is not man who has changed—but his environment, which by his own effort he has so modified as to make the world a safer place in which to live. And what makes his success within the recent period the more remarkable is that this has not been a time of peace and ease. We have passed through a great war which, though fought in foreign lands, drew our young manhood into its coils, and was not without serious repercussions on the life even of those who were not called overseas; into this period fell the worst epidemic in the memory of the present generation; and the close of this quarter century barely saw the beginning of recovery from one of the severest and most long-continued economic depressions in our history as an independent nation.

In the face of these conditions, which, at first sight at any rate, would appear as very serious handicaps, we have witnessed the marvelous development that has added almost a decade and a half to the average duration of life (expectation of life at birth) of the Industrial policyholders of this Company. What has been this change in the environment that man has wrought with such results?

It has been, essentially, *the remodeling of national life in the light of modern understanding of sanitary science*. Needless to say the result has not been achieved through any haphazard or sporadic effort. It has been won by a systematic and long-continued campaign of welfare effort, in which the Metropolitan Life Insurance Company has taken a large and active share.

At the beginning of the second decade of the 20th century, the public health movement in America had just about got under way. In New York State, Dr. Hermann M. Biggs was at the height of his activity. To him we owe the slogan that a community can determine within certain limits its own mortality rate, and, perhaps more important, the application on a broad scale of effective administrative public health procedure in municipal and State health departments. Legislation regarding sanitation was being passed and enforced. The benefits of milk pasteurization had been proved and the increasing safety of the milk supply was immediately visible in the rapid reduction of the typhoid fever rate and in the decline in diarrhea and enteritis which up to then had been exacting so heavy a toll of young lives.

Medical science had meanwhile learned how to control one of the most devastating diseases of childhood. The germ of diphtheria had been isolated, Behring had demonstrated the efficacy of antitoxin, and it only remained for health authorities to make these discoveries widely available to the people. An active campaign against diphtheria was instituted, and today there are sizable cities in the United States which have not had a single diphtheria death for a number of years. This record could be duplicated in other less fortunate communities by instituting the same methods that have proved so effective in the more progressive areas.

The most striking feature of the health picture has been the rapid decline in tuberculosis mortality. In 1911 tuberculosis was the leading cause of death in the group which we are studying; today it is seventh¹ in the list. Its victims were often young men in the prime of life and at the threshold of their economic usefulness. An active campaign against tuberculosis had been organized at the beginning of the century, and by 1911 it was already obtaining excellent results. During the quarter century which we are here contemplating, the death rate from tuberculosis in our particular population has responded to these efforts by a decline from 242 per 100,000 in 1911, to 56 per 100,000 in 1935.

We have every justification to be proud of our record in reducing the mortality of infants, children, and young adults. But in combating diseases characteristic of midlife and after, we have had at most only moderate success; though we have acquired new and, within certain limits, effective means for treating some of these diseases, such as diabetes and pernicious anemia. Insulin

¹This ranking is based on deaths at all ages combined. For ages 1 to 74 years tuberculosis ranks fifth in numerical importance.

has been the means of keeping many diabetics alive and enabling them to carry on a fairly normal amount of activity. Liver therapy has made it possible for physicians to control pernicious anemia, a condition which formerly was considered hopeless.

Thus on many fronts the advances in medicine have been extraordinary. In no department, perhaps, have they been greater than in surgery. Methods of anesthesia, general and local, have been improved and refined, thus enabling surgeons to undertake operations formerly impossible. Methods of diagnosis have also improved. In addition to the tools which the doctor had in former days—the observation of a trained eye and ear—he now has highly specialized instrumental aids, such as the X-ray and fluoroscope, the electrocardiograph, and various other diagnostic expedients unknown to his father. The chemical testing technique has also been improved and extended. Wasserman and typing tests have produced an entirely new and highly efficient line of procedure in the diagnosis of syphilis and pneumonia; blood tests, especially as studied along with the indications of urinalysis, have become a very important feature in the recognition and identification of such disturbances as diabetes, nephritis, the anemias, and leukemia.

Side by side with these developments in the field of medicine have gone far-reaching advances in the standard of living and notable improvements in the conditions under which men and women work. To an ever-increasing degree the comforts and health advantages enjoyed only by the well-to-do 25 years ago have become the property of great masses of wage-earners. A growing proportion of homes enjoy the benefits of sanitary facilities and of modern heating and lighting systems. Industry, likewise, has contributed its share to the increase in human welfare and longevity by providing cleaner and better-ventilated factories and workshops, and by the control of various occupational hazards. Much attention is being paid to the effect of diet upon health; the newer knowledge of nutrition has placed in the hands of the medical profession and of the housekeeper another weapon against disease. The shorter working day and increased hours of leisure permit greater opportunities for wholesome outdoor activities. The automobile, by providing a convenient means of transportation, has enabled many city dwellers, including wage-earners such as are covered by this study, to spend their week-ends and holidays out in the open air—a practice which encourages such healthful diversions as walking, golf and tennis, swimming, etc. All in all, environmental factors as well as medical progress have played an

important role in producing the favorable health picture which is such a satisfaction to enlightened leaders.

In this period of health progress the Metropolitan Life Insurance Company has not remained a passive spectator. Aside from the moral support and general interest which it has at all times given to advancing the cause of public health, it has, within the period covered by this survey, assisted in many important health projects, both financially and through the personal cooperation of its Officers and staff. It realized early that no one organization, working alone, could modify the attitudes and habits of those millions whose willing cooperation had to be secured if we were to put into practice the medical, public health, and sociological gains of the past few decades. Consequently, the Company joined the ranks of agencies, public as well as private, working actively to conserve the health and increase the well-being of the American people. Joining its forces with theirs, it has performed a useful service in helping to raise health department standards throughout the country, to secure more adequate funds for health purposes, and to arouse public support for new and promising methods of disease prevention and treatment.

Its first independent and perhaps its most important contribution to the general welfare of the community was the inauguration of a systematic program for Industrial policyholders in which the central feature was the provision of a nursing service. To the wage-earning group as such, there was thus afforded for the first time trained nursing care during acute illness, together with special services for women during the months of pregnancy and the post-partum period. Wherever possible the Metropolitan utilized the existing nursing organizations for this work with its policyholders. This, of course, gave a great impetus to the movement for public health nursing and tended to raise the standards of the work done by visiting nurse associations. Coincident with the Nursing Service, a campaign of health education was undertaken on a wide scale. Attractive leaflets on various phases of public health were prepared and disseminated through the agency force. These reached the homes of policyholders and were an important factor in inculcating hygienic habits and in promoting an awareness of health dangers. Mothers were taught how to care for their babies and how to safeguard the health of their children during the school years. By degrees, the educational campaign expanded from the home to the school; and special literature was devised for teachers and for pupils.

In addition to these general measures there have been more specialized attacks upon specific health hazards. The Company, like all insurance organizations, suffered from the havoc caused by the influenza epidemic of 1918-1919. Consequently it was instrumental in organizing and endowing the work of the Metropolitan Influenza-Pneumonia Commission. From the researches of this group carried on over a period of 19 years have come many valuable discoveries concerning the etiology and treatment of pneumonia and related respiratory conditions. Some of the results of this work are noted in the section on lobar pneumonia in Chapter VI. Though many people still die from these diseases annually, mortality from this cause of death is declining. More extensive typing of pneumonia and specific serum therapy offer the hope of still greater gains.

Industrial hygiene is another subject that has been given scientific study. The Company some years ago established a laboratory for investigating occupational hazards and has made valuable field surveys dealing with ventilation, sanitation, lighting, and the organization of medical and dental services in industrial plants. Noteworthy has been the accident-prevention work. Concern for the safety of children in the homes and on the streets led to the first publication on accident prevention. The campaign then spread to the factories, mills, and other work places with the objective of interesting employees in safe practices. The toll of street and highway accidents next attracted attention and resulted in cooperation with governmental agencies and private organizations regarding the improvement of traffic conditions.

Such, in sketchy outline, is the kind of modification that the past 25 years have witnessed in the health, the habits of life, and environment of the American people. To this changing milieu have been exposed the rapidly growing numbers of our weekly premium-paying² Industrial policyholders, mounting from 8,000-, 000 in 1911 to 17,000,000 in 1935. Who are these people, what kind of persons are they, and how have they reacted to this changing environment?

First, who are they? They are not wealthy people. They are not a class which, when the occasion arises, calls in a famous specialist. For the most part they are not even in the class that is commonly described as well to do. They are working people and their families—wage-earners in a variety of occupations which,

²All data and analyses in this survey, unless otherwise stated, are based on the mortality experience among the weekly premium-paying policyholders of the Industrial Department.

though they may not involve any exceptional risks to life, do at any rate impose a considerable wear and tear upon the physical organism. Furthermore, the great majority of these people are urban dwellers, and it is a matter of common experience, whatever may be the reason for it, that urban mortality runs somewhat higher than rural mortality.

As compared with the general population, the occupational distribution of these policyholders shows the differences that necessarily accompany their essentially urban residence. Only a little more than 5 percent of the male Industrial policyholders 15 years of age or over were engaged in agriculture, forestry, or animal husbandry at the time of their death,³ whereas in the States of the Registration Area in 1920 more than 25 percent of the occupied males were working at these occupations at the time of their death. There were also fewer gainfully employed males in professional occupations and semiprofessional pursuits in this Metropolitan Industrial group than in the general population of the Registration States, the percentages being 1.7 and 3.9, respectively.

On the other hand, the main industrial classes were more heavily represented among the insured males. Just over one half (51.7 percent) were classified under the heading, "Manufacturing and Mechanical Industries," as compared with 42 percent of the males over 15 years of age in the Registration States. Transportation pursuits, including steam and street railway workers, sailors, longshoremen, and teamsters, accounted for 13.1 percent of the insured males, and 6.7 percent of the other group. Public service occupations, such as watchmen, guards, policemen, city firemen, and soldiers contained 5.1 percent of the policyholders and 2.5 percent of the males in the general population. The percentages of deaths among insured males and among males of the Registration States in the remaining industrial groups were, respectively: Trade, 9.0 and 8.5; domestic and personal service, 6.0 and 4.2; and clerical, 5.6 and 4.1 percent.

In point of distribution by age and sex also, this group of policyholders differs considerably from the general population. This is shown in Table 1 and Charts I and II. We have a considerable excess of females. They constitute 56.18 percent of our total Industrial policyholders, while in the general population of the United States, within the same age limits (1 to 74), the proportion of females is only 49.58 percent. Our Industrial policyholders are a relatively young group, 43.49 percent being under

³The data for this comparison are necessarily derived from death claim records.

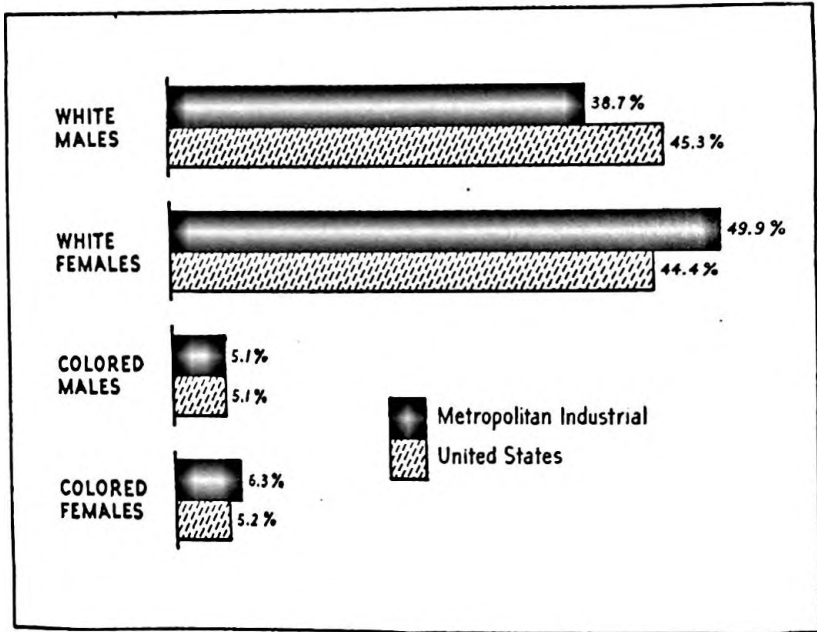
TABLE 1
PERCENT DISTRIBUTION OF POPULATION

By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Policyholders
and Total United States, 1934

AGE PERIOD YEARS	TOTAL PERSONS	WHITE		COLORED	
		Males	Females	Males	Females
METROPOLITAN INDUSTRIAL					
1 to 74	100.00	38.73	49.88	5.09	6.30
1 to 19	43.49	20.32	19.76	1.69	1.72
20 to 54	45.72	15.05	23.97	2.87	3.83
55 to 74	10.79	3.36	6.15	0.53	0.75
1 to 4	7.73	3.68	3.49	0.28	0.28
5 to 9	12.60	5.91	5.74	0.47	0.48
10 to 14	12.58	5.91	5.68	0.48	0.51
15 to 19	10.58	4.82	4.85	0.46	0.45
20 to 24	8.63	3.53	4.13	0.43	0.54
25 to 29	6.97	2.29	3.65	0.44	0.59
30 to 34	6.65	2.09	3.51	0.45	0.60
35 to 39	6.68	1.98	3.63	0.45	0.62
40 to 44	6.27	1.90	3.40	0.42	0.55
45 to 49	5.61	1.73	3.00	0.37	0.51
50 to 54	4.91	1.53	2.65	0.31	0.42
55 to 59	4.09	1.26	2.28	0.23	0.32
60 to 64	3.26	1.02	1.86	0.16	0.22
65 to 69	2.24	0.71	1.30	0.09	0.14
70 to 74	1.20	0.37	0.71	0.05	0.07
UNITED STATES					
1 to 74	100.00	45.31	44.40	5.11	5.18
1 to 19	36.73	16.49	16.03	2.09	2.12
20 to 54	51.36	23.18	22.93	2.55	2.70
55 to 74	11.91	5.64	5.44	0.47	0.36
1 to 4	7.26	3.24	3.13	0.44	0.45
5 to 9	9.64	4.33	4.19	0.56	0.56
10 to 14	10.15	4.56	4.44	0.57	0.58
15 to 19	9.68	4.36	4.27	0.52	0.53
20 to 24	9.22	4.09	4.11	0.49	0.53
25 to 29	8.57	3.74	3.85	0.46	0.52
30 to 34	7.72	3.40	3.48	0.40	0.44
35 to 39	7.29	3.29	3.28	0.35	0.37
40 to 44	7.10	3.27	3.15	0.33	0.35
45 to 49	6.15	2.89	2.72	0.27	0.27
50 to 54	5.31	2.50	2.34	0.25	0.22
55 to 59	4.36	2.06	1.94	0.20	0.16
60 to 64	3.32	1.58	1.52	0.13	0.09
65 to 69	2.52	1.19	1.17	0.09	0.07
70 to 74	1.71	0.81	0.81	0.05	0.04

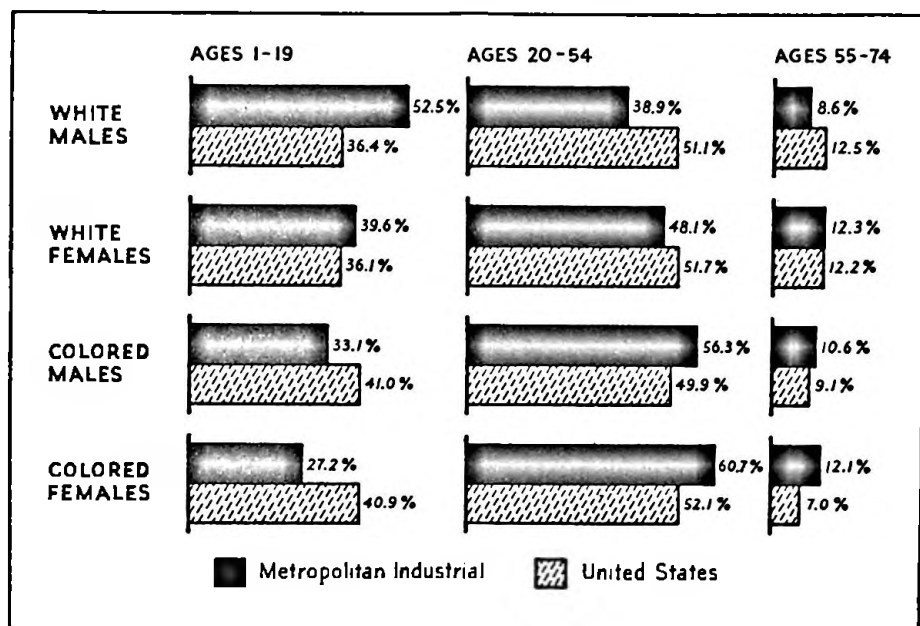
CHART I
PERCENT DISTRIBUTION OF POPULATION
By Color and Sex. Ages 1 to 74 Years
 Metropolitan Life Insurance Company, Industrial Policyholders
 and Total United States, 1934



age 20, as compared with 36.73 in the general population. The age group 20 to 54 makes up 45.72 percent of our policyholders, and 51.36 percent of the general population of ages 1 to 74, though this situation is dominated by the proportion among the white persons, as noted below. In the age group 55 to 74 the proportion is not widely different, 10.79 among the policyholders, 11.91 in the general population.

The proportion of colored persons of ages 1 to 74 among the Industrial policyholders in 1934 was 11.4 percent, which is appreciably more than the 10.3 percent in the general population. The excess is entirely among the females, who constituted 6.3 percent of the total policyholders, whereas in the general population the percent of colored females is only 5.2 percent. The colored males, among the policyholders and in the general population alike, are 5.1 percent of the total. Thus the ratio of females to males in this age group of colored persons is materially higher among the Industrial policyholders than in the general population, namely 1.2 as against 1.0.

CHART II
PERCENT DISTRIBUTION OF POPULATION
By Color, Sex, and Broad Age Periods. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Policyholders
and Total United States, 1934



There is a rather marked difference in age distribution according to color in the two groups. Among the colored under age 20 both males and females are less strongly represented among the policyholders, and above age 20 the situation is reversed, as is clearly seen in Chart II. This is just the opposite of the situation presented among white persons.

In order to establish comparability between figures for the Metropolitan policyholders, as a whole, and for the United States population, as a whole, or, in other cases, in order to establish such comparability between the figures relating to different periods of time, death rates have been computed in a number of instances standardized according to a special schedule with a fixed proportion of white and colored persons, as shown in Appendix I. Such standardization is the more important in some cases, as for certain causes there are material differences between the death rates among the colored and among the white.

Such is the group of human beings to which the mortality experience here recorded relates; such has been the environment

in which they have been placed. How, then, have they reacted? It is essentially in answer to this question that the whole of this report is presented. We shall find the first outline of an answer in the next two chapters dealing with mortality from all causes combined and with the epitome, in the form of life tables, of this total mortality. In subsequent chapters, the broad lesson taught us by this study of gross death rates will be further developed through examination of the course of events with regard to the most important of the individual causes of death, which will be taken up essentially in the order in which they appear in the International List of Causes of Death. The order is as follows: the principal communicable diseases of childhood, tuberculosis, influenza and pneumonia, cancer, the cardiovascular-renal diseases, diabetes, diseases of the puerperal state, a group of miscellaneous diseases of special interest, and, finally, external causes of death which include suicide, homicide, and accidents.

Appendix I briefly indicates the plans and methods employed in gathering and analyzing the data in the report. Appendix II contains a number of detailed tables covering essentially the statistical material on which this survey is based. With the purpose of making the text readily assimilable by the reader, the plan has thus been followed of placing the bulk of the purely numerical material in the Appendix where students and specialists can go directly to the source for these fundamental data.

CHAPTER II

THE GENERAL MORTALITY FROM ALL CAUSES



THE GENERAL MORTALITY FROM ALL CAUSES

The vital statistician and the actuary are both concerned, in much of their work, with a measurable thing that might aptly be described as "quantity of life," though the technical term commonly employed to denote this thing is "exposure." The "quantity of life" in a group of persons over a certain period is the total obtained by summing the number of years lived during that period by each and all the persons in the group. Evidently the number of deaths taking place within the group and period is closely related to this quantity of life, which latter may appropriately be made the denominator in forming an average death rate for the group over the period. In the present case, the period covered being a quarter of a century, and the group numbering many millions of persons, the quantity of life, or, to use a more common expression, the years of life exposed to the risk of death, figures out to a very large number indeed, and so do the total deaths. In fact, the period between 1911 and 1935 covers a total experience of 346,500,000 years of life among the premium-paying Industrial policyholders of the Metropolitan Life Insurance Company. During that time 3,200,000 persons between the ages of 1 and 74 died, or an average of 9.2¹ out of every 1,000 each year.

TABLE 1
YEARS OF LIFE EXPOSED TO RISK
AND NUMBER OF DEATHS, BY COLOR AND SEX
Among Policyholders, Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

COLOR AND SEX	YEARS OF LIFE		DEATHS	
	Number	Percent	Number	Percent
TOTAL PERSONS.....	346,491,849	100	3,198,737	100
White				
Males.....	135,161,771	39	1,200,126	38
Females.....	169,575,357	49	1,375,317	43
Colored				
Males.....	18,948,927	5	288,959	9
Females.....	22,805,794	7	334,335	10

¹When standardized for color, sex, and age according to the standard set forth in Appendix I, the average of the death rates over the period 1911 to 1935 becomes 10.4 per 1,000.

Mortality by Age, Sex, and Color

The number and percentage of deaths from all causes combined, during the 25-year period 1911 to 1935, classified by color

TABLE 2
ALL CAUSES OF DEATH
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES			Percent Decrease 1931-1935 Since 1911-1915	
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915	Males	Females
WHITE								
1 to 74*.....	1,128.7	878.0	1,417.7	866.9	652.0	1,060.7	38.1	38.5
1 to 14*.....	412.1	233.1	545.1	365.0	193.1	506.4	57.2	61.9
15 to 44*.....	700.3	440.0	952.4	535.2	337.7	668.7	53.8	49.5
45 to 74*.....	3,437.7	3,094.0	4,080.0	2,567.4	2,235.7	3,006.4	24.2	25.6
1 to 4.....	805.2	405.9	1,123.7	728.9	354.8	1,034.7	63.9	65.7
5 to 9.....	281.9	178.2	359.9	242.9	142.3	335.9	50.5	57.6
10 to 14.....	201.5	139.9	234.9	175.6	105.4	224.6	40.4	53.1
15 to 19.....	339.7	208.0	394.6	307.4	166.6	373.7	47.3	55.4
20 to 24.....	506.6	291.4	608.1	460.2	268.2	546.4	52.1	50.9
25 to 34.....	708.5	417.1	980.2	566.0	346.5	702.1	57.4	50.6
35 to 44.....	1,133.9	774.7	1,637.9	738.2	519.3	960.0	52.7	45.9
45 to 54.....	1,910.6	1,600.7	2,433.5	1,242.3	1,025.8	1,502.5	34.2	31.7
55 to 64.....	3,580.0	3,299.3	4,198.8	2,619.6	2,302.5	3,081.4	21.4	25.3
65 to 74.....	7,299.6	6,750.9	8,306.5	6,047.2	5,378.3	6,927.3	18.7	22.4
COLORED								
1 to 74*.....	1,578.5	1,336.9	1,866.9	1,457.9	1,172.5	1,707.3	28.4	31.3
1 to 14*.....	682.1	356.2	930.5	668.5	322.8	959.1	61.7	66.3
15 to 44*.....	1,170.0	938.2	1,430.8	1,139.0	869.0	1,349.9	34.4	35.6
45 to 74*.....	4,130.5	4,002.2	4,557.2	3,597.0	3,370.7	3,880.3	12.2	13.1
1 to 4.....	1,355.2	621.9	1,920.6	1,272.6	564.5	1,853.6	67.6	69.5
5 to 9.....	400.2	233.5	536.4	391.5	200.5	552.0	56.5	63.7
10 to 14.....	390.6	252.7	480.3	431.4	239.7	605.5	47.4	60.4
15 to 19.....	783.1	533.6	973.1	937.5	598.7	1,185.2	45.2	49.5
20 to 24.....	980.0	712.3	1,222.8	1,053.1	761.8	1,255.4	41.7	39.3
25 to 34.....	1,159.4	941.0	1,466.1	1,084.8	842.0	1,273.1	35.8	33.9
35 to 44.....	1,646.7	1,439.5	1,918.5	1,441.0	1,208.0	1,658.6	25.0	27.2
45 to 54.....	2,541.3	2,443.4	2,828.3	2,192.8	1,995.7	2,447.1	13.6	18.4
55 to 64.....	4,384.6	4,240.6	4,896.6	3,794.8	3,541.2	4,131.1	13.4	14.3
65 to 74.....	7,957.9	7,775.9	8,607.8	7,027.2	6,770.8	7,292.8	9.7	7.2

*Standardized for age.

and sex, are shown in Table 1. Table 2 exhibits the average of the death rates for individual age groups for the period as a whole and for the initial and final five-year periods.

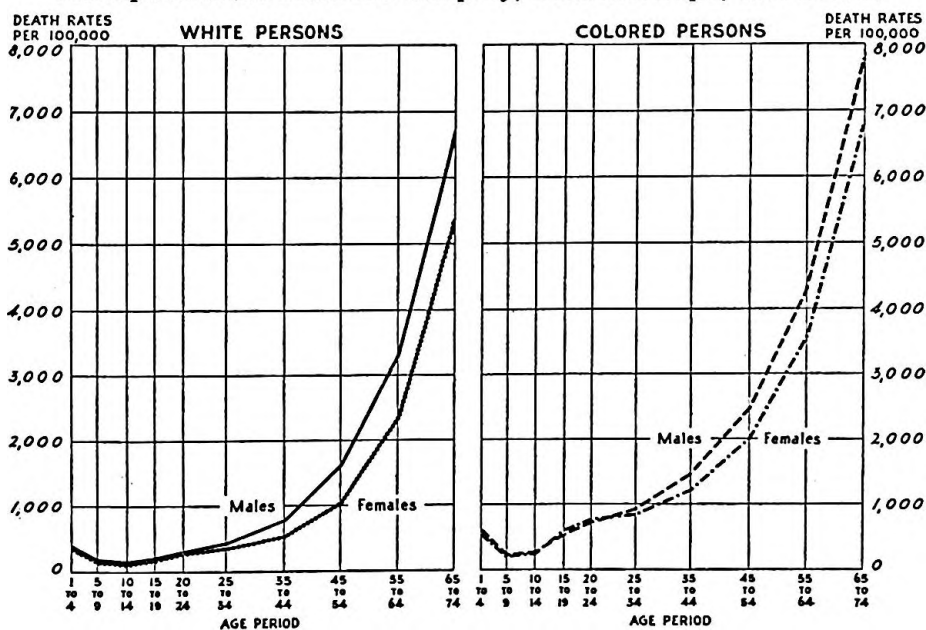
Age In all civilized population groups, mortality is at its lowest in childhood, when the high risks incidental to infancy are past. This appears clearly in Table 2, where it is seen that over the period 1911 to 1935 mortality is relatively high at ages 1 to 4, greatly decreased at ages 5 to 9 and, in all cases but one, at a minimum at ages 10 to 14. The only exception is colored females, among whom the minimum occurs in the age group 5 to 9.

Concentrating on the column giving the figures for the recent period, 1931 to 1935, we note that at ages 1 to 4 the mortality was at the comparatively high figure of 406 per 100,000 among white boys; it decreased rapidly to the level of 178 per 100,000 among white boys aged 5 to 9, and dropped still further to 140 at ages 10 to 14. The minimum mortality lies somewhere in this age group, for above the age group 10 to 14 mortality increases at first slowly, and then more and more rapidly. Thus for the

CHART I ALL CAUSES OF DEATH

Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935



recent quinquennium, the death rate was 291 per 100,000 among white men aged 20 to 24; 775 among those aged 35 to 44 and so on, reaching the high figure of 6,751 among men aged 65 to 74. In each sex and among white and colored alike, these general tendencies are seen. Chart I shows the shape of the mortality curve according to age, separately for each sex and color group.

Sex It is a fact well known to all students of vital statistics that, in civilized countries at any rate, the male sex has generally a higher mortality than the female. In this experience the mortality of insured males during the 25 years was 30 percent higher than that of females among white persons. Concentrating our attention on the closing quinquennium of the period, 1931 to 1935, we note in Table 3 that even at the early ages of life the mortality is materially higher among males than among females. This also is in accordance with well-established experience, and indicates beyond any possible doubt that a part at least of the excess mortality of males is due to inborn constitutional characteristics, and that environmental influences can at most play an additional role. Inspection of the column of figures brings out the significant fact that among white persons the excess of male over female mortality is at a minimum in the age group 20 to 24. The reason for this is obviously the special risk of maternity incurred by women, mainly in this age group. The highest excess mortality of males is found in the age group 45 to 54, where the excess is well over 50 percent. At this point, the dangers of childbirth being past for the women, the industrial risks run by the male wage-earner in the course of his occupation make themselves most strongly felt in the comparison.

The corresponding columns relating to the colored policyholders show that the excess mortality of the male is much more moderate than among the white; perhaps it would be more logical to say that the females among the colored do not enjoy the same advantages as among the white. This same fact also comes out strikingly in the age group 15 to 24, where the burden of maternity actually throws the ratio of male to female mortality below 100 percent.

As to the underlying causes of the excess male mortality, aside from those already mentioned, it may be briefly remarked that the various causes of death, with few exceptions, individually show higher death rates for males than for females. While this holds true for nearly all diseases, the contrast is particularly

TABLE 3
ALL CAUSES OF DEATH

Percentage Male of Female Death Rate
By Color and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	WHITE			COLORED		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
1 to 74*.....	130	135	134	108	114	109
1 to 14*.....	113	121	108	102	110	97
15 to 44*.....	131	130	142	103	108	106
45 to 74*.....	134	138	136	115	119	117
1 to 4.....	110	114	109	106	110	104
5 to 9.....	116	125	107	102	116	97
10 to 14.....	115	133	105	91	105	79
15 to 19.....	111	125	106	84	89	82
20 to 24.....	110	109	111	93	94	97
25 to 34.....	125	120	140	107	112	115
35 to 44.....	154	149	171	114	119	116
45 to 54.....	154	156	162	116	122	116
55 to 64.....	137	143	136	116	120	119
65 to 74.....	121	126	120	113	115	118

*Ratios calculated on basis of standardized death rates.

marked as regards violent modes of death, including accidents, suicide, and homicide.

Color The excess mortality of the colored over the white policyholders in the period 1911 to 1935 as a whole amounted to 40 percent among males and almost 70 percent among females. In the early years, the differences were not quite so marked, being nearer 30 and 60 percent, respectively. The ratios of the death rates among the white and colored policyholders is presented by age periods in Table 4. It is seen that the excess mortality among the colored obtains at every age period, and is greatest during adolescence and the early adult years. There are $3\frac{1}{2}$ times as many deaths per 100,000 among colored females 15 to 19 years of age as among white females, nearly three times as many between ages 20 to 24, and $2\frac{1}{2}$ times as many between ages 25 to 34. Colored males show death rates $2\frac{1}{4}$ to $2\frac{1}{2}$ times as high as white males in these same age groups.

For many of the most important causes of death the death rates are two or more times as high among the colored as among the

white policyholders; this is true, for example, as regards influenza, tuberculosis, syphilis, cerebral hemorrhage, pneumonia, chronic nephritis, and homicide. The experience here surveyed is not unique in this respect, for in similar studies of the general population the mortality among the colored is much higher than that among white persons.

It is not difficult to see some reasons why mortality is higher among colored than among white persons. Generally speaking, the colored population is at a disadvantage economically and, as usual, this also brings with it the disadvantage of greater exposure to industrial risks, quite aside from the lower level of living. The colored and the white policyholders in this experience also show fairly definite divergence in geographic distribution. Of the total Industrial policies in force, just about one third among the colored are owned by persons resident in Southern States; among the white the corresponding figure is about 12 percent. To this extent the two groups represent somewhat different geographical constituents, exposed to correspondingly different levels of mortality.

TABLE 4
ALL CAUSES OF DEATH
Percentage Colored of White Death Rate
By Sex and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
1 to 74*.....	140	152	132	168	180	161
1 to 14*.....	166	153	171	183	167	189
15 to 44*.....	167	213	150	213	257	202
45 to 74*.....	120	129	112	140	151	129
1 to 4.....	168	153	171	175	159	179
5 to 9.....	142	131	149	161	141	164
10 to 14.....	194	181	204	246	227	270
15 to 19.....	231	257	247	305	359	317
20 to 24.....	193	244	201	229	284	230
25 to 34.....	164	226	150	192	243	181
35 to 44.....	145	186	117	195	233	173
45 to 54.....	133	153	116	177	195	163
55 to 64.....	122	129	117	145	154	134
65 to 74.....	109	115	104	116	126	105

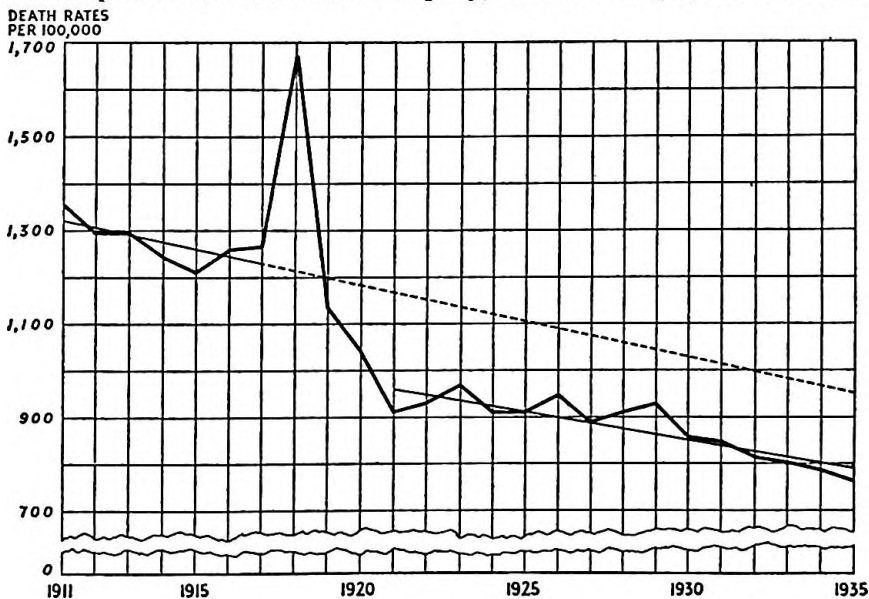
*Ratios calculated on basis of standardized death rates.

Trend of Mortality

In Chart II the course of mortality from all causes among the Industrial policyholders in the period 1911 to 1935 is shown. This chart brings out clearly certain striking characteristics of the series. The curve of death rates is quite definitely split up into three separate sections. The first of these, from 1911 to 1917, moves at an average level of 12.7 deaths per thousand with a fairly even downward slope averaging 1.2 percent per annum of the mean death rate during this period. The third section, extending over the period 1921 to 1935, similarly has a fairly even downward slope, averaging 1.4 percent per annum of the mean death rate (8.8 per thousand) during this period, but situated at an average level very distinctly lower than that of the early section. These two relatively smooth sections are separated by a period of abrupt and violent changes extending between the years 1917 and 1921. This period represents the upheaval brought about by the influenza epidemic of 1918, when the death rate jumped to 16.7 per thousand from the previous year's 12.6; then, in a precipitous decline, fell as low as 9.1 per thousand in 1921. The discussion of the significance of this jolt in the curve will be

CHART II
ALL CAUSES OF DEATH
Standardized Annual Death Rates per 100,000
Total Persons. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



found mainly in the chapter on influenza and pneumonia, with cross references to it in chapters dealing with certain other causes the death rate from which in the years following 1918 were found to be in some manner very greatly affected by the influenza pandemic. Chief among these were tuberculosis and cardiovascular-renal diseases.

The precise cause and effect relation through which the influenza pandemic produced this remarkable result is not altogether clear. The facile explanation that occurs at first glance is that this acute disease killed off a large number of persons in sub-standard health, or afflicted with chronic diseases, who would otherwise have died in ensuing years, and whose elimination in 1918 allowed the death rate in the years immediately following to assume a more favorable level than it otherwise would have done. There are, however, some difficulties in the way of accepting this otherwise plausible explanation, as will be seen in the chapter on influenza and pneumonia.

But whatever may be the underlying causes of the break in the curve, it is interesting to note what would have been the course of events if the old trend from 1911 to 1917 had continued unbroken. For this purpose the trend line computed for these years is shown in Chart II as a solid line over the period 1911 to 1917, and is continued as a line of dashes up to the end of the series, 1935. It will be seen that in the year 1935, according to the old trend, we would have had a death rate of 950 per 100,000, whereas actually this death rate was reached about the year 1922. From this point of view it might be said that the influenza epidemic, if it was indeed the cause of the change in level of the trend, advanced the evolution of our mortality by 13 years. It is true that, though our death rate has been thus greatly diminished, we have paid heavily for this advance by the many thousands of deaths which the influenza epidemic caused.

Trend of Mortality by Age, Sex, and Color

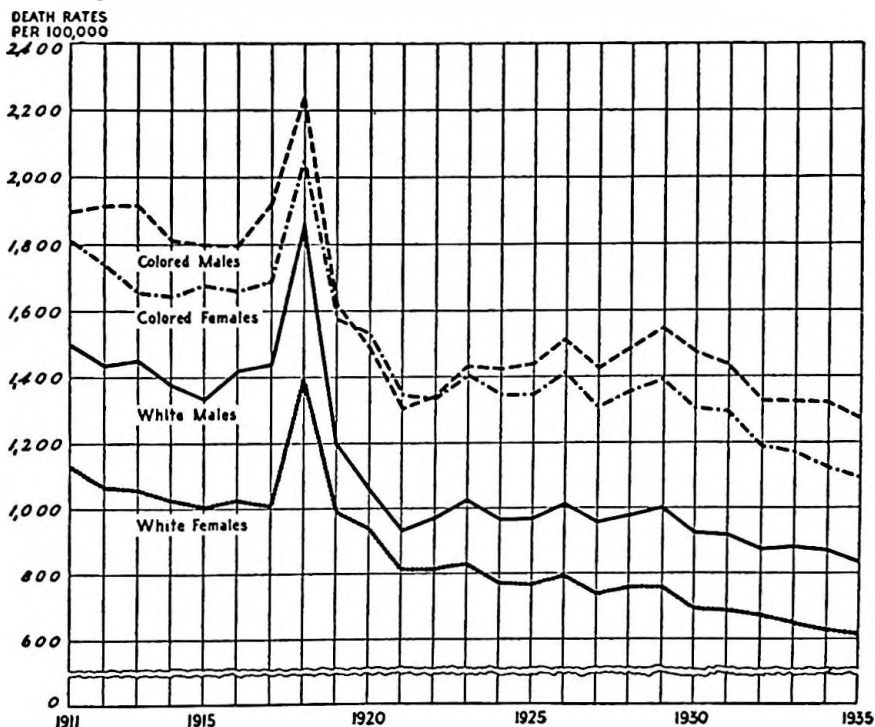
The death rate for each color and sex group was at a materially lower level at the close of the quarter century under review than at the beginning of the period. This fact is obvious from Chart III. A point of special interest is that males registered a more precipitous decline than females in the years immediately following the peak of the influenza pandemic. In fact, among colored persons the death rate for females actually exceeded that for males in the years 1920 and 1921, reversing the usual ratio.

Analysis of the trend in detail shows that each age group registered a decline in death rate over the 25-year period. There are, of course, very material variations in the trend of mortality according to age. The greatest percent gains have been made in the childhood years of life, and this applies to males, females, white, and colored alike. So, for example, it will be seen from Table 2 that in the age group 1 to 4 the percent decrease in the mortality among white males in the five-year period 1931 to 1935, as compared with the earlier period 1911 to 1915, was 63.9 percent; white females did a little better than this, 65.7 percent. In the age group 5 to 9 there are also marked gains recorded in all color and sex groups. At ages 10 to 14 both white males and white females have a smaller relative decrease than do the adjoining upper and lower age groups. Among adult white males the declines in mortality become greater until age 35, beyond which point they diminish with increasing age, while among white

CHART III ALL CAUSES OF DEATH

Standardized Annual Death Rates per 100,000
By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



females the gains become progressively less at all ages beyond adolescence. This lessening of the improvement with advancing age should not surprise us, since we are dealing here mainly with those causes of death which are associated with the degenerative changes characteristic of later life and senescence, for which at the present day there is little means of control.

The series of figures for colored persons in general outline follows a sequence similar to that of white persons, except that throughout adult life the percent gains are smaller than among the white policyholders.

If instead of considering merely the extremes of the period 1911 to 1935, we consider separately the course of events before and after the influenza epidemic, it is to be noted from Table 5 that in the preinfluenza period the greatest improvement was made by white females, who showed a significant decrease in mortality at all ages between 20 and 64, and in the age group 5 to 9. Colored females, on the other hand, showed significant improvement only at ages 20 to 24 and 35 to 44. The mortality of white males recorded a significant improvement at ages 25 to 44; but the decrease in the mortality of colored males was not statistically significant in any age group. After the influenza epidemic, however, the trend of the death rate became significantly downward for practically all sex and color and age groups except at the advanced ages of life. In general, the improvement diminished with age. White females showed improvement even at the oldest ages; but among white males over age 55 and colored females over 65 the trend was slightly upward. Among colored males the death rate advanced in all ages above 25.

Mortality of Industrial Policyholders Compared with That of the General Population

In a general way, the movements of the death rate among the Industrial policyholders parallel those of the death rate of the general population. This parallelism is graphically portrayed in Chart IV.¹ If any such illustration is needed, this chart shows very clearly how the experience of the Industrial policyholders of the Metropolitan Life Insurance Company has for many years past served as a very reliable guide of the mortality for the country as a whole.

Certain of the fundamental characteristics of the trend of mortality for the separate color and sex groups of the two popula-

¹Prior to 1920 figures for the United States suitable for an adequate comparison by color and sex are not available.

TABLE 5
ALL CAUSES OF DEATH
Averages of Annual Death Rates, and Trend of Mortality
By Color, Sex, and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Department,
1911 to 1917 and 1921 to 1935

AGE PERIOD YEARS	AVERAGE OF DEATH RATES PER 100,000				ANNUAL TREND AS PERCENT OF AVERAGE RATE			
	WHITE		COLORED		WHITE		COLORED	
	Males	Females	Males	Females	Males	Females	Males	Females
1911 to 1917								
1 to 74*....	1,420.2	1,048.5	1,863.7	1,697.7	—0.9	—1.7	—0.6	—1.1
1 to 4....	1,119.9	1,030.0	1,873.3	1,813.3	—2.0	—2.6	—4.6	—2.8
5 to 9....	356.5	325.9	530.3	554.6	—2.6	—3.8	—2.5	—1.3
10 to 14....	235.1	219.4	479.4	598.7	—0.8	—1.5	—0.6	—1.8
15 to 19....	403.7	373.9	980.8	1,173.1	+1.1	+0.2	—1.0	—0.7
20 to 24....	621.3	537.4	1,213.9	1,225.7	—0.4	—2.3	—1.6	—2.7
25 to 34....	970.0	681.6	1,456.4	1,258.2	—2.0	—3.3	—0.4	—1.3
35 to 44....	1,625.5	936.3	1,933.7	1,633.9	—1.8	—2.8	+0.5	—1.7
45 to 54....	2,450.9	1,490.0	2,860.3	2,439.4	—0.3	—1.4	+1.0	—0.7
55 to 64....	4,195.0	3,050.7	4,885.5	4,119.3	—0.8	—1.5	—0.1	—0.9
65 to 74....	8,340.3	6,935.7	8,590.2	7,459.7	—0.2	—0.4	—0.1	+0.9
1921 to 1935								
1 to 74*....	943.0	733.6	1,404.4	1,293.6	—1.0	—2.0	—0.3	—1.4
1 to 4....	582.0	510.6	995.8	887.8	—5.9	—5.8	—6.4	—6.3
5 to 9....	225.7	185.0	308.5	273.4	—4.1	—4.6	—4.3	—4.5
10 to 14....	170.1	137.9	314.6	315.8	—3.7	—5.0	—3.6	—5.0
15 to 19....	262.4	237.0	629.4	761.2	—3.6	—5.4	—2.7	—3.5
20 to 24....	349.5	351.8	807.9	907.7	—3.0	—4.5	—1.4	—3.0
25 to 34....	469.6	417.3	971.3	939.0	—2.0	—3.3	+**	—1.6
35 to 44....	856.6	600.5	1,484.9	1,316.3	—1.4	—2.5	+0.1	—1.0
45 to 54....	1,652.8	1,100.6	2,400.8	2,060.4	—0.1	—1.1	+1.1	—0.2
55 to 64....	3,327.6	2,407.2	4,160.5	3,643.7	+0.3	—0.6	+0.9	—0.1
65 to 74....	6,833.8	5,595.6	7,665.6	6,794.8	+**	—0.7	+0.9	+0.1

*Death rates standardized for age. **Less than 0.05.

NOTE:—Figures in boldface indicate significant trends.

tion groups are exhibited in Table 6. It will be seen that for the age group 1 to 74 as a whole, the percent decline between 1921 and 1934 is somewhat greater among the Metropolitan policyholders than in the general population for total persons, as well as for each color and sex group. Although these differences, for the most part, are small, the fact that they are consistently in the

same direction tends to reinforce the implications of each taken separately.

As a result of the somewhat higher rate of decline of the death rates among the Industrial policyholders as compared with the general population, the curves representing the two time series converge, and at the end of the period here considered the death rate among the policyholders was only 11 percent above that recorded for the general population. It is clear that if this convergence of the two trends continues, the mortality of the Industrial policyholders of this Company will soon reach the level of that of the general population.

This situation is the more gratifying in that today's relatively low mortality among the wage-earning population has been attained in the face of handicaps. The persons whose experience is included in this study, as has already been noted, live predominantly in the urban industrial centers. In 1920, according to the Census Bureau, the mortality rate in cities of 10,000 and over was almost 20 percent higher than in smaller cities and rural

CHART IV

ALL CAUSES OF DEATH

Standardized Annual Death Rates per 100,000

Total Persons. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935
and U. S. Registration States of 1920, 1920 to 1934

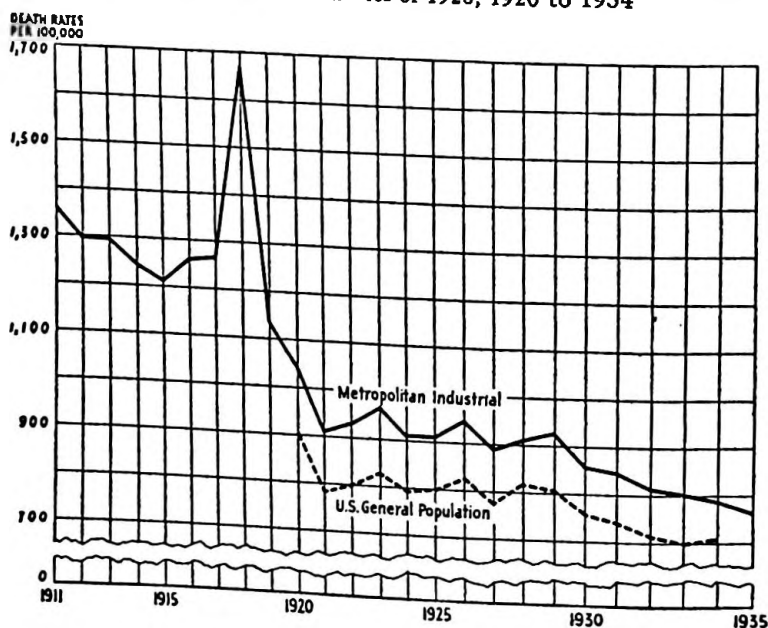


TABLE 6
ALL CAUSES OF DEATH
Averages of Annual Death Rates,* and Trend of Mortality
By Color and Sex. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Department,
and U. S. Registration States of 1920, 1921 to 1934

COLOR AND SEX	AVERAGE OF DEATH RATES* PER 100,000		ANNUAL TREND AS PERCENT OF AVERAGE RATE	
	M. L. I. Co.	U. S. Reg. States	M. L. I. Co.	U. S. Reg. States
TOTAL PERSONS	886.0	774.7	-1.3	-1.0
White males	950.5	781.3	-0.9	-0.6
White females	741.9	657.0	-2.0	-1.8
Colored males	1,413.7	1,425.4	-0.1	+0.2
Colored females	1,308.1	1,387.9	-1.2	-0.7

*Standardized for age, and in the case of Total Persons, also for color and sex.

NOTE:—Figures in boldface indicate significant trends.

areas.³ Furthermore, the Industrial policyholders are largely representative of the lower income brackets of the urban population. These two factors, an urban habitat and a relatively low income, tend to react unfavorably upon the health of the entire family.

The wage-earner himself, who does unskilled and semiskilled work, is exposed to certain hazards to his life and health which are not faced by professional or white-collar workers. These conditions, as well as others, necessarily are reflected in the mortality of the group. Actually, in spite of these handicaps, the mortality rates of the Industrial policyholders of the Metropolitan Life Insurance Company today are not appreciably higher than those of the general population.

The Leading Causes of Death

The 10 leading causes of death,⁴ with the corresponding death rates and the percent of deaths among the Industrial policyholders of ages 1 to 74, are set forth in Table 7, exhibiting the situation for the period 1911 to 1935 as a whole and for the years 1911 and 1935 separately. It will be noted that the

³U. S. Registration States of 1920: cities of 10,000 population and over, 1920 death rate 14.1 per 1,000; smaller cities and rural areas, 11.9 per 1,000.

⁴The enumeration of these leading causes from 1 to 10 is, of course, somewhat arbitrary and depends to some extent on the items comprised within each title. As regards the reason for combining certain causes in the way indicated in Table 7, see the footnote at the bottom of that table.

10 leading causes alone account for about 73 percent of all deaths.

Owing to the great inequality of our success in reducing the death rate from various causes, the order of rank of the 10 principal causes of death in 1935 is greatly changed from that which prevailed in 1911. The most striking change is that of tuberculosis, which in 1911 headed the list, contributing 18.5 percent of the total deaths from all causes, but at the end of the series had fallen to fifth,⁵ in rank, accounting for 7.0 percent of the total deaths. On the other hand, diseases of the heart, which in 1911 ranked second with 11.1 percent of the total (though greatly outdistanced by the first item, namely tuberculosis), had risen to first in rank in 1935, accounting for 18.5 percent of all the deaths, and again separated by a large margin from the second item. The second item in 1935 is itself another example of the drastic change in rank that has occurred during this calendar period. For cancer, which in 1935 was second with 11.9 percent of the total deaths, had been seventh in 1911 with 5.4 percent of the total deaths. In the case of cancer, however, the extreme change in rank is due in part to the fact that several of the death rates from certain other causes have materially diminished.

In 1911, next to tuberculosis and organic diseases of the heart, influenza and pneumonia combined (10.4 percent), chronic nephritis (7.5 percent), and accidents (6.2 percent) led all other causes of death. At the end of the series, 1935, four of these causes still ranked among the leading five, namely tuberculosis, organic diseases of the heart, influenza and pneumonia, and chronic nephritis. Accidents, which had ranked fifth in 1911, were moved down to seventh place in 1935.

Important changes occurred also among the causes that ranked from sixth to 10th. In 1911 these causes, in order of their importance, were cerebral hemorrhage, cancer, diphtheria, diarrhea and enteritis, and typhoid fever. By 1935 only cerebral hemorrhage remained in this group of five causes, still ranking sixth as before, but being followed by accidents, diseases of the coronary arteries and angina pectoris jointly, diabetes, and appendicitis. Deaths from diphtheria and from diarrhea and enteritis, as well as those from typhoid fever, have so declined in the past 25 years that these diseases now rank far below the 10 principal causes of death. On the other hand, there have moved into ninth and 10th ranks diabetes and appendicitis.

⁵This is the ranking for the number of deaths in the age group 1 to 74. If the ranking were based on persons of all ages, including those 75 and over, tuberculosis would rank even further down the list.

TABLE 7
RANK OF LEADING CAUSES OF DEATH
Total Persons. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Department,
1911, 1935, and 1911 to 1935

1911				
CAUSE OF DEATH	DEATHS		DEATH RATE PER 100,000	
	Number	Percent	Crude	Standardized*
ALL CAUSES OF DEATH.....	94,316	100.0	1,214.4	1,354.9
Ten Leading Causes.....	67,117	71.2	864.3	971.2
1. Tuberculosis—all forms.....	17,448	18.5	224.7	241.6
2. Diseases of the heart.....	10,423	11.1	134.2	157.7
3. Influenza and pneumonia†.....	9,836	10.4	126.6	140.6
4. Chronic nephritis.....	7,046	7.5	90.7	109.1
5. Accidents—all forms.....	5,893	6.2	75.9	86.6
6. Cerebral hemorrhage and paralysis without specified cause.....	5,348	5.7	68.9	83.3
7. Cancer—all forms.....	5,116	5.4	65.9	75.8
8. Diphtheria.....	2,126	2.3	27.4	25.6
9. Diarrhea and enteritis.....	2,106	2.2	27.1	28.7
10. Typhoid fever.....	1,775	1.9	22.9	22.1
1935				
CAUSE OF DEATH	DEATHS		DEATH RATE PER 100,000	
	Number	Percent	Crude	Standardized*
ALL CAUSES OF DEATH.....	132,420	100.0	801.3	762.6
Ten Leading Causes.....	99,970	75.3	604.9	572.4
1. Diseases of the heart.....	24,555	18.5	148.6	138.6
2. Cancer—all forms.....	15,822	11.9	95.7	86.8
3. Influenza and pneumonia†.....	11,500	8.7	69.6	67.8
4. Chronic nephritis.....	9,718	7.3	58.8	52.9
5. Tuberculosis—all forms.....	9,284	7.0	56.2	56.4
6. Cerebral hemorrhage and paralysis without specified cause.....	9,029	6.8	54.6	47.9
7. Accidents—all forms.....	8,863	6.7	53.6	57.5
8. Diseases of the coronary arteries and angina pectoris.....	5,261	4.0	31.8	32.4
9. Diabetes mellitus.....	4,020	3.0	24.4	20.5
10. Appendicitis.....	1,912	1.4	11.6	11.5
1911 to 1935				
CAUSE OF DEATH	DEATHS		AVERAGE ANNUAL DEATH RATE PER 100,000	
	Number	Percent	Crude	Standardized†
ALL CAUSES OF DEATH.....	3,198,737	100.0	923.2	1,037.3
Ten Leading Causes.....	2,326,603	72.7	671.6	757.8
1. Diseases of the heart.....	445,833	13.9	128.7	144.1
2. Tuberculosis—all forms.....	403,851	12.6	116.6	135.7
3. Influenza and pneumonia†.....	391,023	12.2	112.0	128.6
4. Cancer—all forms.....	262,046	8.2	75.0	81.4
5. Chronic nephritis.....	246,217	7.7	71.1	83.9
6. Accidents—all forms.....	216,531	6.8	62.5	70.8
7. Cerebral hemorrhage and paralysis without specified cause.....	200,217	6.3	57.8	67.3
8. Diabetes mellitus.....	60,407	1.9	17.4	17.6
9. Diseases and conditions of the puerperal state.....	55,141	1.7	15.9	15.5
10. Appendicitis.....	45,337	1.4	13.1	12.9

*Standardized for color, sex, and age. †1909 classification, International List of Causes of Death.

†Changes in the rules governing the classification of deaths necessitates the bracketing together of influenza and pneumonia, although this brings together under one item a somewhat heterogeneous group of conditions. Full discussion of this will be found in the chapter on Influenza and Pneumonia.

There have also been some changes in classification affecting other causes of death within the 25-year period, which, however, do not materially affect the list of ranks here shown, and which are fully brought to the reader's attention in the pertinent chapters.

†Averages of standardized annual death rates.

Table 7 shows also the leading 10 causes of death in order of rank as they appear when the period 1911 to 1935 is considered as a whole. This portion of the table, of course, fails to bring out the striking changes that occurred, but may be found useful as a general epitome of the characteristics of the entire calendar period.

Of greater interest in this table are the columns which show, in addition to the crude death rates, also the standardized rates. The ranks discussed above are figured according to the actual number of deaths, or, what amounts to the same thing, the crude death rates. Such ranking is necessarily affected by the prevailing age distribution. The standardized death rates essentially eliminate this influence. It will be noted that if the ranking were made according to standardized death rates, it would be slightly modified in a few instances.

CHAPTER III

THE TREND OF LONGEVITY THROUGH A QUARTER CENTURY



THE TREND OF LONGEVITY THROUGH A QUARTER CENTURY

The Meaning of the Life Table and of the Expectation of Life

The inverse of mortality is longevity. This is not merely a matter of words, but is true in a very definite arithmetical sense. In a population in which the birth rate and the death rate are both constant and are equal to one another, so that the total number of persons is maintained stationary, the death rate is the reciprocal of the average length of life. For, if everybody just lived this average length of life, for example 60 years, evidently the entire population would be just completely replaced in 60 years, so that in a population of 1,000,000 for example, 1,000,000 deaths would take place in 60 years, or $1/60 \times 1,000,000$ would take place in one year, and the annual death rate per head would be $\frac{1/60 \times 1,000,000}{1,000,000} = 1/60$. Thus the death rate per head would be reciprocal of the average length of life, as just stated. In the usual terminology this would be written as 16.6 per 1,000. This relation is general for the stationary population defined as above.

There is thus a simple connection between the figure that measures the death rate in a *stationary* population and the average length of life. But this relation no longer holds for a population such as we commonly have to deal with in studies relating either to the country as a whole, or to separate groups distinguished by geographic territories, or, as in the case of the policyholders of a Life insurance company, by certain special personal relations. Nevertheless, here also the average length of life still represents in a somewhat broader sense the inverse of mortality, for it may be regarded as a numerical measure of the longevity of the population. And this measure has certain advantages over mortality rates, as a gauge of the vitality of the population, because the average length of life is a fundamental characteristic independent of the prevailing age distribution (which markedly influences the crude death rate), and also independent of any arbitrary standard, such as is necessarily used in computing standardized death rates.

TABLE 1
LIFE TABLE FOR TOTAL PERSONS
 Metropolitan Life Insurance Company, Industrial Dept., 1935

1	2	3	4	5	1	2	3	4	5
AGE	OF 100,000 BORN ALIVE		RATE OF MORTALITY PER 1,000	Complete Expectation of Life or Mean After-Lifetime; Average Number of Years Lived After Age x per Person Surviving to Exact Age x	AGE	OF 100,000 BORN ALIVE		RATE OF MORTALITY PER 1,000	Complete Expectation of Life or Mean After-Lifetime; Average Number of Years Lived After Age x per Person Surviving to Exact Age x
	Number Surviving to Exact Age x	Number Dying Between Ages x and $x+1$				Number Surviving to Exact Age x	Number Dying Between Ages x and $x+1$		
x	l_x	d_x	$1,000q_x$	e_x	x	l_x	d_x	$1,000q_x$	e_x
0	100,000	5,042	50.42	60.25	50	76,125	996	13.08	21.20
1	94,958	979	10.31	62.42	51	75,129	1,052	14.00	20.47
2	93,979	365	3.88	62.06	52	74,077	1,111	15.00	19.76
3	93,614	257	2.75	61.30	53	72,966	1,175	16.11	19.05
4	93,357	209	2.24	60.47	54	71,791	1,243	17.32	18.36
5	93,148	175	1.88	59.61	55	70,548	1,316	18.65	17.67
6	92,973	171	1.84	58.72	56	69,232	1,392	20.10	17.00
7	92,802	142	1.53	57.83	57	67,840	1,471	21.69	16.33
8	92,660	125	1.35	56.91	58	66,369	1,554	23.42	15.69
9	92,535	115	1.24	55.99	59	64,815	1,640	25.31	15.05
10	92,420	111	1.20	55.06	60	63,175	1,730	27.39	14.43
11	92,309	111	1.20	54.12	61	61,445	1,823	29.67	13.82
12	92,198	115	1.25	53.19	62	59,622	1,918	32.17	13.23
13	92,083	123	1.34	52.25	63	57,704	2,014	34.90	12.65
14	91,960	133	1.45	51.32	64	55,690	2,109	37.87	12.09
15	91,827	146	1.59	50.40	65	53,581	2,200	41.06	11.55
16	91,681	160	1.74	49.48	66	51,381	2,284	44.46	11.02
17	91,521	175	1.91	48.56	67	49,097	2,360	48.06	10.51
18	91,346	191	2.09	47.65	68	46,737	2,424	51.86	10.01
19	91,155	208	2.28	46.75	69	44,313	2,477	55.89	9.53
20	90,947	225	2.47	45.86	70	41,836	2,519	60.20	9.07
21	90,722	241	2.66	44.97	71	39,317	2,549	64.83	8.62
22	90,481	258	2.85	44.09	72	36,768	2,567	69.82	8.18
23	90,223	273	3.03	43.21	73	34,201	2,572	75.21	7.76
24	89,950	290	3.22	42.34	74	31,629	2,566	81.12	7.35
25	89,660	304	3.39	41.48	75	29,063	2,547	87.63	6.95
26	89,356	318	3.56	40.62	76	26,516	2,515	94.86	6.57
27	89,038	332	3.73	39.76	77	24,001	2,470	102.91	6.21
28	88,706	345	3.89	38.91	78	21,531	2,408	111.83	5.86
29	88,361	358	4.05	38.06	79	19,123	2,323	121.46	5.54
30	88,003	371	4.22	37.21	80	16,800	2,211	131.60	5.23
31	87,632	386	4.40	36.37	81	14,589	2,072	142.03	4.95
32	87,246	400	4.59	35.53	82	12,517	1,909	152.55	4.69
33	86,846	416	4.79	34.69	83	10,608	1,729	163.01	4.44
34	86,430	434	5.02	33.85	84	8,879	1,541	173.58	4.21
35	85,996	452	5.26	33.02	85	7,338	1,354	184.47	3.99
36	85,544	472	5.52	32.19	86	5,984	1,172	195.91	3.78
37	85,072	493	5.80	31.37	87	4,812	1,002	208.13	3.57
38	84,579	516	6.10	30.55	88	3,810	843	221.27	3.38
39	84,063	541	6.43	29.73	89	2,967	698	235.19	3.20
40	83,522	567	6.79	28.92	90	2,269	567	249.68	3.03
41	82,955	596	7.19	28.12	91	1,702	450	264.50	2.88
42	82,359	630	7.65	27.32	92	1,252	350	279.45	2.73
43	81,729	667	8.16	26.52	93	902	266	294.35	2.60
44	81,062	708	8.73	25.74	94	636	197	309.23	2.47
45	80,354	751	9.35	24.96	95	439	142	324.19	2.35
46	79,603	797	10.01	24.19	96	297	101	339.30	2.24
47	78,806	845	10.72	23.43	97	196	70	354.66	2.14
48	77,961	893	11.45	22.68	98	126	47	370.34	2.04
49	77,068	943	12.24	21.93	99	79	31	386.40	1.94

Now the basis for the computation of the average length of life is the Life Table.

Without going into technicalities,¹ a life table, such as that appearing on page 34, may be described as a record showing how many persons out of an arbitrary large number of persons of a given age, such as for instance 100,000 newly born alive, would survive to each year of life *under the prevailing mortality conditions*. The number of survivors to age x shown in the second column of the table is commonly denoted by the symbol l_x . The table shows also in separate columns the deaths d_x in each year of age x , and the corresponding death rate, q_x .²

From the data in these columns it is a simple matter to compute, for each age of life, the corresponding average after-lifetime, or, as it is commonly called, expectation of life. The average after-lifetime at birth is, of course, simply the average length of life. A complete life table includes a column of the average after-lifetime, denoted by the symbol e_x , for each age of life.

Expectation of Life

Table 2 and Chart I exhibit the expectation of life *at birth* among Industrial policyholders of the Metropolitan Life Insurance Company for all calendar years for which life tables had been prepared,³ up to 1935, inclusive. This figure has been computed

TABLE 2
EXPECTATION OF LIFE AT BIRTH
Total Persons

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

CALENDAR YEAR	EXPECTATION IN YEARS	CALENDAR YEAR	EXPECTATION IN YEARS	CALENDAR YEAR	EXPECTATION IN YEARS
1935	60.25	1929	55.78	1923	54.55
1934	59.45	1928	55.88	1922	55.04
1933	59.19	1927	56.42	1921	55.08
1932	58.80	1926	55.02	1919-1920	51.14
1931	57.90	1925	55.51	1911-1912	46.63
1930	57.36	1924	55.62	.....	.....

Gain: 1935 since 1911-1912, 13.62 years.

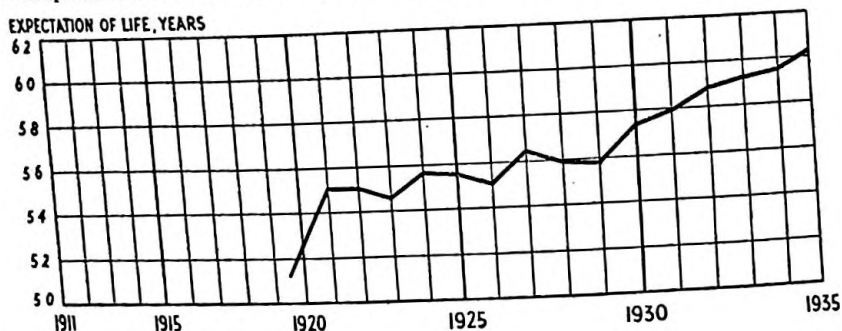
¹For a very detailed description of the life table and methods of its construction, see *Length of Life—A Study of the Life Table*, by Louis I. Dublin and Alfred J. Lotka, Ronald Press, New York, N. Y., 1936.

²To be exact, q_x measures the probability, at age x , of dying within one year.

³Except that in the Chart the figure for 1911-1912 is omitted, because no tables were prepared for the following years until 1919-1920.

CHART I EXPECTATION OF LIFE AT BIRTH Total Persons

Metropolitan Life Insurance Company, Industrial Dept., 1919-1920 to 1935



only for total Industrial policyholders without distinction of color or sex. In its computation an approximate estimate, gathered from extraneous sources,⁴ of the mortality in the first year of life, and of the mortality at ages 75 and over has been used, since data for these ages, derived from the claim records of weekly premium-paying Industrial policyholders are necessarily inadequate.

From the table it will be seen that in 1935, the last year covered by this period, the expectation of life among Industrial policyholders crossed the 60-year mark for the first time, touching the figure of 60.25 years. This represents a gain of no less than 13.62 years over the expectation of life at birth in 1911-1912, namely 46.63 years. The rise from this original figure to the latest reported has not been uniform throughout the period. In the first period of nine years, from 1911-1912 to 1919-1920, there was an increase of 4.51 years. Actually, however, the terminal date, 1919-1920, in this comparison, was somewhat unfavorably chosen, since it happened to include a sizable influenza epidemic. It is mainly for this reason that the very next year, 1921, showed quite a marked increase, namely 3.94 years, over the immediately preceding figure. From 1921 forward, over a considerable succession of years, there was not very much change in the expectation of life at birth, which hovered around the figure of 55 years up to about 1926. The year 1927 was particularly favorable, with an expectation of life at birth of 56.42, almost $1\frac{1}{2}$ years greater than that for the year 1926. This advantage was not altogether maintained in the next two years, which fell back slightly to a level just short of 56 years. Taken as a whole, the period from 1921 to

⁴See Appendix I.

1929 showed relatively small gains. The picture is entirely changed in the years since 1930. That year was, itself, exceedingly favorable, with an increase of no less than 1.58 years over 1929. And since 1930, each year has shown an increase over the preceding year, culminating in 1935 in an expectation of life at birth of 60.25 years.

This showing for the last six years is the more remarkable because within it fell one of the most profound and lasting economic depressions that this country has experienced. Possibly the low mortality has been, in part, just pure good fortune, due to favorable climatic conditions. Reduced industrial activity undoubtedly resulted in diminished mortality from occupational causes. It is even possible that the necessary retrenchments in the scale of living may have had beneficial effects.

Expectation of Life by Color, Sex, and Age

From the figures which have been cited, it is clear that there have been marked gains in the expectation of life over the period covered among Industrial policyholders. Not all classes of these policyholders have shared alike in these gains. For details regarding the way in which the different color and sex groups among these policyholders have profited, our data permit comparisons of the expectation of life only from age 10 up. The main facts are collected in Table 3. The familiar observation is here again to be made that, generally speaking, females have a higher expectation of life than males and that the expectation of life of colored persons falls materially below that of white persons. At age 10 the expectation of life of white males in 1911-1912 was 45.61 years, that of white females 50.66 years. Among the colored the corresponding figures were 41.32 years for males and 41.30 years for females. In this case, the two sexes among colored policyholders had practically identical expectations. At the other end of the series, 1935, the last year for which comparable data are available, the figures at age 10 were 53.68 for white males and 57.65 years for white females. Among the colored, the figure for males is 46.97 years, and that for females 49.38 years. Thus, in the period from 1911-1912 to 1935 white males at age 10 gained 8.07 years; white females, 6.99 years; colored males, 5.65 years; and colored females, 8.08 years. At age 30 the corresponding gains were 6.29, 4.96, 3.01, and 4.22 years, respectively; while at age 50 the respective figures were 2.78, 2.85, 1.78, and 2.29 years. In general, it may be said that white Industrial policyholders experienced a greater gain in

TABLE 3
EXPECTATION OF LIFE AT QUINQUENNIAL AGES
White Persons by Sex

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

CALENDAR YEAR	AGE										
	10	15	20	25	30	35	40	45	50	55	60
MALES											
1935	53.68	49.03	44.47	40.03	35.65	31.40	27.31	23.41	19.76	16.40	13.39
1934	53.23	48.57	44.01	39.57	35.24	30.96	26.85	22.98	19.38	16.06	13.08
1933	53.00	48.35	43.83	39.43	35.10	30.86	26.78	22.90	19.35	16.10	13.14
1932	53.11	48.48	43.97	39.58	35.26	31.05	26.99	23.13	19.54	16.21	13.21
1931	52.49	47.90	43.43	39.08	34.81	30.66	26.68	22.91	19.37	16.15	13.22
1930	52.38	47.79	43.35	39.03	34.75	30.59	26.60	22.77	19.22	16.02	13.15
1929	51.20	46.65	42.27	38.03	33.84	29.72	25.78	22.12	18.70	15.53	12.64
1928	51.74	47.22	42.83	38.58	34.36	30.18	26.21	22.50	19.04	15.80	12.87
1927	51.88	47.34	42.93	38.66	34.44	30.25	26.26	22.49	18.93	15.77	12.91
1926	51.41	46.90	42.49	38.21	34.02	29.42	26.00	22.38	19.02	15.78	12.84
1925	51.63	47.08	42.72	38.49	34.27	30.15	26.25	22.53	18.95	15.70	12.76
1924	51.77	47.27	42.93	38.72	34.53	30.43	26.54	22.88	19.38	16.15	13.23
1923	50.98	46.46	42.10	37.89	33.72	29.71	25.88	22.23	18.79	15.60	12.73
1922	51.89	47.41	43.07	38.88	34.77	30.77	26.94	23.33	19.84	16.53	13.53
1921	52.70	48.28	44.01	39.88	35.74	31.64	27.72	23.97	20.26	16.79	13.64
1919-1920	49.50	45.04	40.85	37.04	33.45	29.90	26.32	22.82	19.39	16.11	13.14
1911-1912	45.61	41.12	36.87	33.00	29.36	26.03	22.94	19.92	16.98	14.14	11.50
FEMALES											
1935	57.65	52.95	48.31	43.82	39.43	35.06	30.75	26.54	22.52	18.73	15.23
1934	57.45	52.70	48.08	43.62	39.22	34.86	30.54	26.34	22.35	18.57	15.10
1933	57.01	52.27	47.68	43.26	38.93	34.63	30.37	26.21	22.22	18.45	14.98
1932	56.55	51.86	47.31	42.97	38.67	34.38	30.14	26.02	22.05	18.31	14.91
1931	56.41	51.71	47.20	42.88	38.61	34.36	30.16	26.09	22.19	18.47	15.03
1930	56.14	51.49	47.01	42.71	38.47	34.20	29.95	25.83	21.91	18.22	14.83
1929	55.14	50.49	46.07	41.87	37.69	33.49	29.35	25.34	21.44	17.73	14.35
1928	55.10	50.42	46.03	41.89	37.71	33.52	29.41	25.42	21.54	17.86	14.48
1927	55.32	50.71	46.33	42.18	38.05	33.87	29.74	25.73	21.88	18.23	14.90
1926	54.87	50.24	45.87	41.68	37.53	33.40	29.27	25.29	21.51	17.87	14.56
1925	55.09	50.47	46.11	41.98	37.87	33.80	29.76	25.77	21.90	18.20	14.82
1924	55.10	50.53	46.20	42.08	37.96	33.86	29.76	25.75	21.92	18.24	14.84
1923	53.88	49.28	44.97	40.95	36.90	32.82	28.79	24.80	20.88	17.23	13.92
1922	54.46	49.93	45.62	41.54	37.55	33.51	29.46	25.48	21.58	17.96	14.54
1921	54.61	50.12	45.88	41.84	37.74	33.66	29.66	25.67	21.81	18.13	14.68
1919-1920	52.05	47.57	43.44	39.69	36.13	32.49	28.72	24.93	21.17	17.57	14.25
1911-1912	50.66	46.19	42.02	38.21	34.47	30.72	27.00	23.29	19.67	16.32	13.20

expectation of life than colored policyholders, and among white persons, males have gained more than females. Colored males showed the least gain. Further details can be gathered from the accompanying diagram Chart II and Table 3.

TABLE 3—*Continued*
 EXPECTATION OF LIFE AT QUINQUENNIAL AGES
 Colored Persons by Sex

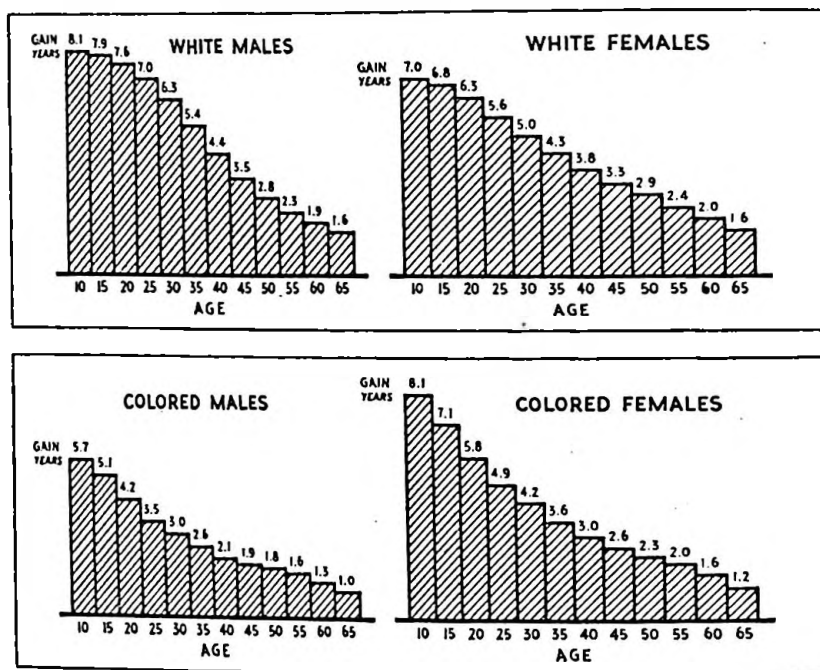
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

CALENDAR YEAR	AGE										
	10	15	20	25	30	35	40	45	50	55	60
MALES											
1935	46.97	42.52	38.38	34.56	30.96	27.45	24.04	20.84	17.87	15.08	12.49
1934	46.56	42.12	38.03	34.21	30.49	26.94	23.49	20.22	17.23	14.60	12.15
1933	46.44	41.98	37.94	34.14	30.50	26.99	23.59	20.35	17.47	14.77	12.27
1932	46.31	41.90	37.97	34.24	30.58	27.05	23.61	20.43	17.49	14.68	12.20
1931	45.03	40.71	37.00	33.61	30.11	26.67	23.46	20.41	17.45	14.69	12.20
1930	44.66	40.32	36.49	33.02	29.55	26.11	22.82	19.82	17.04	14.43	11.92
1929	44.09	39.86	36.17	32.74	29.27	25.90	22.68	19.64	16.72	14.07	11.64
1928	44.48	40.24	36.51	33.08	29.64	26.24	22.99	19.94	17.06	14.42	12.09
1927	44.99	40.81	37.08	33.60	30.05	26.59	23.33	20.24	17.31	14.58	12.00
1926	44.84	40.52	36.80	33.40	29.91	26.49	23.18	19.98	16.92	14.11	11.59
1925	45.04	40.88	37.26	33.82	30.30	26.90	23.63	20.56	17.56	14.68	12.03
1924	45.71	41.46	37.61	34.07	30.44	26.92	23.76	20.70	17.77	15.07	12.57
1923	45.63	41.35	37.55	34.04	30.46	26.95	23.66	20.60	17.74	15.01	12.59
1922	46.74	42.39	38.60	35.20	31.75	28.27	24.85	21.73	18.63	15.77	13.15
1921	47.08	43.06	39.24	35.70	32.17	28.68	25.37	22.04	18.74	15.75	13.06
1919-1920	43.79	39.84	36.51	33.53	30.29	26.98	23.82	20.72	17.71	14.78	12.07
1911-1912	41.32	37.42	34.16	31.11	27.95	24.90	21.91	18.93	16.09	13.48	11.21
FEMALES											
1935	49.38	44.89	40.95	37.26	33.54	29.85	26.27	22.86	19.63	16.63	13.84
1934	49.13	44.62	40.70	37.02	33.30	29.55	25.92	22.51	19.31	16.34	13.52
1933	48.31	43.81	39.90	36.28	32.63	28.99	25.45	22.09	18.90	15.86	13.13
1932	48.16	43.77	39.98	36.48	32.95	29.40	25.92	22.68	19.65	16.76	14.19
1931	46.50	42.29	38.74	35.47	32.09	28.63	25.25	22.03	19.01	16.24	13.62
1930	46.47	42.26	38.70	35.41	32.01	28.54	25.16	21.97	18.88	15.99	13.41
1929	45.48	41.28	37.74	34.51	31.20	27.81	24.50	21.40	18.43	15.61	12.95
1928	46.00	41.84	38.36	35.06	31.61	28.23	24.97	21.84	18.87	16.08	13.51
1927	46.34	42.16	38.64	35.46	32.15	28.77	25.46	22.32	19.26	16.32	13.75
1926	45.60	41.46	37.97	34.77	31.41	28.07	24.69	21.37	18.24	15.34	12.78
1925	45.60	41.55	38.13	34.93	31.67	28.28	24.87	21.62	18.58	15.69	13.03
1924	46.63	42.32	38.88	35.61	32.16	28.82	25.46	22.20	19.01	16.11	13.51
1923	45.48	41.37	38.05	34.94	31.55	28.17	24.87	21.65	18.69	15.97	13.33
1922	46.07	42.19	38.78	35.49	32.13	28.66	25.23	21.94	18.86	15.80	12.90
1921	46.12	42.20	39.03	36.18	32.99	29.71	26.50	23.35	20.22	17.29	14.61
1919-1920	43.76	40.08	37.09	34.23	31.13	28.09	25.03	21.88	18.74	15.85	13.18
1911-1912	41.30	37.83	35.14	32.39	29.32	26.30	23.25	20.25	17.34	14.60	12.20

The Trend of the Expectation of Life

While a certain insight is gained into the development of the expectation of life by a consideration of only the initial and terminal points of the 25 years here reviewed, a more representative view

CHART II
IMPROVEMENT IN EXPECTATION OF LIFE
1935 Compared with 1911-1912
By Color and Sex, at Quinquennial Ages
 Metropolitan Life Insurance Company, Industrial Department



would be obtained by a study of the curves exhibiting the fluctuating annual values. This has been done in Chart III for the period 1919-1920 forward, for which annual data are available. In this chart, curves are shown for the expectation of life at ages 10, 30, 50, as representative of three of the main periods of life. The isolated data for 1911-1912 are shown in the table but omitted in the chart.

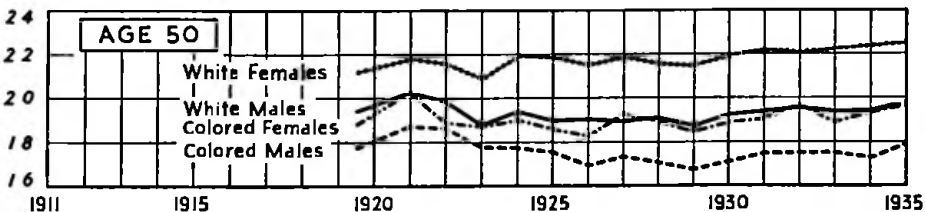
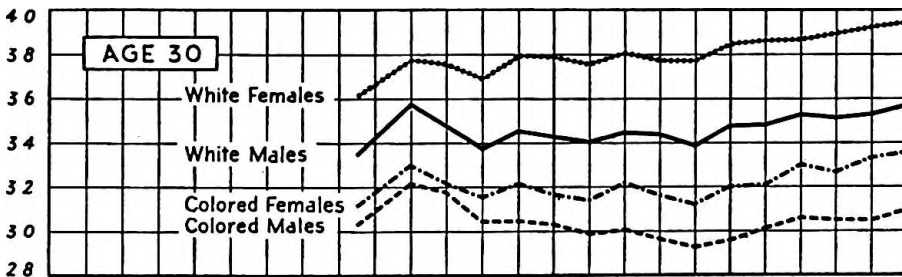
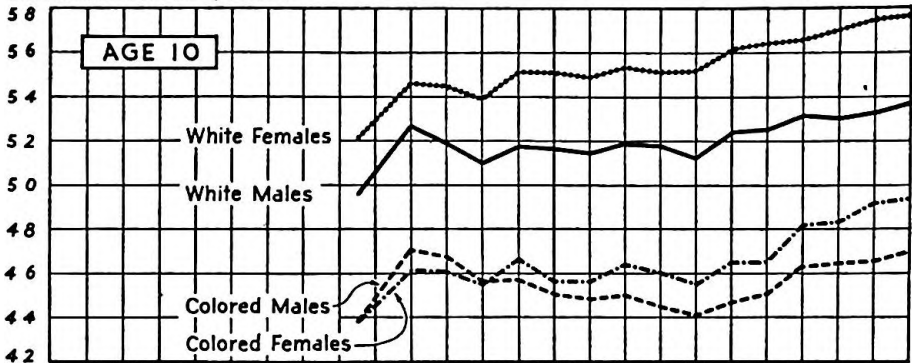
A study of these graphs and the data in Table 3 brings out the following facts:

At practically all ages the figure for 1919-1920 is somewhat out of line. This was due to the prevalence of a fairly definite influenza epidemic in 1919. Aside from this, and on the basis of the data available, the entire period 1911 to 1935 may be broadly divided into three sections. As will be observed from Table 3, from 1911 to 1919-1920, there was a definite gain at all ages and for each color and sex group. In the second period, 1921 to 1929, at age 10, among white and colored males, there is little change in level; among white females there is a distinct upward trend, but

CHART III
EXPECTATION OF LIFE AT SELECTED AGES
By Color and Sex

Metropolitan Life Insurance Company, Industrial Dept., 1919-1920 to 1935

EXPECTATION OF LIFE, YEARS



among colored females there is a very pronounced and continued downward movement. The third period, 1929 to 1935, including as it does the depression years, is characterized by a clear upward trend, which in the case of colored males and colored females in this experience is quite sharp.

The curves for ages 30 and 50 exhibit somewhat similar characteristics in lesser degree.

**Comparison with the General Population of the
United States**

The many millions of Industrial policyholders of the Metropolitan Life Insurance Company furnish, as we have already indicated, a very generous sample of the total population of the

United States and Canada. A particular interest, therefore, attaches to a comparison between the figures for longevity among the Industrial policyholders and in the general population.

In making such a comparison it is necessary, however, to have clearly in mind certain qualitative differences between the two populations under discussion. It must be remembered that the Industrial policyholders represent a specially selected, and in this sense biased, sample of the general population. Geographically they are distinguished from the general population in that they are predominantly urban dwellers. As regards occupation they belong very largely to the rank and file of industrial workers.

These distinguishing features find expression in the fact that the mortality of the Industrial policyholders is higher than that of the general population, and their expectation of life is correspondingly lower. So, for example, the expectation of life at birth in the United States Registration Area for Deaths of 1911 was 53.04 years, while that for the Industrial policyholders of the Metropolitan Life Insurance Company, 1911-1912, was 46.63 years. At the other end of our series, in 1935, however, the corresponding figure for the total United States (which by this time had been completely absorbed in the Registration Area for Deaths) was 61.39 years, while that for the Industrial policyholders was 60.25 years.

The gains in expectation of life over the 25-year period was, therefore, 13.62 among the Industrial policyholders, as against 8.35 in the general population. The two series, for the policyholders and for the general population, starting 6.41 years apart in 1911, have since converged until in 1935 they were only 1.14 years apart. If this approach continues, it will not be long before the longevity of the Industrial policyholders will equal that of the general population.

CHAPTER IV

THE PRINCIPAL COMMUNICABLE DISEASES OF CHILDHOOD

THE DISEASES AS A GROUP	45
DIPHTHERIA	54
MEASLES	61
SCARLET FEVER	67
WHOOPING COUGH	73



THE PRINCIPAL COMMUNICABLE DISEASES OF CHILDHOOD AS A GROUP

The history of the principal communicable diseases of childhood—measles, scarlet fever, whooping cough, and diphtheria—like that of tuberculosis, typhoid fever, and other infections, makes a triumphant chapter in the recent advancement of American public health. Only a few decades ago the childhood diseases were a serious menace to life, and in years of severe outbreaks the death rates rose to heights which to us today would seem almost incredible. One, and by no means an isolated instance, is the experience of Chicago in 1880. In that year diphtheria alone registered a death rate of 290.7 per 100,000 population, which is more than twice the 1933 rate for cancer, and five times that for tuberculosis. In the intervening years, however, the death toll from the four childhood diseases in the United States has so greatly diminished, that today the objective of public and private health agencies is nothing less than the complete suppression of these diseases.

Among children at ages 1 to 14 years insured in the Metropolitan Life Insurance Company, the standardized death rate from this group of diseases declined from 144.6 per 100,000 in the period 1911 to 1915, to 27.7 per 100,000 in 1931 to 1935, a drop of 81 percent. This fact takes on added meaning when we note that the mortality at these ages from all other causes combined declined 53 percent between these two periods. Viewing the data from another angle, we find that among these children the four diseases combined accounted for 25 deaths out of every 100 in the early quinquennium, but caused only 12 deaths out of every 100 in the recent five-year period.

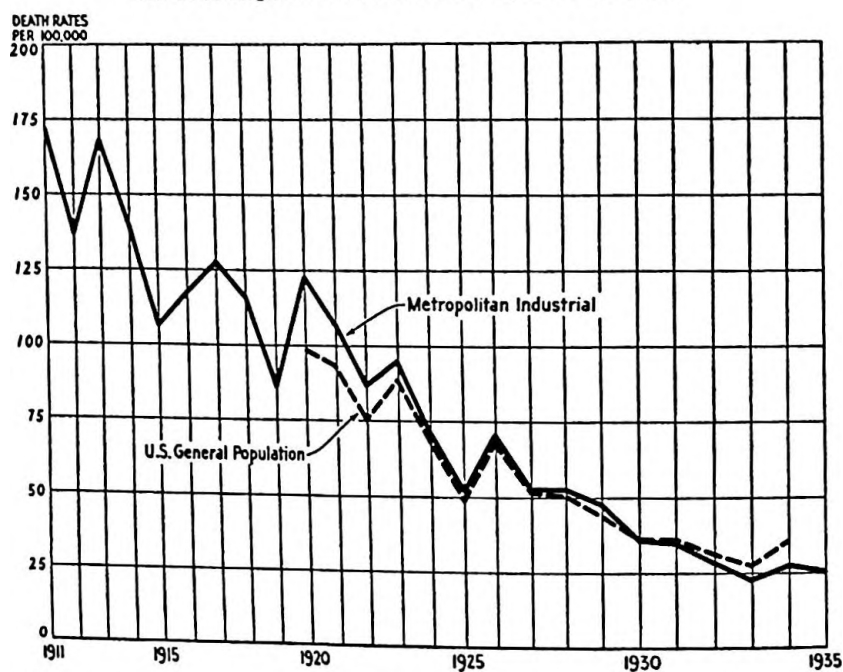
Chart I illustrates graphically the rapidly falling death rate among our young policyholders. The chart shows also the downward trend of the mortality in the corresponding group of the general population for the years 1920 to 1934. Comparable data prior to 1920 are not available, owing to the lack of accurate population estimates by color, sex, and age for the expanding United States Death Registration Area. It is obvious from the chart that the downward course of the death rate in the general

CHART I PRINCIPAL COMMUNICABLE DISEASES OF CHILDHOOD†

Standardized Annual Death Rates per 100,000

Total Persons. Ages 1 to 14 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935
and U. S. Registration States of 1920, 1920 to 1934



†Measles, scarlet fever, whooping cough, and diphtheria.

population was not quite so rapid as that for the Industrial policy-holders. Nevertheless, the two experiences are so much alike that, in general, this insurance material may be considered as representative of that for the country as a whole.

The control of the childhood diseases has added measurably to the average length of life over the 25-year period. In 1911-1912, among the insured at age 1, the principal communicable diseases of childhood were together responsible for a loss of more than 13 months in life expectation. By 1935, at age 1, the loss in expectation due to these infections had fallen to less than four months. But even this lengthening of life does not fully measure the gains achieved. In many nonfatal cases, these acute infections leave in their train heart and kidney impairments. Consequently, the decline in the incidence of the communicable diseases has brought about a diminution in the number of persons afflicted with damaged vital organs. Invalidism and disability have been

TABLE 1
PRINCIPAL COMMUNICABLE DISEASES OF CHILDHOOD†
Five-Year Averages of Annual Death Rates* per 100,000
By Color and Sex. Ages 1 to 14 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

YEARS	TOTAL PERSONS	WHITE		COLORED	
		Males	Females	Males	Females
1911 to 1935.....	83.9	84.0	84.9	77.6	82.5
1931 to 1935.....	27.7	27.4	27.7	28.4	27.7
1926 to 1930.....	51.7	51.0	50.9	58.1	59.7
1921 to 1925.....	82.2	82.3	82.6	80.4	79.8
1916 to 1920.....	113.9	113.0	116.1	100.2	115.4
1911 to 1915.....	144.6	145.7	147.0	121.2	130.2
Percent decline 1931-1935 since 1911-1915.....	80.8	81.2	81.2	76.6	78.7

*Standardized for age, and in the case of Total Persons, also for color and sex.

†Measles, scarlet fever, whooping cough, and diphtheria.

correspondingly reduced, and there are fewer premature deaths from cardiac and renal diseases. Taking all these facts into consideration, the importance of conquering the childhood diseases has been great, even if we are still unable to give an exact quantitative measure of it in terms of increased life expectation.

The improvement in mortality for the childhood diseases was not shared equally by the several groups in the insured population. White children, among whom the death rate from these diseases was higher than among colored children, registered a greater drop than the latter. As Table 1 shows, the percent decline in death rate between 1911 to 1915 and 1931 to 1935 was 81.2 for both white boys and white girls, 76.6 for colored boys, and 78.7 for colored girls. As a result of the differential decline in mortality by color, the disparity in rates between the white and colored has diminished. Whereas in the earlier period whites in each sex exhibited a definitely higher rate than the colored, in the closing years the death rates were approximately the same in each color-sex group.

Importance as a Cause of Death

In the quarter century under review, the four principal communicable diseases of childhood accounted for 90,400 deaths, or

TABLE 2
PRINCIPAL COMMUNICABLE DISEASES OF CHILDHOOD†
 Number of Deaths and Death Rates* per 100,000
 By Specified Age Periods. Total Persons. Ages 1 to 74 Years
 Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	NUMBER OF DEATHS	PERCENT OF DEATHS		DEATH RATES* PER 100,000
		All Causes	Communicable Diseases	
1 to 74.....	90,400	2.8	100.0	27.7
1 to 14.....	85,719	19.2	94.8	83.9
1 to 4.....	54,973	22.7	60.8	195.7
5 to 9.....	25,707	21.3	28.4	58.5
10 to 14.....	5,039	6.1	5.6	13.3
15 to 74.....	4,681	0.2	5.2	2.2

*Death rates for specific age groups are standardized for color and sex; rates for broad age periods are standardized also for age.

†Measles, scarlet fever, whooping cough, and diphtheria.

2.8 percent of the deaths from all causes among Metropolitan Industrial policyholders, ages 1 to 74 years. Deaths from these diseases were heavily concentrated in early childhood, 94.8 percent of the total occurring at 1 to 14 years. As Table 2 shows, about one death out of every five at these ages was due to the communicable diseases. The toll of these diseases is especially high in the preschool ages.

For the 25-year period as a whole, diphtheria was by far the most important disease in this group, comprising 50.3 percent of the deaths at 1 to 14. As can be seen from Table 3, diphtheria in this age range was responsible for about one out of every 10 deaths from all causes combined. Measles ranked next in numerical importance, accounting for 19.2 percent of the principal communicable diseases and for 3.7 percent of the deaths from all causes among these children. In third place was scarlet fever with 15.8 percent of the deaths from communicable disease, followed by whooping cough with 14.7 percent of such deaths. The mortality from whooping cough is at a maximum among infants, and if children under 1 year of age were included in this experience this disease would occupy a more prominent position.

The relative importance of these diseases has changed in the period under review. Table 4 shows the progressive changes by quinquennial periods, for ages 1 to 14 years. Within the com-

TABLE 3
PRINCIPAL COMMUNICABLE DISEASES OF CHILDHOOD
 Number of Deaths and Death Rates* per 100,000
 for Each Disease. Total Persons. Ages 1 to 14 Years
 Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

CAUSE OF DEATH	NUMBER OF DEATHS	PERCENT OF DEATHS		DEATH RATE* PER 100,000
		All Causes	Communicable Diseases	
PRINCIPAL COMMUNICABLE DISEASES OF CHILDHOOD	85,719	19.2	100.0	83.9
Measles.....	16,478	3.7	19.2	16.4
Scarlet fever.....	13,496	3.0	15.8	13.0
Whooping cough.....	12,620	2.8	14.7	13.1
Diphtheria.....	43,125	9.7	50.3	41.4

*Standardized for color, sex, and age.

municable disease group, the proportion of deaths from diphtheria diminished appreciably, from 51.4 percent of the deaths in 1911 to 1915, to 33.0 percent in 1931 to 1935. As a concomitant to this decline, the other three diseases of the group increased in relative importance.

Each of the principal communicable diseases of childhood separately showed a rapidly falling death rate in the 25-year period. The percent decline in death rate for ages 1 to 14 between the years 1911 to 1915 and 1931 to 1935 was 72.5 for scarlet fever, 73.2 for whooping cough, 76.7 for measles, and 87.6 for diphtheria. As Chart II illustrates, the greater improvement for diphtheria has brought the level of this disease much nearer to that of the others in the group. In fact, at ages 1 to 14 the death rate from diphtheria was actually lower than that from measles or scarlet fever in both 1934 and 1935. The standardized annual death rates for each of these diseases and for the group as a whole appear in Appendix Table C.

The mortality from the principal childhood diseases declined much more rapidly than that from all causes of death combined. As a result, the proportion of deaths from communicable diseases decreased from 24.8 percent of the deaths from all causes at ages 1 to 14 in 1911 to 1915, to 11.9 percent in 1931 to 1935. Each of the four diseases, as well as the total, showed a lower proportion of deaths in the last five years than in the initial five years of the 25-year period.

TABLE 4
PRINCIPAL COMMUNICABLE DISEASES OF CHILDHOOD
 Percent Each Disease of All Causes of Death
 and of Principal Communicable Diseases. Total Persons
 Ages 1 to 14 Years
 Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

CAUSE OF DEATH	1931 to 1935	1926 to 1930	1921 to 1925	1916 to 1920	1911 to 1915
PERCENT OF DEATHS FROM ALL CAUSES					
PRINCIPAL COMMUNICABLE DISEASES OF CHILDHOOD.....	11.9	16.3	21.3	19.7	24.8
Measles.....	2.7	3.6	3.6	4.0	4.3
Scarlet fever.....	3.3	2.2	3.2	2.1	4.7
Whooping cough.....	2.0	2.9	2.9	3.1	3.0
Diphtheria.....	3.9	7.6	11.6	10.5	12.8
PERCENT OF DEATHS FROM COMMUNICABLE DISEASES					
PRINCIPAL COMMUNICABLE DISEASES OF CHILDHOOD.....	100.0	100.0	100.0	100.0	100.0
Measles.....	22.3	21.9	16.8	20.1	17.5
Scarlet fever.....	28.0	13.9	15.1	10.8	19.1
Whooping cough.....	16.7	17.6	13.4	15.8	12.0
Diphtheria.....	33.0	46.6	54.7	53.3	51.4
AVERAGES OF ANNUAL DEATH RATES* PER 100,000					
PRINCIPAL COMMUNICABLE DISEASES OF CHILDHOOD.....	27.7	51.7	82.2	113.9	144.6
Measles.....	6.2	11.5	14.2	23.7	26.6
Scarlet fever.....	7.4	7.0	12.1	11.8	26.9
Whooping cough.....	5.2	9.5	11.8	19.7	19.4
Diphtheria.....	8.9	23.7	44.1	58.7	71.7

*Standardized for color, sex, and age.

Factors in the Decline of the Death Rate

The remarkable progress in controlling the principal communicable diseases of childhood may be attributed to a number of factors, ranging from specific prophylactic measures to causes which have apparently operated independently of human control. The most efficacious measures have been developed for the suppression of diphtheria. The value of antitoxin as a curative agent was convincingly demonstrated as early as 1895. Another contri-

CHART II

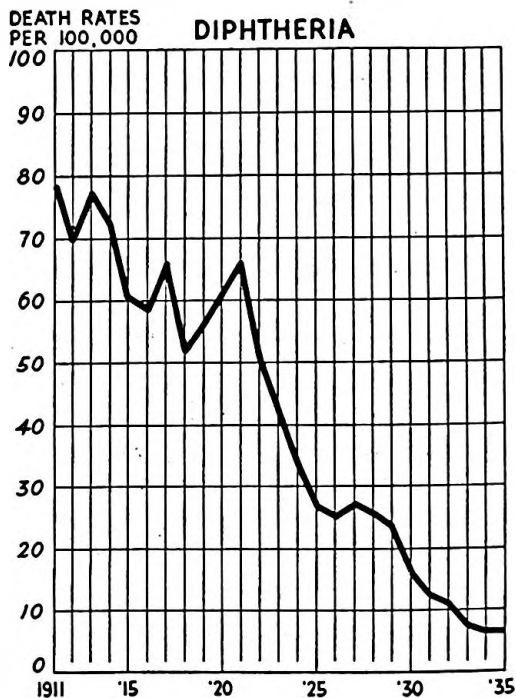
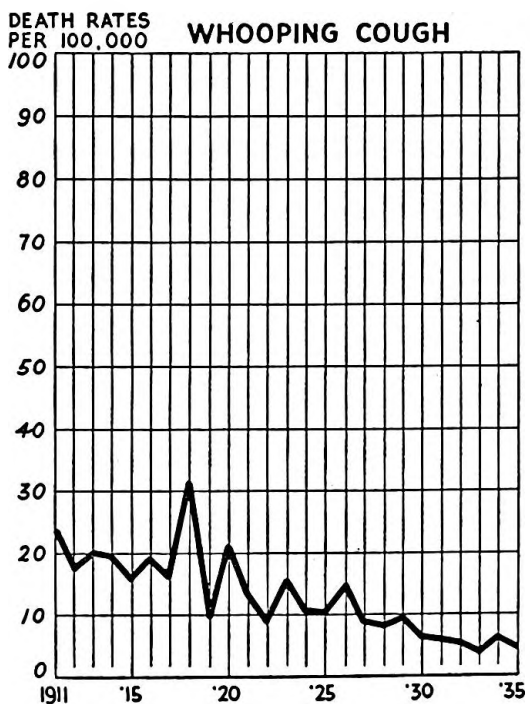
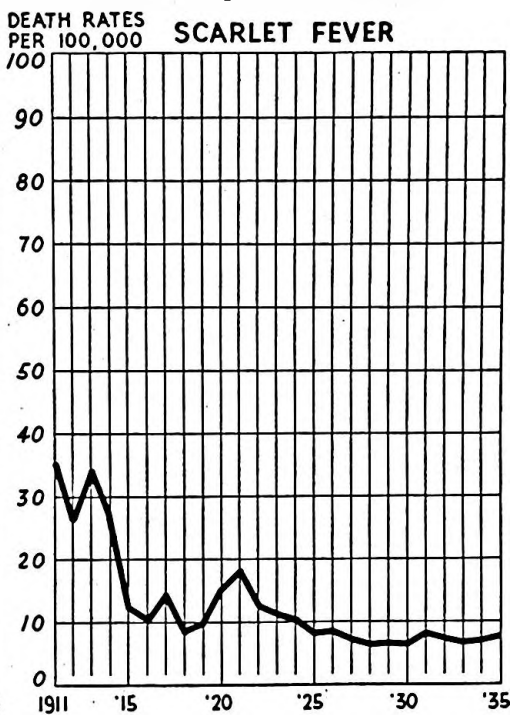
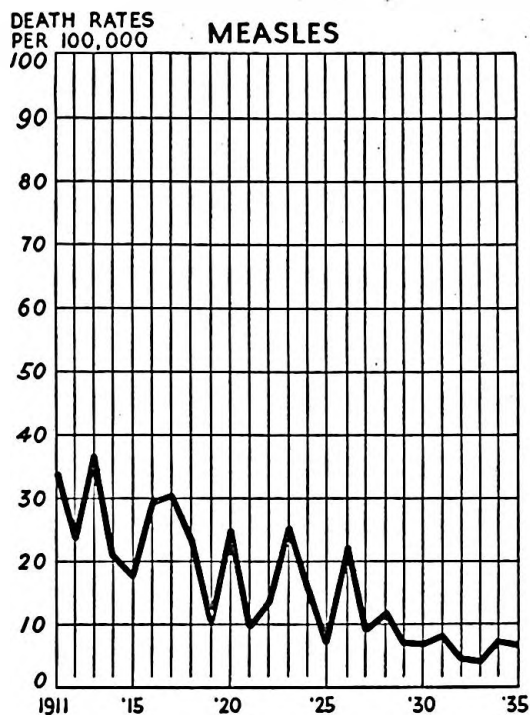
[51]

PRINCIPAL COMMUNICABLE DISEASES OF CHILDHOOD

Standardized Annual Death Rates per 100,000

Total Persons. Ages 1 to 14 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



bution of major importance introduced in the early years of the period under survey was the Schick test for determining susceptibility to the disease. Procedures for the active immunization of susceptible children began to be used on a nationwide scale about 1921. We shall discuss these developments in fuller detail in the later sections of this chapter. Here it is sufficient to point out how eminently successful these measures have proved to be.

Unfortunately, the specific weapons which served as the spearhead for the attack on diphtheria were not available for the other diseases of childhood. Nevertheless measles, scarlet fever, and whooping cough recorded large declines in the period under review. Unquestionably the downward trend of the death rate from these diseases has resulted in part from the generally rising standard of living. In the quarter century that we are considering, a considerable amount of attention has been directed toward the improvement of child health. The child population has had advantages of more and better medical and nursing care. Advances in the field of nutrition have contributed their share to elevate the level of child health to a higher plane. Housing conditions have improved, providing for greater sanitation and less crowding. This factor, in combination with that of smaller families, has reduced the hazard of transmitting communicable diseases from one member of the family to another. Undoubtedly, mothers are better informed on the principles of child care today, and are, therefore, able to rear more sturdy children. These are some of the general factors that have contributed to the lowered mortality from these diseases.

In addition to these general items, a special factor has apparently influenced the trend of the scarlet fever death rate. Competent investigators have recorded the observation that the causative organisms of the disease have exhibited a diminished virulence in recent years. If this is true, and there is reason to believe that it is, the lowered mortality from scarlet fever has resulted in part from a decrease in the case fatality rate rather than from a marked decline in the incidence of the disease. Whether the milder type of scarlet fever now prevalent will continue or whether the disease will revert to a more virulent type, is a matter of conjecture.

Prevention of Deaths from Childhood Diseases

Although notable gains in controlling the mortality from the principal communicable diseases of childhood have been achieved, a problem of considerable magnitude still confronts the public

health movement. There is a definite challenge in the fact that in 1934 these four diseases were still responsible for 21,187 deaths in the United States. It is a chastening thought that thousands of these deaths could have been prevented if existing knowledge of prophylaxis and treatment had been utilized.

The campaign against these diseases must expand and develop those procedures which have already proved to be successful. Foremost in the campaign for the conservation of child life has been the successful use of immunization against diphtheria. This campaign should be widened to include every susceptible child. In communities where such a large-scale program is not feasible, effort should be concentrated on immunizing the preschool population. Convalescent sera for measles and scarlet fever in many cases have proved useful adjuncts in the treatment of these infections. The early and sufficient use of these sera will undoubtedly reduce the case fatality of these diseases. More adequate nursing will likewise help to save life and reduce the number of new cases. There is still much for our official health agencies to do in this already well-developed field of work.

DIPHTHERIA

In the 25-year period under review, diphtheria registered a larger decline in death rate than any of the other communicable diseases of childhood discussed in this chapter. This highly favorable experience reflects the fact that much more is known about diphtheria than about the other childhood infections. The causative organism has been isolated, a test for susceptibility to the disease has been developed, and prophylactic and therapeutic measures have been applied on a large scale and with great success. It should be possible through the application of available knowledge to eliminate this disease as a cause of death.

The disease was responsible in the quarter century under review for 45,233 deaths among the Industrial policyholders of the

TABLE 5
DIPHTHERIA
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 14 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
WHITE						
1 to 74*.....	14.3	3.1	24.8	13.9	3.0	23.9
1 to 14*.....	44.0	9.2	76.8	42.1	8.7	73.4
1 to 4.....	92.7	19.2	171.2	83.3	17.4	153.0
5 to 9.....	38.3	8.4	60.9	39.4	7.9	63.8
10 to 14.....	7.5	1.4	11.2	9.2	1.9	14.0
COLORED						
1 to 74*.....	8.5	2.9	12.6	8.3	2.4	12.8
1 to 14*.....	25.8	8.6	37.8	24.1	7.0	37.2
1 to 4.....	55.1	20.9	84.3	44.2	13.2	76.7
5 to 9.....	21.5	6.1	29.3	23.4	6.9	31.9
10 to 14.....	4.9	0.5	6.1	7.3	1.7	8.4

*Standardized for age.

Metropolitan Life Insurance Company. Of this number, 43,125, or 95.3 percent of the total occurred in the age range 1 to 14 years. Diphtheria accounted for 9.7 percent of the deaths from all causes at these ages, and for 50.3 percent of the deaths from the four communicable diseases of childhood combined.

Mortality by Age, Sex, and Color

The average death rates from diphtheria among children by age, sex, and color for the 25-year period as a whole, and for the initial and final quinquennia of that period, are presented in Table 5.

Age Although diphtheria occurs at every period in the life cycle, it is essentially a disease of childhood. In this experience the death rate drops from a relatively high figure at 1 to 4 years, to a negligible rate in the ages beyond 15. The preponderance of deaths at the preschool ages is due in part to the high case fatality rate at this period of life. Table 6, based on figures for the State of New Jersey, clearly illustrates this fact. In contrast with the experience for measles and whooping cough, diphtheria only infrequently attacks infants under 1 year.

Sex At ages 1 to 74 combined, as well as at 1 to 14 years, the mortality for males among both the white and the colored is slightly higher than that for females. For the 25-year period

TABLE 6
DIPHTHERIA
Cases, Deaths, and Deaths per 100 Cases
Ages Under 15 Years
State of New Jersey, 1930 to 1934

AGE PERIOD YEARS	CASES		DEATHS		DEATHS PER 100 CASES
	Number	Percent of Total, All Ages	Number	Percent of Total, All Ages	
ALL AGES.....	9,373	100.0	658	100.0	7.0
UNDER 15.....	7,526	80.3	602	91.5	8.0
Under 1.....	180	1.9	40	6.1	22.2
1.....	446	4.8	78	11.8	17.5
2.....	693	7.4	95	14.4	13.7
3.....	810	8.6	88	13.4	10.9
4.....	825	8.8	71	10.8	8.6
5 to 9.....	3,366	35.9	182	27.7	5.4
10 to 14.....	1,206	12.9	48	7.3	4.0

as a whole, the death rates per 100,000 at ages 1 to 14 were 44.0 for white males, 42.1 for white females, 25.8 for colored males, and 24.1 for colored females. Little significance can be attached to these sex differences.

Color The death rate among white persons is higher than that for the colored. Owing to the more rapid decline in the death rate for white children, the excess white over colored mortality decreased materially in the period under review. For the years 1911 to 1915 the mortality among white children was double that for the colored; in the period 1931 to 1935 the excess white over colored mortality at ages 1 to 14 was only 7 percent among males and 24 percent among females.

Trend of Mortality

The death rate from diphtheria dropped precipitously in the quarter century under survey. Among Metropolitan Industrial policyholders at ages 1 to 14, the rate declined from 71.7 per 100,000 in 1911 to 1915, to 8.9 per 100,000 in 1931 to 1935, a drop of 87.6 percent. As Chart III shows, the downward sweep of

CHART III
DIPHTHERIA

Standardized Annual Death Rates per 100,000
Total Persons. Ages 1 to 14 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935
and U. S. Registration States of 1920, 1920 to 1934

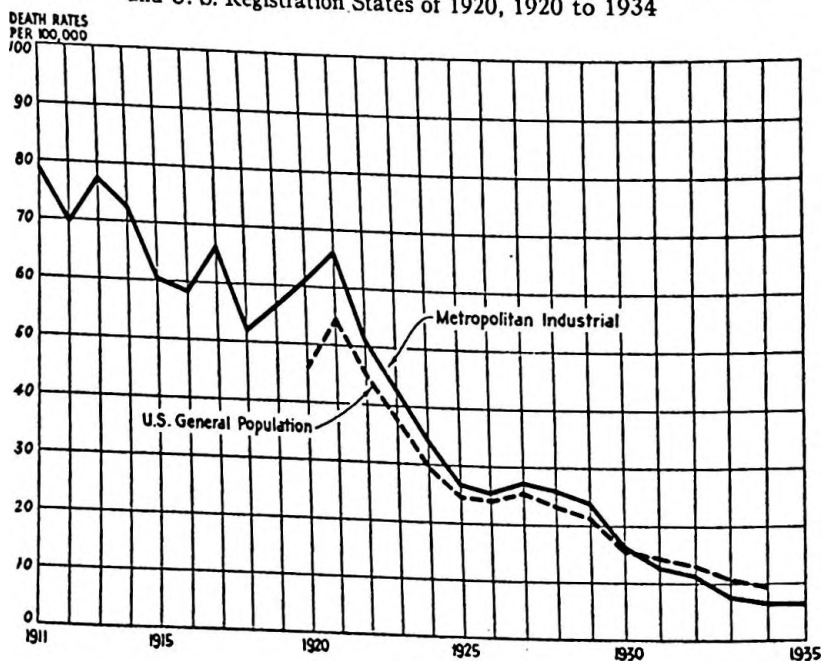


TABLE 7
DIPHTHERIA
Five-Year Averages of Annual Death Rates* per 100,000
By Color and Sex. Ages 1 to 14 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

YEARS	TOTAL PERSONS	WHITE		COLORED	
		Males	Females	Males	Females
1911 to 1935.....	41.4	44.0	42.1	25.8	24.1
1931 to 1935	8.9	9.2	8.7	8.6	7.0
1926 to 1930	23.7	24.7	23.5	20.6	18.7
1921 to 1925	44.1	46.7	45.2	27.9	24.6
1916 to 1920	58.7	62.4	60.0	34.4	33.1
1911 to 1915	71.7	76.8	73.4	37.8	37.2
Percent decline 1931-1935 since 1911-1915	87.6	88.0	88.1	77.2	81.2

*Standardized for age, and in the case of Total Persons, also for color and sex.

the curve was practically uninterrupted from 1921 onward. It was during this period that immunization was practiced on a nationwide scale. The chart illustrates, too, the fact that the improvement in mortality among the insured was considerably more rapid than that for the general population of the United States. In 1920 the death rate from diphtheria among these young policyholders was about one third higher than that for the general population. By 1934, however, the rate for the Industrial Department was actually one third below that for the population as a whole.

White children registered a greater decline than the colored in this insurance experience. The percent decrease at ages 1 to 14 between the years 1911 to 1915 and 1931 to 1935 was 88.0 for white males, 88.1 for white females, 77.2 for colored males, and 81.2 for colored females. These figures appear in Table 7; standardized annual death rates by color and sex are to be found in Appendix Table C.

The Experience in New York City

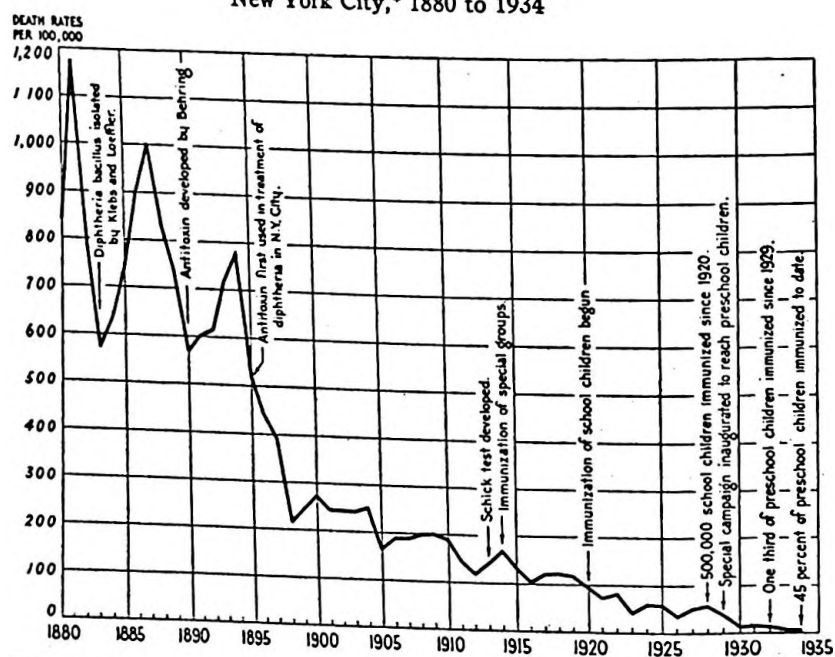
The remarkable progress made in the reduction of diphtheria is nowhere better exemplified than in the records of New York City. The health authorities of this city were the pioneers in the field of diphtheria prevention; they took the lead in putting into

effect, as soon as it appeared, each new progressive control measure and, in many instances, devised new procedures. Consequently, a review of their activities during the past 40 years provides an epitome of the entire campaign against diphtheria and its extraordinary success.

Chart IV shows the trend since 1880 of diphtheria mortality among children under 10 years of age in the boroughs of Manhattan and The Bronx. It will be observed that during the '80's, mortality from diphtheria among children under 10 in what was then New York City ranged around 800 per 100,000, with almost incredible peaks of 1,175 and 1,005 in the years 1881 and 1887, respectively. During this period treatment was directed mainly toward disinfection, dissolving the pseudomembrane, and supporting the strength of the sick child. Nothing was known concerning the efficacy of antitoxin or the possibilities of immunization.

It was not until 1890 that Behring first developed antitoxin, and not until January 1895 that practical use of this discovery

CHART IV
DIPHTHERIA
Crude Annual Death Rates per 100,000 Children
Under 10 Years of Age
New York City,* 1880 to 1934



*Manhattan and Bronx Boroughs.

was made on a considerable scale within the city. When antitoxin was administered early in the disease, its beneficial effect on the patient was remarkable. It was effective also in immunizing for short periods those children who had been exposed to the infection. That very year the diphtheria death rate dropped more than 33 percent; three years later it reached the then unheard of figure of 215 per 100,000 children under 10, little more than one quarter of that recorded in 1894.

Prior to the discovery of antitoxin, at least 45 percent of all diphtheria cases ended fatally; by 1906 the case fatality rate had fallen to 13 percent. Owing to the short period of immunity provided by antitoxin, however, the extremely high prevalence of the disease continued.

About this time (1895-1896) Babes and Park, working independently, discovered that neutralized antitoxin (toxin-antitoxin) brought about the production of antitoxin in animals. It was not until the development of the Schick test in 1913, however, that much practical use could be made of this discovery. The Schick test made it possible to determine not only which children were naturally immune to the disease but also the length of time it took to acquire immunity after receiving toxin-antitoxin treatment. At first this procedure was employed only among special groups, such as children in institutions, but by 1920 the city health authorities had become so convinced of the effectiveness of toxin-antitoxin that they decided to immunize all school children. Although the death rate meanwhile had been declining quite steadily up to this time, it had not fallen below 100 per 100,000 children under 10 years of age.

By 1928, it is estimated, 500,000 children in the city schools had received injections, and the death rate had been halved since 1920. Nevertheless, it was realized that diphtheria never could be completely controlled until the preschool child as well as the school child was protected. Since the immunization of school children had served to educate parents regarding the harmlessness and value of toxin-antitoxin, it was decided to undertake the project of immunizing the younger children. Accordingly, in 1929 an intensive campaign for this purpose was initiated by the Special Diphtheria Prevention Commission. How well that commission performed its task is apparent from Chart IV. In 1934 it was estimated that about 45 percent of all preschool children had received injections since the start of the campaign in 1929. The total number of cases (all ages) reported in Manhattan and Bronx

Boroughs fell from 3,854 in 1929, to 686 in 1934; the deaths declined from 190 to 32. The fatality rate, however, remained about the same, slightly less than 5 percent.

Prevention of Deaths from Diphtheria

The work in New York City is a shining example of what can be accomplished through the wholehearted and intelligent cooperation of all interested groups in the community. Moreover, the splendid achievement of this metropolis is by no means an isolated experience. Nineteen large cities of the United States succeeded in wiping out the disease as a cause of death in 1935. Among these were New Haven, Waterbury, Evansville, Cambridge, Albany, Syracuse, Scranton, and Seattle. Several cities showed a perfect record for two successive years. The experience of these cities shows conclusively that deaths from diphtheria can be virtually eliminated.

Nevertheless, the disease still claims more than 4,000 lives in the United States each year. In many nonfatal cases the patient is left with serious impairments of the kidneys and of the nervous system. The focal point in the campaign against diphtheria is the immunization of preschool children. This entails the education of parents and the active cooperation of the medical profession. Undoubtedly the prompt and adequate use of toxin-antitoxin or of the more recently developed toxoid on a larger scale would result in a further decline in the diphtheria death rate.

MEASLES

It is fortunate that the case fatality rate for measles is usually low, for measles is the most widespread of the diseases of childhood. Infants under 3 to 6 months of age whose mothers have themselves had measles are immune, but beyond these early months of life everyone unprotected by a previous attack is highly susceptible. Measles is most virulent when an epidemic breaks out in a place which has not previously suffered from the disease and whose inhabitants have, therefore, little resistance to its ravages. During the World War it was common in the army among troops recruited from rural areas, and was a serious cause of disability in the training camps. The causative agent of measles is as yet unknown, but there is a considerable amount of evidence pointing to the conclusion that it is a filterable virus.

Death from measles is almost always due not to the disease itself, but to respiratory complications, particularly bronchopneumonia. Statistical confirmation of this well-known clinical fact is available from a study of contributory causes of death made by the United States Bureau of the Census from the mortality records of 1925. Out of the 2,404 deaths recorded as due to measles in that year, 2,261, or 94.1 percent, were stated to be complicated by some other disease; in 1,462 cases, or 60.8 percent of the total, bronchopneumonia was the complicating condition. The actual proportion of cases with complications was probably even higher than this study showed.

In this quarter century of insurance experience, measles ranked second to diphtheria as a cause of death in this group of childhood diseases. The disease was responsible for 17,193 deaths at ages 1 to 74; of this number, 16,478, or 95.8 percent, occurred at ages 1 to 14. The infection at these ages accounted for 3.7 percent of the deaths from all causes, and for 19.2 percent of the deaths from the four communicable diseases.

Mortality by Age, Sex, and Color

The average death rates from measles by age, sex, and color for the entire period 1911 to 1935, and for the five-year periods at the beginning and at the end of the 25-year period, are given in Table 8.

The mortality from measles is virtually confined to infancy and early childhood. In this experience, as shown in Table 8,

TABLE 8
MEASLES

Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 14 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
WHITE						
1 to 74*.....	5.4	2.0	8.7	5.3	2.0	8.8
1 to 14*.....	16.8	6.4	27.0	16.2	6.1	26.6
1 to 4.....	47.3	15.1	78.4	44.8	14.4	75.6
5 to 9.....	6.5	4.5	8.7	6.6	4.4	9.4
10 to 14.....	1.0	0.8	1.3	1.2	0.7	1.9
COLORED						
1 to 74*.....	5.3	1.9	8.1	5.2	1.7	8.2
1 to 14*.....	16.2	5.8	24.2	15.8	5.1	24.1
1 to 4.....	44.7	14.2	68.9	41.5	10.4	63.0
5 to 9.....	6.1	3.6	7.9	6.9	3.9	10.8
10 to 14.....	2.0	0.7	2.3	2.6	1.9	4.2

*Standardized for age.

there is a heavy concentration of deaths at ages 1 to 4 years; the maximum death rate is recorded in the second year of life. These facts are to be interpreted in the light of age data on case incidence and case fatality. Table 9, reflecting conditions in New Jersey, shows that the maximum morbidity occurs at the early school ages. The highest fatality rate, however, is registered in the first year of life and to a lesser extent in the second year. It is thus an interesting characteristic of measles that the likelihood of dying from the disease is greatest during infancy, when the danger for a child of contracting it is least.

The death rate from measles is slightly higher among males than among females, and is slightly greater among white children than among the colored. The average death rates per 100,000 at ages 1 to 14, for the period 1911 to 1935, were 16.8 for white males, 16.2 for white females, 16.2 for colored males, and 15.8 for colored females.

TABLE 9
MEASLES
Cases, Deaths, and Deaths per 100 Cases
Ages Under 15 Years
State of New Jersey, 1930 to 1934

AGE PERIOD YEARS	CASES		DEATHS		DEATHS PER 100 CASES
	Number	Percent of Total, All Ages	Number	Percent of Total, All Ages	
ALL AGES.....	106,182	100.0	383	100.0	0.4
UNDER 15.....	103,616	97.6	374	97.7	0.4
Under 1.....	2,053	1.9	81	21.1	3.9
1.....	4,833	4.5	114	29.8	2.4
2.....	6,918	6.5	54	14.1	0.8
3.....	7,605	7.2	31	8.1	0.4
4.....	9,355	8.8	18	4.7	0.2
5 to 9.....	64,087	60.4	68	17.8	0.1
10 to 14.....	8,765	8.3	8	2.1	0.1

Trend of Mortality

In spite of wide fluctuations, the mortality from measles fell rapidly in the 25-year period under review. The death rate declined from 26.6 per 100,000 in 1911 to 1915, to 6.2 per 100,000 in 1931 to 1935, a drop of 76.7 percent. Chart V displays graphically the trend of mortality among the insured children. The annual death rates appear in Appendix Table C. It is also apparent from the chart that, in the years for which comparable data are available, the experience for the Metropolitan practically coincides with that for the general population of the United States.

Each of the color and sex groups among the policyholders shared about equally in the improvement in mortality. As Table 10 shows, the percent decline in death rate at ages 1 to 14 between 1911 to 1915 and 1931 to 1935 was 76.3 for white males, 77.1 for white females, and 76.0 and 78.8 for colored males and colored females, respectively. Measles is the only affection in the children's communicable disease group in which the fall in mortality showed almost no differences by color or sex.

In view of the fact that measles is not readily amenable to public health control and that the etiology of the disease is still unknown, it is difficult to account for the marked decline in mortality. It is probable that the fall in death rate was due for

CHART V MEASLES

Standardized Annual Death Rates per 100,000
Total Persons. Ages 1 to 14 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935
and U. S. Registration States of 1920, 1920 to 1934

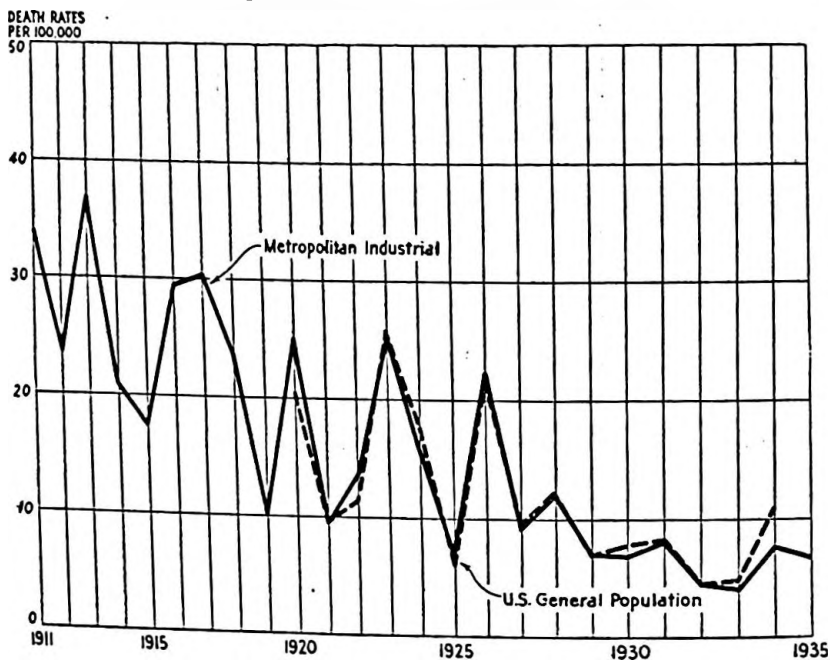


TABLE 10
MEASLES

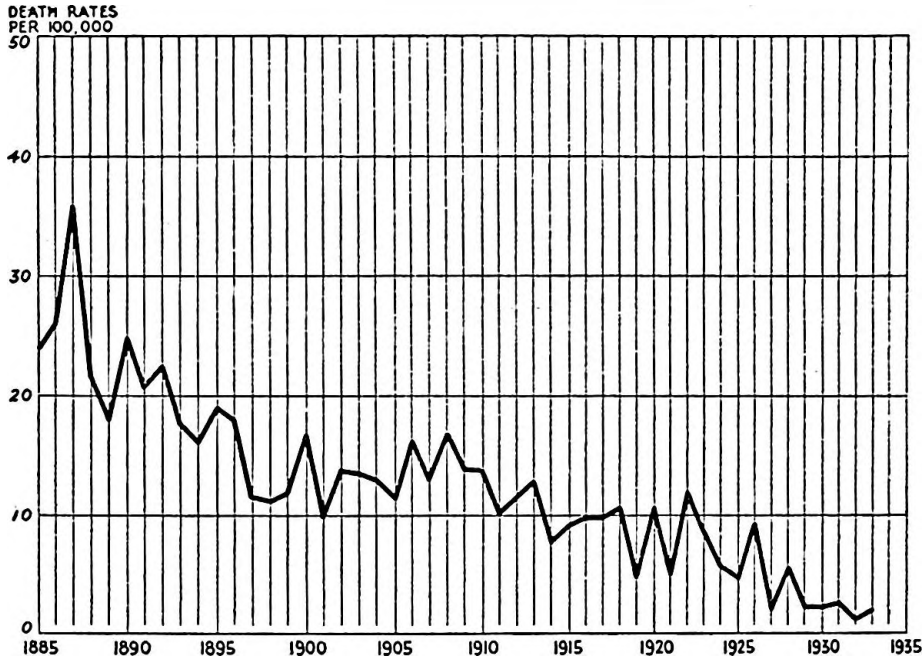
Five-Year Averages of Annual Death Rates* per 100,000
By Color and Sex. Ages 1 to 14 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

YEARS	TOTAL PERSONS	WHITE		COLORED	
		Males	Females	Males	Females
1911 to 1935.....	16.4	16.8	16.2	16.2	15.8
1931 to 1935.....	6.2	6.4	6.1	5.8	5.1
1926 to 1930.....	11.5	11.7	11.0	12.2	13.2
1921 to 1925.....	14.2	14.4	13.6	17.5	14.5
1916 to 1920.....	23.7	24.4	23.5	21.4	21.9
1911 to 1915.....	26.6	27.0	26.6	24.2	24.1
Percent decline 1931-1935 since 1911-1915.....	76.7	76.3	77.1	76.0	78.8

*Standardized for age, and in the case of Total Persons, also for color and sex.

CHART VI
MEASLES
Crude Annual Death Rates per 100,000
Total Persons. All Ages
Twenty-two American Cities, 1885 to 1933



the most part to such general factors as better nutrition, improved physical conditions, better hygienic surroundings, and more adequate medical and nursing care during illness and in convalescence. The use of convalescent serum is both too recent and too limited to explain any substantial part of the downward trend. Moreover, a falling death rate from measles has been observed for at least a half century. Chart VI shows the mortality experience for 22 American cities since 1885.

Prevention of Deaths from Measles

It is unfortunate that the low case fatality rate for measles has lulled people into the erroneous belief that the disease is quite harmless. Measles was responsible for almost 7,000 deaths in the United States in 1934, the most recent year for which data for the entire country are available. Although the death toll in that year was unusually heavy, it is clear that the disease is a serious enemy of child life. For a full accounting, one should add to this total of deaths the many nonfatal cases in which the patient after recovery is left with serious impairments.

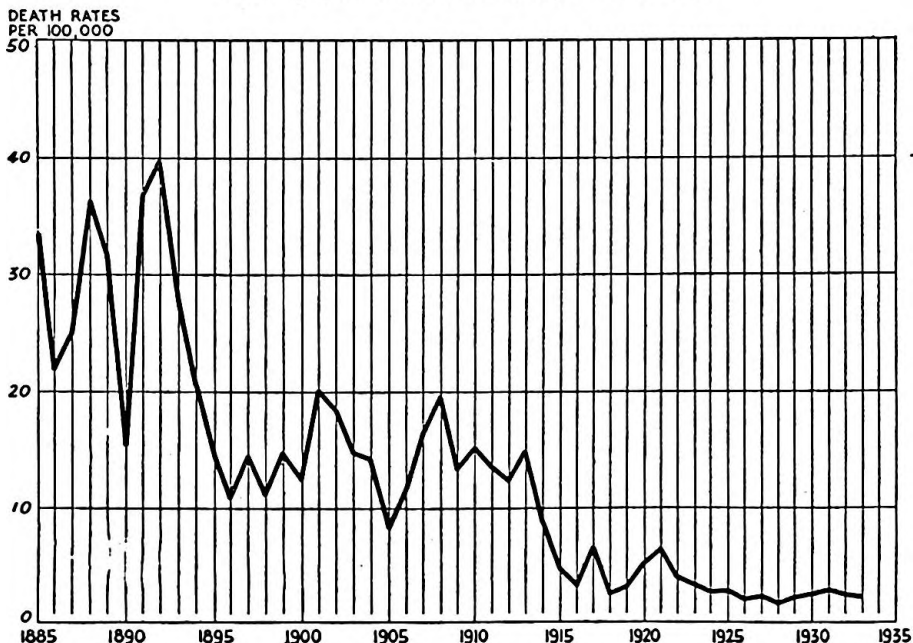
The suppression of measles is a problem which presents a number of difficulties. The disease is highly infectious, particularly in the pre-eruptive stage, so that by the time the infection is recognized in the individual, it has already been transmitted to other susceptibles. Moreover, preventive medicine has thus far failed to provide means of active immunization. In view of the fact that it is virtually impossible under normal conditions to prevent anyone from becoming infected with the disease, the immediate task in reducing the mortality from measles is to urge more adequate medical and nursing care of children. Convalescent serum may be used to confer temporary immunity or to temper the severity of the infection. Isolation of the patient is a measure which has a twofold benefit: it reduces the likelihood of secondary infections for the patient; secondly, isolation, if carried out at the very onset of the disease, protects his playmates and school-mates.

SCARLET FEVER

Although many unsolved problems regarding the causation, prevention, and treatment of scarlet fever still exist, recent decades have witnessed notable advances in this field of investigation. The Dick test has proved to be a reliable index of susceptibility to the disease. Furthermore, there is a considerable body of clinical evidence to substantiate the claim that antitoxin or convalescent serum, when used early in the disease, mitigates the severity and diminishes the duration of the infection. While there still remains much uncertainty concerning the behavior of the causative organism or organisms, it is generally agreed that the disease is caused by strains of hemolytic streptococci.

The death rate from scarlet fever is determined to a great extent by the type or virulence of the disease which prevails. In the past century epidemiologists have noted wide variations in the severity of the infection. In the United States a marked

CHART VII
SCARLET FEVER
Crude Annual Death Rates per 100,000
Total Persons. All Ages
Twenty-one American Cities, 1885 to 1933



change in the virulence of scarlet fever occurred about 50 years ago and since then the mortality from the disease has declined rapidly. Chart VII illustrates the course of the mortality from the disease in a group of 21 American cities since 1885.

In the 25-year period 1911 to 1935, scarlet fever accounted for 15,259 deaths among the Industrial policyholders of the Metropolitan Life Insurance Company. Of this number, 13,496 or 88.4 percent were among policyholders in the age range 1 to 14 years. At these ages, the disease was responsible for 3.0 percent of the deaths from all causes and for 15.8 percent of the deaths from the four communicable diseases of childhood.

Mortality by Age, Sex, and Color

The average death rates from scarlet fever among children by age, sex, and color for the 25-year period as a whole and for the initial and final quinquennia of the series are presented in Table 11.

TABLE 11
SCARLET FEVER
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 14 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
WHITE						
1 to 74*.....	4.9	2.9	9.7	4.9	2.9	9.6
1 to 14*.....	14.1	8.0	28.9	13.6	7.6	28.2
1 to 4.....	28.0	15.1	60.3	25.7	13.3	55.3
5 to 9.....	12.4	7.7	24.2	12.6	7.7	24.4
10 to 14.....	3.7	2.2	6.7	4.1	2.4	8.6
COLORED						
1 to 74*.....	1.8	1.3	3.2	2.0	1.7	3.6
1 to 14*.....	5.1	3.4	9.8	5.2	3.5	9.8
1 to 4.....	9.1	6.8	15.4	10.3	8.6	22.1
5 to 9.....	4.7	2.8	9.4	4.4	1.8	6.9
10 to 14.....	2.0	1.0	5.3	1.7	0.8	2.3

*Standardized for age.

Age Although the deaths from scarlet fever show a wider dispersion over the age range than those from any of the other principal communicable diseases of childhood, the disease is essentially one of childhood. From a maximum rate in early child life, the mortality drops sharply to a low point in adolescence, after which period the death rate is negligible. To a considerable extent the concentration of deaths at the preschool ages is due to the relatively high case fatality rate at those ages. Table 12, based on figures for the State of New Jersey, shows that whereas the ages under 5 contribute 19.2 percent of the total *cases*, these ages account for 41.4 percent of the *deaths*.

Sex In the age period 1 to 14 years, white males register a slightly but consistently higher death rate than white females. For the 25-year period as a whole, the death rate for white boys was 14.1 per 100,000 and that for white girls, 13.6 per 100,000. Among the colored there appears to be practically no sex difference in mortality in the age period 1 to 14, taken as a whole, the rates being 5.1 and 5.2, respectively. Analyzing the data by age, we find that among the white the excess of the male over the female mortality is limited to the age period 1 to 4 years. Beyond this age, females show the higher mortality. The situation is reversed among the colored. In this group, females show

TABLE 12
SCARLET FEVER
Cases, Deaths, and Deaths per 100 Cases
Ages Under 15 Years
State of New Jersey, 1930 to 1934

AGE PERIOD YEARS	CASES		DEATHS		DEATHS PER 100 CASES
	Number	Percent of Total, All Ages	Number	Percent of Total, All Ages	
ALL AGES.....	40,738	100.0	338	100.0	0.8
UNDER 15.....	34,868	85.6	261	77.2	0.7
Under 1.....	171	0.4	12	3.5	7.0
1.....	633	1.6	31	9.2	4.9
2.....	1,566	3.8	28	8.3	1.8
3.....	2,477	6.1	37	10.9	1.5
4.....	2,959	7.3	32	9.5	1.1
5 to 9.....	18,942	46.5	85	25.1	0.4
10 to 14.....	8,120	19.9	36	10.7	0.4

a higher rate at the preschool ages and males register a higher mortality at the school ages.

Color Our experience bears out the well-established fact that colored persons are relatively immune to scarlet fever. The death rate among white children was more than $2\frac{1}{2}$ times that for colored. In the 25-year period under survey, the excess white over colored mortality diminished somewhat.

Trend of Mortality

Among Metropolitan Industrial policyholders at ages 1 to 14, the death rate from scarlet fever dropped from 26.9 per 100,000 in 1911 to 1915, to 7.4 per 100,000 in 1931 to 1935, a decrease of 72.5 percent. The decline has not been uniform, however, in the quarter century. The early years of this experience were characterized by a sharply falling death rate, but only slight improvement in mortality from this cause was recorded in the last decade of the series. Chart VIII shows graphically the time series for the insured children. The chart shows also that this insurance

CHART VIII

SCARLET FEVER

Standardized Annual Death Rates per 100,000
Total Persons. Ages 1 to 14 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935
and U. S. Registration States of 1920, 1920 to 1934

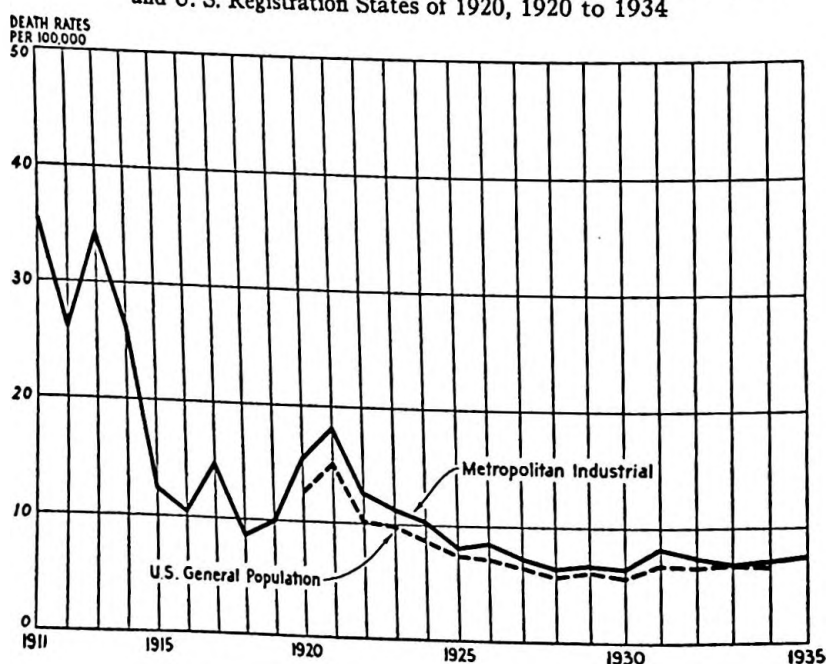


TABLE 13
SCARLET FEVER
Five-Year Averages of Annual Death Rates* per 100,000
By Color and Sex. Ages 1 to 14 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

YEARS	TOTAL PERSONS	WHITE		COLORED	
		Males	Females	Males	Females
1911 to 1935.....	13.0	14.1	13.6	5.1	5.2
1931 to 1935.....	7.4	8.0	7.6	3.4	3.5
1926 to 1930.....	7.0	7.8	7.0	3.8	3.2
1921 to 1925.....	12.1	12.9	12.7	4.5	5.5
1916 to 1920.....	11.8	12.7	12.5	3.8	4.2
1911 to 1915.....	26.9	28.9	28.2	9.8	9.8
Percent decline 1931-1935 since 1911-1915.....	72.5	72.3	73.0	65.3	64.3

*Standardized for age, and in the case of Total Persons, also for color and sex.

experience closely parallels that for the general population of the United States, although the downward trend of the death rate was somewhat more rapid for these policyholders than for the population as a whole.

Among white children the decline was somewhat more rapid than that for the colored in this insurance experience. The percent decline in death rate between 1911 to 1915 and 1931 to 1935 was 72.3 for white males, 73.0 for white females, 65.3 for colored males, and 64.3 for colored females. These figures appear in Table 13; the annual death rates from scarlet fever by color, sex, and broad age periods appear in Appendix Table C.

Prevention of Deaths from Scarlet Fever

Although the trend of the scarlet fever death rate has been downward, the disease in 1934 was still responsible for more than 2,500 deaths in the United States. With the cooperation of public health officers, physicians, and parents, the death rate from this disease can be reduced to an even lower level. The early reporting and prompt isolation of all cases of the disease is a fundamental means of control. Parents should be warned that convalescence is a critical period. It is during the weeks of recovery that secretions from the nose, throat, and ear of the patient are apt to infect other persons; it is during this period also

that fatal or seriously disabling complications are likely to set in. One point to be kept in mind in discussing the control of scarlet fever is that a mild type of the disease is now prevalent and that we have no assurance that there will not be a reversion to the more virulent type. The ultimate suppression of the disease waits upon a method for the immunization of those susceptible to it. A number of problems are yet to be solved before there is general agreement upon the methods to be used. In the meantime, convalescent serum may be used profitably to give temporary protection to susceptible contacts.

WHOOPIING COUGH

The mortality from whooping cough contrasts sharply in three respects with that for the other communicable diseases of childhood discussed in this chapter. In the first place, the disease kills more girls than boys; second, it has a considerably higher death rate among colored than among white children; third, the mortality is greater in rural than in urban areas. Whooping cough, like measles, is widely prevalent and if death results it is usually from complicating respiratory conditions. A study of contributory causes of death made by the Bureau of the Census from the records of 1925, shows that out of 6,948 deaths recorded as due to whooping cough, 5,546, or 80 percent of the total, were complicated by some other disease; in 3,421, or in almost half the deaths, the contributory cause was bronchopneumonia. The actual number of deaths from whooping cough which were complicated by respiratory conditions undoubtedly exceeded the number reported.

The mortality data for whooping cough in this insurance experience lack the significance which attaches to the statistics for the other diseases of this group, because this investigation does not include deaths in the first year of life, when the mortality from whooping cough is at a maximum. Nevertheless, in the 25 years under survey the disease was responsible for 12,715 deaths among Metropolitan Industrial policyholders; of this number, 12,620 occurred in the age range 1 to 14 years. At these ages whooping cough, with an average death rate of 13.1 per 100,000, comprised 2.8 percent of the deaths from all causes and 14.7 percent of the deaths from the communicable diseases.

Mortality by Age, Sex, and Color

The average death rates from whooping cough by color and sex for the childhood ages are presented in Table 14.

Deaths from whooping cough are almost altogether confined to infancy and early childhood. The relatively high mortality at 1 to 4 years in this experience is due chiefly to the concentration of deaths at ages 1 and 2. In the general population of the United States about 60 percent of all the deaths from whooping cough occur among infants under one year. In fact, at this early age the disease is responsible for almost three times as many deaths as measles, scarlet fever, and diphtheria combined. The heavy

TABLE 14
WHOOPIING COUGH
 Averages of Annual Death Rates per 100,000
 By Color, Sex, and Age. Ages 1 to 14 Years
 Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
WHITE						
1 to 74*.....	2.8	1.2	4.1	4.1	1.7	5.9
1 to 14*.....	9.1	3.8	13.0	13.0	5.3	18.8
1 to 4.....	28.0	11.6	39.7	39.8	16.4	56.9
5 to 9.....	1.9	0.8	3.0	2.8	1.1	4.7
10 to 14.....	0.1	0.1	0.3	0.2	0.1	0.3
COLORED						
1 to 74*.....	9.6	3.3	15.4	11.7	3.8	18.6
1 to 14*.....	30.5	10.6	49.4	37.4	12.1	59.1
1 to 4.....	92.4	32.3	147.5	114.3	38.6	174.3
5 to 9.....	7.4	2.8	13.4	8.6	1.3	17.1
10 to 14.....	0.7	0.0	1.5	0.7	0.2	2.6

*Standardized for age.

TABLE 15
WHOOPIING COUGH
 Cases, Deaths, and Deaths per 100 Cases
 Ages Under 15 Years
 State of New Jersey, 1930 to 1934

AGE PERIOD YEARS	CASES		DEATHS		DEATHS PER 100 CASES
	Number	Percent of Total, All Ages	Number	Percent of Total, All Ages	
ALL AGES.....	42,126	100.0	455	100.0	1.1
UNDER 15.....	41,542	98.6	451	99.1	1.1
Under 1.....	2,888	6.9	271	59.6	9.4
1.....	3,555	8.4	106	23.3	3.0
2.....	4,629	11.0	34	7.5	0.7
3.....	5,085	12.1	16	3.5	0.3
4.....	5,253	12.5	13	2.8	0.2
5 to 9.....	18,683	44.3	10	2.2	0.1
10 to 14.....	1,449	3.4	1	0.2	0.1

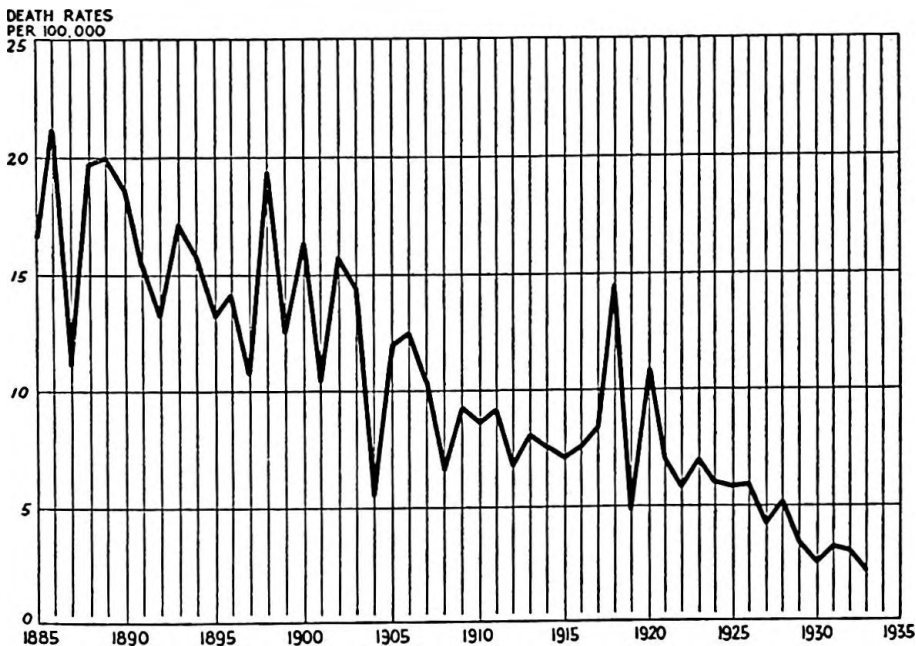
toll from whooping cough in infancy results from the high case fatality rate at this age; there are actually more cases of the disease in each of the other years of the initial five-year period of life than in the first year. Table 15, based on figures for the State of New Jersey, illustrates these facts.

The death rate from whooping cough is higher for girls than for boys. Among children 1 to 14 years of age insured in the Industrial Department, the female rate in recent years averaged about 40 percent in excess of the male rate for whites and 15 percent for the colored. The sex ratio did not change appreciably in the period under review. The mortality among colored children in the period 1931 to 1935 exceeded that for the white by 179 percent among males and 128 percent among females. The disparity in rates by color was even more pronounced in the earlier years of this experience.

Trend of Mortality

The mortality from whooping cough, while fluctuating widely from year to year, has on the whole exhibited a marked downward trend in the past half century. Chart IX shows graphically the

CHART IX
WHOOPIING COUGH
Crude Annual Death Rates per 100,000
Total Persons. All Ages
Twenty-three American Cities, 1885 to 1933



crude death rates per 100,000 population in 23 American cities since 1885.

A more accurate picture of the declining mortality, based on standardized death rates for children 1 to 14 years, is available for Metropolitan Industrial policyholders in the 25-year period 1911 to 1935. Among these insured children the death rate dropped from 19.4 per 100,000 in 1911 to 1915, to 5.2 per 100,000 in 1931 to 1935, a decline of 73.2 percent. In 1935 the rate actually reached the low figure of 4.5. A peculiar characteristic of the curve as shown in Chart X is the sharp rise in death rate in 1918, the year of the influenza pandemic. Whether the two phenomena are causally related we are not in a position to say; the fact that the other three diseases discussed in this section showed declines in 1918 does little to clarify the situation. Another point of interest in Chart X is that the experience for the insured group closely paralleled that for the general population.

The improvement in mortality over the 25-year period varied somewhat with sex and color. Among these policyholders 1 to 14

CHART X WHOOPING COUGH

Standardized Annual Death Rates per 100,000
Total Persons. Ages 1 to 14 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935
and U. S. Registration States of 1920, 1920 to 1934

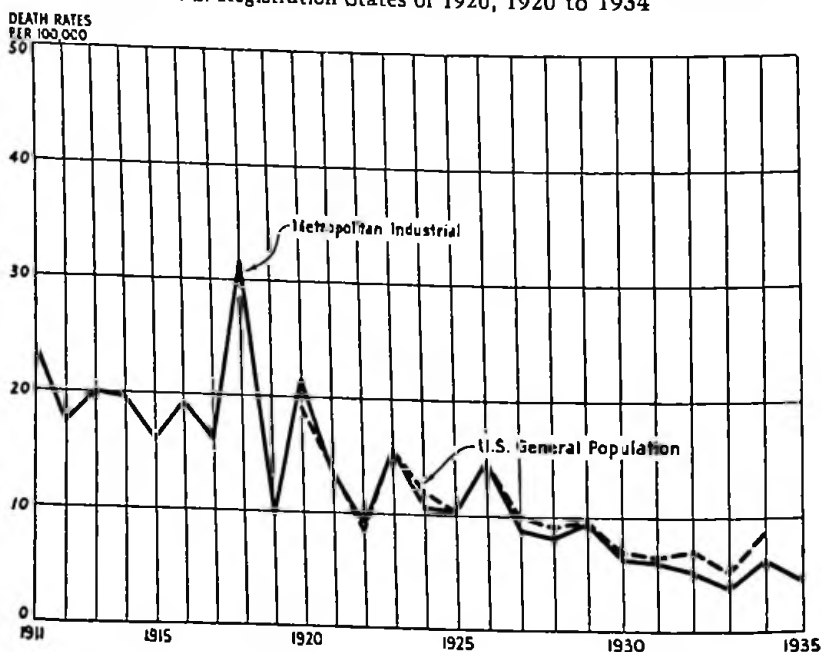


TABLE 16
WHOOPING COUGH

Five-Year Averages of Annual Death Rates* per 100,000
By Color and Sex. Ages 1 to 14 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

YEARS	TOTAL PERSONS	WHITE		COLORED	
		Males	Females	Males	Females
1911 to 1935.....	13.1	9.1	13.0	30.5	37.4
1931 to 1935.....	5.2	3.8	5.3	10.6	12.1
1926 to 1930.....	9.5	6.8	9.4	21.5	24.6
1921 to 1925.....	11.8	8.3	11.1	30.5	35.2
1916 to 1920.....	19.7	13.5	20.1	40.6	56.2
1911 to 1915.....	19.4	13.0	18.8	49.4	59.1
Percent decline 1931-1935 since 1911-1915.....	73.2	70.8	71.8	78.5	79.5

*Standardized for age, and in the case of Total Persons, also for color and sex.

years of age, the percent decline in death rate between 1911 to 1915 and 1931 to 1935 was 70.8 for white males, 71.8 for white females, 78.5 for colored males, and 79.5 for colored females. Thus, females registered a slightly greater fall in mortality than males; colored children experienced a more rapid decline than the white. It is apparent from Table 16 that the greatest declines were recorded in the groups which showed the highest rates. Whooping cough is the only disease of the communicable disease group to register a definitely greater improvement in mortality among the colored than among whites. Annual death rates from the disease by color and sex appear in Appendix Table C.

Prevention of Deaths from Whooping Cough

Although notable gains have been made in reducing the death rate from whooping cough, much still remains to be done. In 1934 this disease was the most important of the four communicable diseases of childhood, and was responsible for 7,518 deaths in the United States; the number exceeded that for scarlet fever and diphtheria combined. It is true that the death rate from whooping cough was unusually high in 1934, but such periodic outbreaks indicate that the disease is far from being under control.

The ultimate suppression of whooping cough waits upon further research. Outstanding among the problems in this field are the

development of diagnostic methods, of standard immunization procedures, and of therapeutic measures which will lessen the duration and severity of the disease. Investigators report encouraging results on these projects, but there is as yet no general agreement regarding the value of the procedures now being used. In the present state of knowledge, efforts to reduce the mortality from whooping cough should be concentrated on good nursing care. The prevention of respiratory complications during or immediately after the disease would save many lives annually. Parents should be aroused to the seriousness of this disease.

CHAPTER V

TUBERCULOSIS

TUBERCULOSIS—ALL FORMS	81
TUBERCULOSIS OF THE RESPIRATORY SYSTEM	97
TUBERCULOSIS OF THE MENINGES AND THE CENTRAL NERVOUS SYSTEM	105
TUBERCULOSIS OF THE INTESTINES AND PERITONEUM . . .	109
TUBERCULOSIS OF OTHER ORGANS AND CHRONIC DIS- SEMINATED TUBERCULOSIS	113

TUBERCULOSIS—ALL FORMS

Perhaps the most vivid proof of the success of the public health movement has been the striking decline in the tuberculosis mortality during the past $3\frac{1}{2}$ decades. This is a short time in which to witness a fundamental change in health conditions. At the beginning of the century tuberculosis stood first in the list of causes of death and was an especial menace to the lives of young adults. It contributed in no small degree to the impoverishment of our homes and the continual replenishment of our orphan asylums. Today it ranks seventh in numerical importance as a cause of death in the general population of the United States. There is no reason why it should not follow plague, cholera, yellow fever, typhoid fever, and smallpox into the limbo of almost forgotten diseases in America.

Although tuberculosis is probably as old as civilization itself and was fully described by Greek and Roman writers, its cause and nature were first clearly recognized only a little more than 50 years ago when Robert Koch succeeded in isolating the tubercle bacillus. Shortly thereafter the various forms of the disease were identified and the usual mode of transmission was disclosed. The next step was to inaugurate an effective campaign against the infection and thereby reduce it to a fraction of its former incidence. How successfully that has been done is amply demonstrated in this chapter. These mortality figures of the Metropolitan Life Insurance Company cover the 25-year period from 1911 to 1935, during which years the campaign was at its height.

The analysis of the experience of the Company is all the more interesting because it relates to a group of persons among whom tuberculosis, in the past, has been particularly prevalent. Students of the tuberculosis problem have long been aware of the fact that the disease takes its victims in large part from among wage-earners and their families, particularly those in urban areas. It is precisely this economic group that constitutes the bulk of the Industrial policyholders of the Metropolitan Life Insurance Company.

During the 25 years under consideration, tuberculosis was responsible for the death of 403,851 Metropolitan Industrial policyholders. The standardized annual death rates during the period averaged 135.7 per 100,000 lives exposed at ages 1 to 74 years. Among these policyholders the disease caused 12.6 percent of the deaths from all causes.

Mortality by Age, Sex, and Color

The average death rates from all forms of tuberculosis combined by age, sex, and color among these policyholders for the 25-year period, and for the initial and final quinquennia of the series, are presented in Table 1.

Age Tuberculosis takes its heaviest death toll in early and middle adult life, the main ages at which the individual is economically productive and socially useful. The maximum death rate in recent years is recorded at ages 45 to 64 among white males,

TABLE 1
TUBERCULOSIS—ALL FORMS
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
WHITE						
1 to 74*.....	149.7	68.4	265.1	98.6	45.7	155.6
1 to 4.....	45.1	18.3	77.9	43.1	17.4	78.4
5 to 9.....	15.4	6.5	25.7	16.2	6.2	29.4
10 to 14.....	13.1	4.9	21.9	26.2	8.6	44.5
15 to 19.....	68.4	22.3	123.7	111.5	41.9	163.0
20 to 24.....	145.8	54.8	264.3	173.9	84.8	245.0
25 to 34.....	212.4	83.8	410.6	161.3	76.8	258.7
35 to 44.....	288.1	121.7	550.8	125.0	54.0	218.2
45 to 54.....	283.2	152.5	460.0	93.7	45.8	149.2
55 to 64.....	241.3	152.3	363.3	93.1	54.0	142.6
65 to 74.....	200.7	130.5	257.2	100.8	66.7	142.6
COLORED						
1 to 74*.....	278.7	186.3	413.7	265.5	168.7	371.5
1 to 4.....	159.9	89.3	244.9	154.4	83.1	249.8
5 to 9.....	84.4	39.3	140.0	89.4	38.3	152.0
10 to 14.....	102.9	49.8	153.6	198.8	91.6	323.0
15 to 19.....	332.1	189.8	469.7	482.7	305.8	642.1
20 to 24.....	415.5	272.0	588.0	509.5	351.5	650.2
25 to 34.....	378.8	270.2	567.8	355.8	243.2	475.6
35 to 44.....	370.5	270.4	571.3	237.7	145.8	354.5
45 to 54.....	324.4	239.1	474.8	168.7	113.9	233.9
55 to 64.....	287.4	214.9	445.9	145.6	107.3	195.7
65 to 74.....	248.7	174.9	328.1	132.2	98.8	181.7

*Standardized for age.

and at ages 20 to 24 in each of the three other color-sex groups. Owing to the general decline in the tuberculosis death rate during the 25-year period under review, the age curve in recent years is at a lower level than that in the earlier years covered by this investigation. Moreover, the fall in mortality has been more rapid at some ages than at others, with the result that among white persons the contour of the age curve has been materially altered. The age of maximum death rate shifted, during the 25-year period, to later life among white males, but to an earlier age among white females.

Chart I, page 84, presents graphically the age distribution of the mortality from tuberculosis, by color and sex, for the periods 1931 to 1935, and 1911 to 1915.

Sex The death rate from tuberculosis is higher among males than among females. For the five-year period 1931 to 1935, the excess male over female mortality, at ages 1 to 74, averaged 50 percent for white persons and 10 percent for colored. The sex ratio varied, however, with age. Up to age 10 there was no material difference in the rates between the sexes. In the age range 10 to 24 years females registered a considerably higher death rate than males, among both white and colored policyholders; the rate for females was approximately twice that for males at ages 10 to 19 among white policyholders, and at ages 10 to 14 among the colored. It has been claimed, and probably with much reason, that the physiological changes taking place in the growing female during puberty and adolescence place her under a greater handicap in resisting tuberculous disease. Later, the burden of childbearing, and particularly the care and breast feeding of infants, constitute an important additional hazard, which is probably reflected in high tuberculosis mortality among women of early childbearing ages.

At ages 25 and over, however, the death rate among males exceeds that among females. The maximum excess male mortality among white persons occurs at ages 45 to 54, at which period the death rate among white males averages $3\frac{1}{3}$ times that among white females.

Women after age 25 lead a more sheltered life than men; they tend to withdraw more and more from the hazards of industry and to seek the protection of the home. At the same time, at these ages, they have passed the peak of their reproductive function, and as they further progress in age the frequency of childbirth becomes less, and with it the general strain upon the constitution which inevitably is associated with childbirth.

CHART I

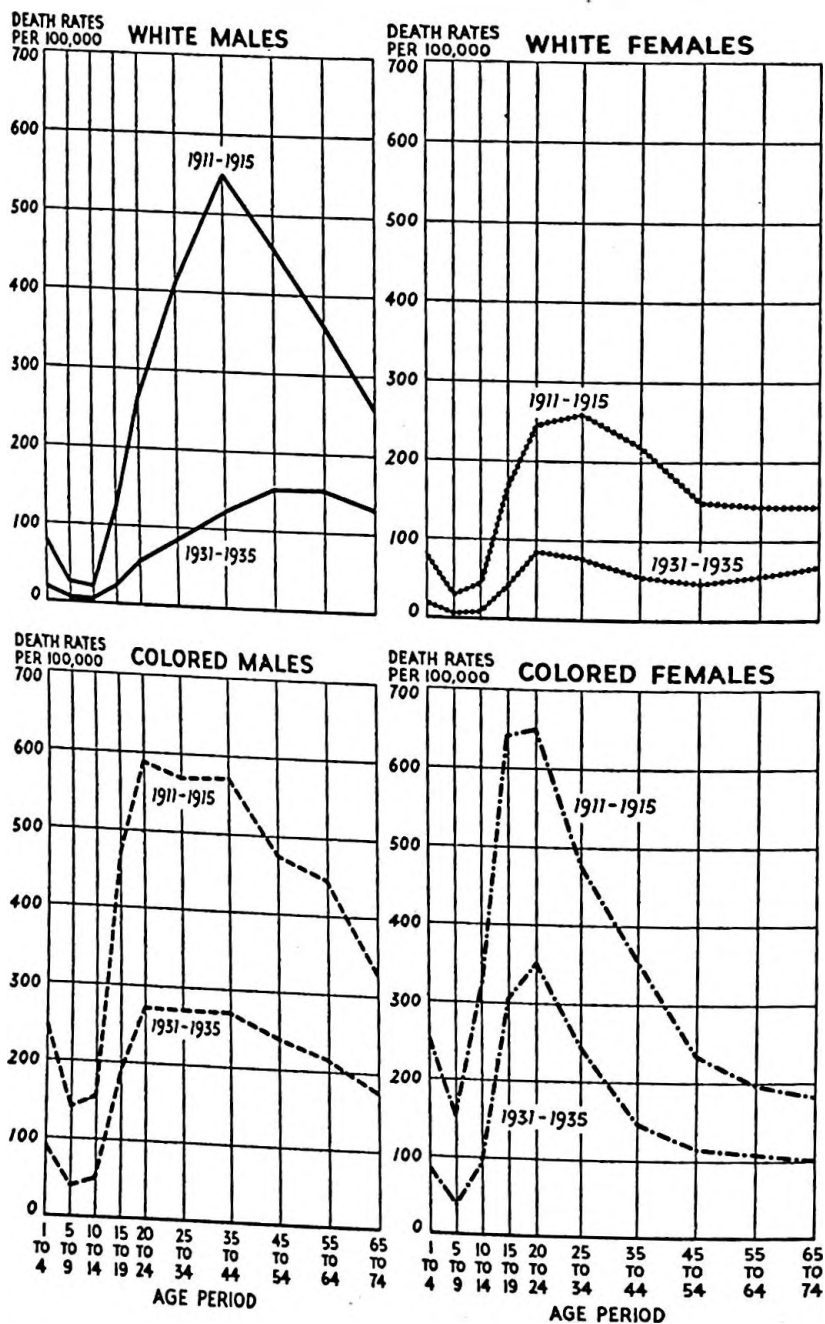
TUBERCULOSIS—ALL FORMS

Averages of Annual Death Rates per 100,000

By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Department

1931 to 1935 and 1911 to 1915



Among males the situation is naturally somewhat different. Here, occupation is one of the dominating factors influencing the death rate from tuberculosis, owing mainly to the deleterious effect of various forms of dust encountered in industrial work. Poorly ventilated workshops and factories, unsanitary working conditions, and excess physical exertion in some occupations also play a role in this respect.

As Table 2 shows, the excess of the male over the female death rate from tuberculosis has diminished during the years under survey. For the period 1911 to 1915 the rate among white males of ages 1 to 74 exceeded that for white females by 70 percent; in 1931 to 1935 the tuberculosis death rate for these males was only 50 percent higher than that for the females. Among colored persons the excess male mortality in the early period was 11 percent, which is practically the same as in the recent period.

Color Tuberculosis exacts a very high toll among Negroes. In fact, tuberculosis is one of the outstanding scourges of that race. It has frequently been claimed that there is a hereditary susceptibility to the disease, or a lower resistance as a result of other diseases—syphilis, for example. The handicap of the colored has also been ascribed to nutritional deficiencies. Far more important,

TABLE 2
TUBERCULOSIS—ALL FORMS
Percentage Male of Female Death Rate
By Color and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	WHITE			COLORED		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
1 to 74*.....	152	150	170	105	110	111
1 to 4.....	105	105	99	104	107	98
5 to 9.....	95	105	87	94	103	92
10 to 14.....	50	57	49	52	54	48
15 to 19.....	61	53	76	69	62	73
20 to 24.....	84	65	108	82	77	90
25 to 34.....	132	109	159	106	111	119
35 to 44.....	230	225	252	156	185	161
45 to 54.....	302	333	308	192	210	203
55 to 64.....	259	282	255	197	200	228
65 to 74.....	199	196	180	188	177	181

*Based on standardized death rates.

however, are the consequences of unhygienic living conditions, overcrowding, bad housing, and the general economic insecurity in which the colored live. Furthermore, some special facilities for the treatment and comfort of white tuberculous patients have no adequate counterpart available for the colored. Another factor has been the northward migration since the World War and the resultant concentration in many large industrial centers of the North. Negroes were encouraged to settle in manufacturing towns and enter the ranks of unskilled labor left vacant by the stoppage of immigration from Europe. But their tenure of employment was very unsteady, and their wages were low. In spite of their handicaps and adverse economic and social surroundings, there has been a gratifying decline in tuberculosis mortality among the colored, and there appears to be no reason why they should not attain as good rates as white people of similar social strata. It is only necessary to apply to the Negro population the same preventive and curative methods that have already proved so successful in the case of the whites.

For the 25-year period as a whole, the tuberculosis death rate for colored policyholders exceeded that for the white by 86 percent among males and 169 percent among females. In each sex the ratio colored to white mortality increased during the quarter century under survey. Comparing the period 1911 to 1915 with the years 1931 to 1935, we find that the excess colored death rate among males, ages 1 to 74, rose from 56 percent to 172 percent; among females the corresponding increase was from 139 to 269 percent. This change reflects the more rapid decline in mortality among white than among colored persons during the 25-year period.

The death rate for colored persons in each sex exceeds that for white persons at every age period, but the excess is most pronounced in childhood and adolescence, among both males and females. At ages 10 to 14 years, in the period 1931 to 1935, the death rate for colored policyholders in each sex was more than 10 times that for the white. These figures harmonize with the observations of Opie and others that young colored persons suffer excessively from tuberculosis and that the disease runs a rapidly fatal course among them. Table 3 presents the ratio colored of white death rate by sex and age.

Trend of Mortality

The mortality from tuberculosis has declined steadily in this insured population during the period under review. Considering

TABLE 3
TUBERCULOSIS—ALL FORMS
Percentage Colored of White Death Rate
By Sex and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
1 to 74*.....	186	272	156	269	369	239
1 to 4.....	355	488	314	358	478	319
5 to 9.....	548	605	545	552	618	517
10 to 14.....	785	1,016	701	759	1,065	726
15 to 19.....	486	851	380	433	730	394
20 to 24.....	285	496	222	293	415	265
25 to 34.....	178	322	138	221	317	184
35 to 44.....	129	222	104	190	270	162
45 to 54.....	115	157	103	180	249	157
55 to 64.....	119	141	123	156	199	137
65 to 74.....	124	134	128	131	148	127

*Based on standardized death rates.

the entire group of weekly premium-paying policyholders, the standardized death rate declined from 223.9 per 100,000 in the period 1911 to 1915, to less than one third of this figure, namely 66.8 in 1931 to 1935, a total drop of 70.2 percent. Between these quinquennia the percent decline in death rate was 74.2 for white males, 70.6 for white females, 55.0 for colored males, and 54.6 for colored females. It is obvious from these figures, shown in Table 4, that the improvement in mortality among white persons very materially exceeded that for the colored in each sex.

The standardized annual death rates by color, sex, and broad age periods are presented in Appendix Table C; the 25-year series, by color and sex, at ages 1 to 74, are shown in graphic form in Chart II.

The curves in Chart II show that among white persons the downward trend has three distinct phases: 1911 to 1918, 1918 to 1921, and 1921 to 1935; but that among colored persons a fourth phase begins with the year 1931, in which the death rate extends sharply downward to the end of the time series shown.

During the period 1918 to 1921—the years of the influenza pandemic and its recurrences—the tuberculosis death rate among males declined much more rapidly than among females. This

TABLE 4

TUBERCULOSIS—ALL FORMS

Five-Year Averages of Annual Death Rates* per 100,000

By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

YEARS	TOTAL PERSONS	WHITE		COLORED	
		Males	Females	Males	Females
1911 to 1935.....	135.7	149.7	98.6	278.7	265.5
1931 to 1935.....	66.8	68.4	45.7	186.3	168.7
1926 to 1930.....	91.7	93.2	68.3	216.5	215.4
1921 to 1925.....	112.8	115.3	89.4	225.7	239.5
1916 to 1920.....	183.3	206.2	133.9	351.5	332.4
1911 to 1915.....	223.9	265.1	155.6	413.7	371.5
Percent decline 1931-1935 since 1911-1915.....	70.2	74.2	70.6	55.0	54.6

*Standardized for age, and in the case of Total Persons, also color and sex.

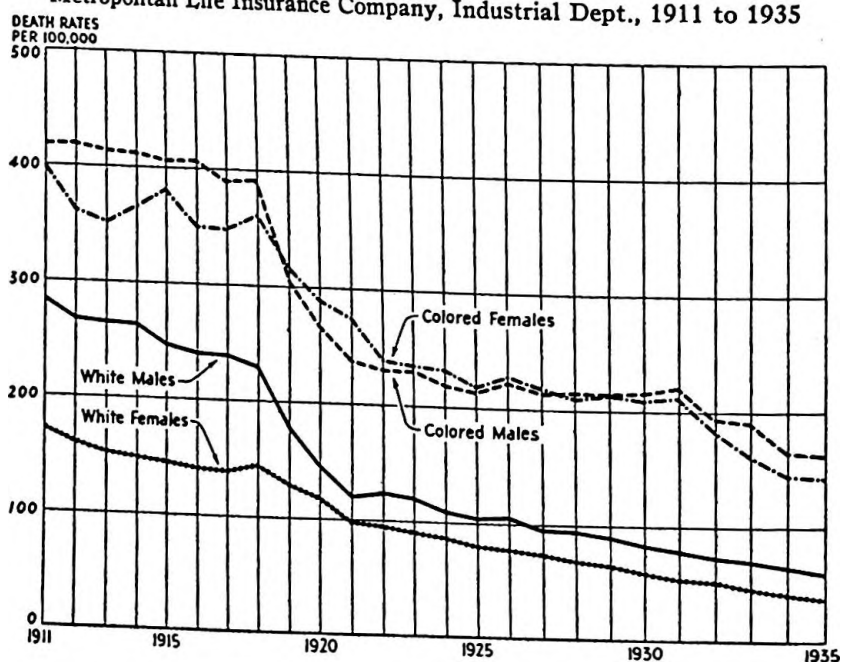
CHART II

TUBERCULOSIS—ALL FORMS

Standardized Annual Death Rates per 100,000

By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



phenomenon accounts for the slightly greater decline among males for the 25-year period as a whole, as shown in Table 4. Among insured colored persons this differential decline in the influenza period resulted in tuberculosis death rates actually lower among males than among females in each of the years from 1919 to 1927. The decline in the death rate for total persons between 1918 and 1921 was equal to 44 percent of that for the 25-year experience as a whole.

Decline in Tuberculosis Mortality Before and After the Influenza Pandemic

Although abrupt changes in the rate of decline make it inadvisable to calculate straight-line trends to fit the tuberculosis death rates of any of our color-sex groups over the entire 25-year period of this review, the data are sufficiently consistent and the periods of time sufficiently long to warrant the calculation of such trends for the periods before and after the influenza pandemic. These calculations have been made and are presented in Table 5.

Examination of this table reveals the fact that, for each color-sex group, the average annual percentage decline in the tuberculosis death rate has been considerably greater in the years 1921 to 1935 than it had been in the years before the influenza pandemic. The table shows also that since the influenza pandemic the rate of decline in tuberculosis mortality among white males and white females has been significant at every age period as well as at all ages combined, and that in practically every age group the rate of decline was greater after the influenza period than before. This finding points not only to a progressive diminution in the incidence of tuberculous disease, but to a progressive decline in the number of foci of infection as well. The more recent trend in the rates of decline from tuberculosis suggests that the forces which combated this disease (and in this we must include the effect of the influenza epidemic) have actually reduced the number of infectious foci to a point at which the annual number of new cases is insufficient to maintain the death rate at a constant level under existing conditions.

Trends of Mortality in the Insured and in the General Population Compared

In view of the fact that accurate population estimates by color, sex, and age are not available for the expanding United States Death Registration Area for the period 1911 to 1919, comparison of

TABLE 5
TUBERCULOSIS—ALL FORMS
Averages of Annual Death Rates, and Trend of Mortality
By Color, Sex, and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Department
1911 to 1917 and 1921 to 1935

AGE PERIOD YEARS	AVERAGE OF DEATH RATES PER 100,000				ANNUAL TREND AS PERCENT OF AVERAGE RATE			
	WHITE		COLORED		WHITE		COLORED	
	Males	Females	Males	Females	Males	Females	Males	Females

1911 to 1917

1 to 74*....	257.7	151.0	409.2	365.0	-2.9	-3.5	-1.0	-1.4
1 to 4.....	76.9	75.2	235.7	242.1	-1.9	-3.8	-7.1	-0.7
5 to 9.....	25.3	28.4	136.1	155.3	-0.8	-4.3	-3.7	+0.1
10 to 14.....	21.1	42.7	151.7	321.7	-3.5	-2.6	-1.7	-1.2
15 to 19.....	118.2	163.1	478.3	637.5	-6.2	-0.9	-0.2	-0.3
20 to 24.....	250.9	241.7	581.1	635.5	-5.5	-2.3	-1.9	-2.4
25 to 34.....	391.8	249.1	561.6	468.1	-4.5	-4.6	-0.2	-0.9
35 to 44.....	534.8	208.6	567.4	345.6	-3.0	-5.0	+0.8	-2.7
45 to 54.....	457.9	145.1	465.7	234.7	+0.3	-2.8	-1.0	+1.0
55 to 64.....	360.8	138.3	425.5	194.2	-0.9	-2.4	-2.6	-1.6
65 to 74.....	265.1	137.3	340.5	175.2	+0.5	-4.9	+0.5	+2.1

1921 to 1935

1 to 74*....	92.3	67.8	209.5	207.9	-5.1	-6.4	-2.0	-3.6
1 to 4.....	27.2	26.0	116.7	108.9	-6.5	-5.7	-4.0	-3.7
5 to 9.....	9.7	9.5	55.5	52.0	-6.8	-6.6	-6.0	-4.7
10 to 14.....	8.3	16.3	68.4	129.0	-7.9	-9.8	-5.3	-6.2
15 to 19.....	40.4	78.1	250.5	385.9	-8.6	-8.6	-4.1	-3.7
20 to 24.....	89.5	130.3	326.8	431.3	-7.9	-6.7	-2.6	-3.8
25 to 34.....	120.5	110.0	287.2	291.5	-6.0	-6.0	-1.1	-3.1
35 to 44.....	161.2	78.7	273.6	178.7	-4.7	-6.6	-0.7	-3.4
45 to 54.....	187.0	64.3	249.5	134.5	-3.5	-6.1	-0.6	-2.9
55 to 64.....	176.6	67.8	217.7	114.3	-2.8	-4.0	-0.8	-2.2
65 to 74.....	159.8	80.0	192.8	107.3	-3.8	-3.8	-2.8	-2.3

*Standardized for age.

NOTE—Figures in boldface indicate significant trends.

the tuberculosis mortality in the insured and in the general population is not possible for those years. Virtually comparable data for the two experiences are available, however, for the period since 1921. Table 6 presents the trend data of tuberculosis mortality for

TABLE 6
TUBERCULOSIS—ALL FORMS
Averages of Annual Death Rates, and Trend of Mortality
By Color, Sex, and Age. Ages 1 to 74 Years
United States Registration States of 1920, 1921 to 1934

AGE PERIOD YEARS	AVERAGE OF DEATH RATES PER 100,000				ANNUAL TREND AS PERCENT OF AVERAGE RATE			
	WHITE		COLORED		WHITE		COLORED	
	Males	Females	Males	Females	Males	Females	Males	Females
1 to 74*	66.3	58.7	212.1	206.5	-4.7	-5.8	-1.9	-3.1
1 to 4	25.9	24.3	87.9	77.1	-6.6	-6.0	-2.8	-3.3
5 to 9	8.9	8.1	36.5	37.5	-6.3	-6.9	-2.2	-2.2
10 to 14	7.9	12.9	48.6	85.8	-7.4	-8.2	-3.2	-3.6
15 to 19	31.7	61.4	191.2	294.6	-7.6	-7.8	-3.2	-3.1
20 to 24	70.7	102.5	340.8	395.4	-7.2	-6.9	-3.6	-2.9
25 to 34	90.1	93.5	330.3	325.8	-5.9	-5.7	-2.1	-3.2
35 to 44	104.4	68.2	293.0	222.0	-4.0	-5.8	-0.3	-3.1
45 to 54	116.2	59.7	259.3	183.9	-2.5	-5.1	+ †	-3.2
55 to 64	126.1	68.6	244.7	170.0	-2.8	-4.5	-1.8	-3.5
65 to 74	135.6	97.2	250.5	152.1	-3.3	-4.1	-1.5	-3.6

*Standardized for age. †Less than 0.05.

NOTE—Figures in boldface indicate significant trends.

the general population in the years 1921 to 1934. Chart III displays graphically the time series for the two experiences.

Comparison of the figures in Table 6 with those for similar groups in the Metropolitan Life Insurance Company, as exhibited in the lower half of Table 5, shows that in each color-sex group at ages 1 to 74 years, the decline in the death rate from tuberculosis was greater among the Industrial policyholders of the Metropolitan Life Insurance Company than in the corresponding classes of the general population.

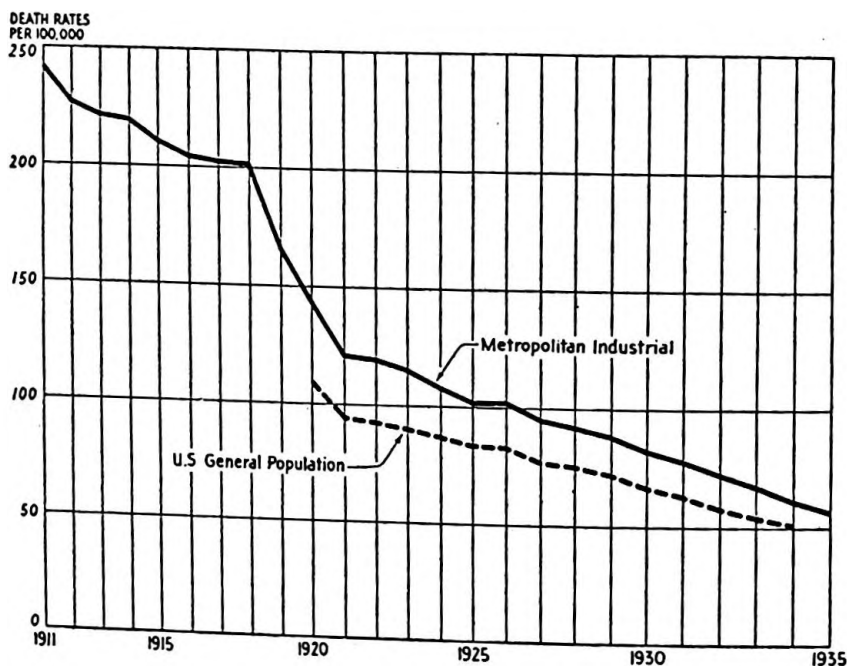
The more rapid decline in tuberculosis mortality among insured persons than in the general population may be due to the urban character of the insured group. Since urban rates have always been higher than rural ones, there has been more room for improvement. The cities, moreover, with their more adequate medical services, have made available earlier diagnosis and better methods of treatment. In addition to the facilities open to all city dwellers, the Metropolitan Life Insurance Company has given its Industrial policyholders the benefits of health education. It is not unreasonable to assume that these advantages have contributed materially to the favorable showing made by the insured.

CHART III

TUBERCULOSIS—ALL FORMS

Standardized Annual Death Rates per 100,000

Total Persons. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935
and U. S. Registration States of 1920, 1920 to 1934Factors in the Decline of the Death Rate
from Tuberculosis

This brings us logically to a consideration of the factors responsible for the decline in tuberculosis. It would take us too far afield to go into any detailed discussion of the subject. Suffice it to say that this disease has received much attention from medical and public health workers in the past three decades. The preventive program originally launched by the National Tuberculosis Association has spread to every corner of the country, and every village has benefited from the effects of this campaign. Among the most effective methods employed to further the work have been the community health demonstrations held in various localities, which clearly showed that the mortality and morbidity from the disease could be drastically reduced. The first of these community experiments, the forerunner of others of similar character, was conducted at Framingham, Mass., by the National Tuberculosis Association

with the financial support of the Metropolitan Life Insurance Company.¹

The rapid extension of clinical facilities in urban areas, the growth of visiting nursing services, more frequent medical surveys among children in the public schools, and similar activities, have uncovered an increasing number of tuberculous cases in the incipient and early stages, in which the disease is, in most instances, readily amenable to treatment. Undoubtedly, a reduction in the number of cases, particularly in children, has resulted from the wholesale slaughter of infected cows. Concomitant with these developments has been the wide extension of the sanatorium movement. During the years under survey, sanatoria, public and private, have sprung up in all parts of the country, and have been continuously increasing their bed capacity until in 1935 the number of beds available in the country as a whole about equalled the annual number of deaths from tuberculosis. There is abundant evidence available to show that these institutions have been successful in arresting tuberculosis, with the result that many thousands of patients have been restored to an active, productive life.

Newer methods of therapy appear to have aided the forces working towards the suppression of tuberculosis. Among the most promising of these newer methods is the surgical treatment of the disease. This so-called "collapse therapy" consists in collapsing the infected lung either by injecting sterilized air in the space around it (pneumothorax) or by other surgical procedures. By thus temporarily preventing the disabled lung from functioning it is enabled to rest—an important factor in the healing process. Only relatively recently has this procedure come into favor, but now doctors are rapidly learning the technique and putting it into practice. Many patients who have been treated in this manner have shown remarkable improvement. In addition the patient is no longer a tuberculosis carrier or a source of infection to others. In fact, one of the main reasons why tuberculosis mortality has declined so greatly is because there are no longer so many people in the active stages of the disease walking around and carrying infection to others.

Supplementing these medical efforts, industry in general is taking more seriously its obligation to protect workers. Since the World War there has been an amazing development in industrial hygiene. An increasing number of firms have inaugurated medical

¹Framingham Community Health and Tuberculosis Demonstration of the National Tuberculosis Association. Monograph 10. General Series IV. Final Summary Report 1917-1923, inclusive. Framingham, Mass., 1924.

departments, are providing annual physical examinations for employees, and are eliminating dangerous dusts as far as possible. These measures have lowered the amount of infection, as is shown by the improved mortality among males in the industrial population.

At the same time that these specific activities have operated in the campaign, a number of general factors, some of them quite accidental, have greatly helped to increase the measure of control over tuberculosis. Certainly during the period under review the national standard of living has greatly improved. Shorter hours of labor, better housing conditions, more abundant food, increased leisure, fuller knowledge of personal hygiene—all of these factors have made life easier and have added their effect to the more specific medical measures.

To these factors must be added such demographic forces as the decline in the birth rate and the check on immigration. The former of these has very materially lightened the burden on the large number of young women who, as we have seen, in past years played a prominent part in the tuberculosis picture. The greatly reduced number of pregnancies in recent years has undoubtedly carried with it a favorable reflex in the tuberculosis mortality of women at the childbearing ages. The reduction in immigration has likewise had a favorable influence, for the immigrants in many instances belong to racial groups among whom tuberculosis was much more prevalent than in the general population of the United States. Furthermore, the very diminution of newcomers has reduced the trend of further congestion in our cities, an item of no small importance in determining tuberculosis death rates.

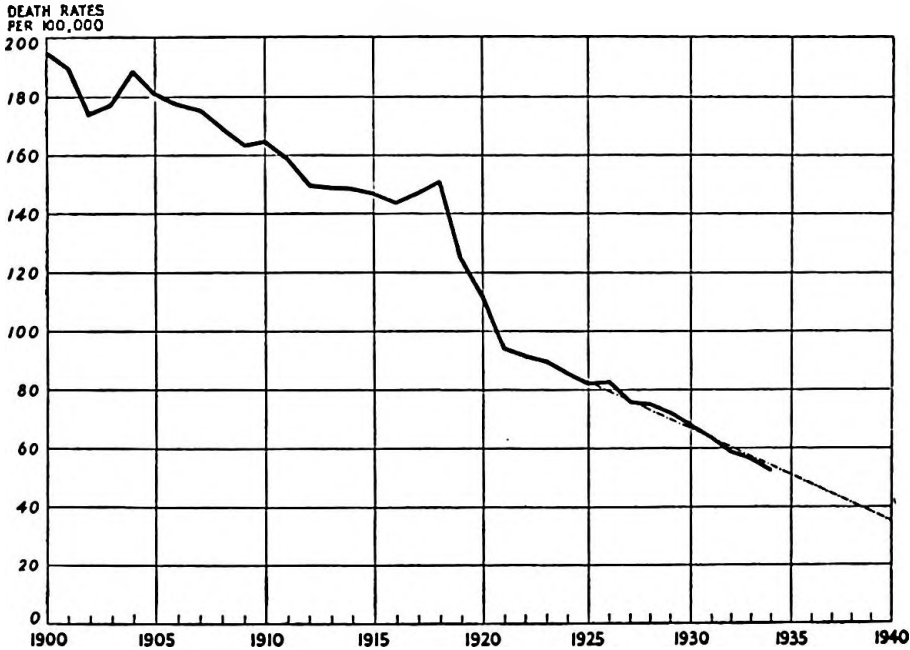
It is, therefore, not surprising that mortality from tuberculosis reflects the achievements in preventive medicine as well as in the general living conditions of the people. We see the tuberculosis death rate responding sensitively to the many new forces that are at work to check it. It is no small matter that in the general population of the United States the death rate from tuberculosis has declined so far as to bring this disease into seventh place in the list of causes of death in recent years. Chart IV illustrates very clearly what has happened in recent decades in a representative area of the United States. But more interesting is our projection of what we believe the forces which are now at work against tuberculosis will accomplish in the years immediately ahead. The graph exhibits the trend of the death rate for the period 1900 to 1934 and the prospective death rates for the years 1935 to 1940.

CHART IV

TUBERCULOSIS—ALL FORMS

Crude Death Rates per 100,000, All Ages

Original Registration States and District of Columbia, 1900 to 1934 Observed,
1935 to 1940 Projected on Basis of Trend for 1921 to 1934



The forecast for the year 1940 has been made on the basis of the trend for the period 1921 to 1934. If the trend for these years is indicative of the course of events in the immediate future, the death rate from tuberculosis in the Original Registration States and the District of Columbia will be 35 per 100,000 in the year 1940. The disease is well on its way toward becoming a minor cause of death.

In focusing attention on the past and prospective gains, we must not lose sight of the fact that tuberculosis is still an exceedingly important health problem. The disease is still the leading cause of death in early adult life and is an important cause of orphanhood and of family disruption. The time is now ripe for a final and intensified drive which will lead to the suppression of the disease. States, municipalities, and private organizations should make every effort at this time to provide additional facilities for the care of tuberculous patients. In some communities additional beds are needed for the isolation and treatment of open cases. In others, additional clinic facilities are needed for better diagnosis of

the disease. In all communities more knowledge of the causes of tuberculosis and a better practice of personal hygiene are needed. The anti-tuberculosis campaign has been eminently successful, and we must let the light of past experience illumine and stimulate the drive to further gains.

TUBERCULOSIS OF THE RESPIRATORY SYSTEM

Up to this point the discussion has been concerned with all forms of tuberculosis combined. Of these, by far the most important is tuberculosis of the respiratory system, which is responsible for nine tenths of the total mortality from this disease, as Table 7 shows. It is, therefore, natural that the mortality curves for all forms combined are determined by the characteristics of this form of tuberculosis. The greatest effort of the preventive campaigns has been directed against the respiratory form of the disease. The organization and multiplication of tuberculosis clinics, hospitals, and sanatoria, the training of large numbers of physicians to diagnose the disease in its early stages, the campaign against unsanitary conditions in the home and in industry, the widespread educational campaign—all of these measures aimed specifically at respiratory tuberculosis are probably responsible for much of the improvement in the mortality from all forms of the disease.

It is not within the province of this study to describe clinically tuberculosis of the respiratory system in its various manifestations; nor is it fitting here to do more than touch upon the events responsible for the declining death rate, starting even before the brilliant discovery of the bacillus that causes the disease, by Robert Koch in 1882. Prior to the work of Koch, Villemin had clearly recognized the infectious nature of pulmonary tuberculosis, and long before that time Galen had made the same observations. To Laennec, inventor of the stethoscope, with his *Traité de l'auscultation médiate*, published in 1819, we owe the modern understanding of the disease. The development of the cutaneous test by von Pirquet provided a means of determining the existence of tuberculosis. The use of the X-ray followed the discovery of the rays by Roentgen in 1895 and gave another important technique for diagnosing the disease and for following its progress in an individual.

During the 25-year period covered by this review, 365,592 deaths among the weekly premium-paying policyholders of the Metropolitan Life Insurance Company, 90.5 percent of the total tuberculosis deaths in this period, were charged to tuberculosis of the respiratory system.² The average standardized annual death rate, ages 1 to 74, was 123.8 per 100,000. Among insured white persons the rate was 112.9; among the colored, 243.8 per 100,000.

²Including acute disseminated tuberculosis.

TABLE 7
TUBERCULOSIS BY ORGANS OR PARTS AFFECTED

Percent Each Form of Total Tuberculosis Deaths

Total Persons. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

CAUSE OF DEATH	1911 to 1935	1931 to 1935	1926 to 1930	1921 to 1925	1916 to 1920	1911 to 1915
----------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------

PERCENT OF TOTAL DEATHS FROM TUBERCULOSIS

TUBERCULOSIS—All Forms . .	100.0	100.0	100.0	100.0	100.0	100.0
Respiratory system†	90.5	91.0	88.3	90.0	90.6	90.5
Meninges and central nervous system	4.2	3.7	4.4	4.1	4.5	4.2
Intestines and peritoneum	2.7	2.4	2.7	2.7	2.6	2.9
Other organs and chronic disseminated tuberculosis	2.6	2.9	4.6	3.2	2.3	2.4

PERCENT OF DEATHS FROM ALL CAUSES

TUBERCULOSIS—All Forms . .	12.6	8.0	10.7	12.9	15.1	18.3
Respiratory system†	11.4	7.3	9.4	11.6	13.6	16.6
Meninges and central nervous system	0.5	0.3	0.5	0.5	0.7	0.8
Intestines and peritoneum	0.3	0.2	0.3	0.4	0.4	0.5
Other organs and chronic disseminated tuberculosis	0.4	0.2	0.5	0.4	0.4	0.4

AVERAGES OF ANNUAL DEATH RATES* PER 100,000

TUBERCULOSIS—All Forms . .	135.7	66.8	91.7	112.8	183.3	223.9
Respiratory system†	123.8	60.9	83.2	103.0	167.8	204.1
Meninges and central nervous system	5.4	2.5	3.7	4.3	7.3	8.9
Intestines and peritoneum	3.3	1.4	2.2	2.8	4.4	5.7
Other organs and chronic disseminated tuberculosis	3.3	2.0	2.5	2.8	4.0	5.2

*Standardized for color, sex, and age.

†Including acute disseminated tuberculosis.

Mortality by Age, Sex, and Color

The average death rates from tuberculosis of the respiratory system by age, sex, and color appear in Table 8. The data are presented for the three periods: 1911 to 1935, 1931 to 1935, and 1911 to 1915.

TABLE 8
TUBERCULOSIS OF THE RESPIRATORY SYSTEM†
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
WHITE						
1 to 74*.....	138.7	63.2	246.6	88.6	41.3	138.7
1 to 4.....	11.3	5.8	16.0	11.1	5.8	17.5
5 to 9.....	4.7	1.8	7.0	6.1	2.5	10.6
10 to 14.....	7.1	2.4	12.2	19.6	5.9	33.9
15 to 19.....	61.3	18.9	124.3	103.8	38.1	152.0
20 to 24.....	138.3	51.1	252.9	165.5	80.0	232.3
25 to 34.....	204.3	78.8	397.1	154.3	73.3	247.2
35 to 44.....	279.3	116.9	536.8	117.8	50.3	205.8
45 to 54.....	274.5	147.6	446.2	86.8	42.3	138.9
55 to 64.....	229.9	145.8	341.5	85.7	49.9	131.8
65 to 74.....	187.4	123.2	239.5	91.2	61.3	128.6
COLORED						
1 to 74*.....	249.0	168.1	369.7	238.9	152.6	329.0
1 to 4.....	81.7	52.4	109.7	85.9	51.5	132.5
5 to 9.....	50.3	21.7	80.3	58.8	23.1	101.7
10 to 14.....	76.5	34.4	118.0	172.2	79.1	279.0
15 to 19.....	298.0	170.0	429.0	450.3	281.8	592.6
20 to 24.....	387.5	252.3	550.6	483.7	331.2	612.7
25 to 34.....	358.6	253.2	540.4	335.8	229.2	449.7
35 to 44.....	352.3	257.2	545.1	220.0	135.3	325.5
45 to 54.....	305.3	224.9	454.3	155.6	104.6	215.9
55 to 64.....	266.4	201.7	412.2	130.0	97.5	169.3
65 to 74.....	228.7	160.6	297.6	115.4	85.0	151.4

*Standardized for age. †Including acute disseminated tuberculosis.

Age The age curves of the mortality from respiratory tuberculosis and the changes in age distribution that have occurred during the 25-year period under review, are essentially like those for all forms of tuberculosis discussed in the preceding section. It is to be noted, however, that in childhood the death rate from respiratory tuberculosis is relatively much lower than that for all forms of the disease, which reflects the high rate from tuberculosis of the meninges and the central nervous system at

the younger ages. Beyond age 15 the deaths from respiratory tuberculosis constitute a high and fairly constant proportion of the total deaths from tuberculosis. During the most recent five-year period, 1931 to 1935, tuberculosis of the lungs and associated organs accounted for approximately one third of the deaths from all forms of the disease among white policyholders aged 1 to 4, while tuberculosis of the meninges and the central nervous system contributed more than half the total. At ages 5 to 9 among white males, about a quarter of the deaths were of the respiratory form; among white females, 40 percent. At ages above 15, respiratory tuberculosis constituted over 90 percent of the total death rate from tuberculosis among white policyholders in both sexes. Respiratory tuberculosis comprised a larger portion of the tuberculosis death rate among colored than among white persons at ages under 20; beyond that age, however, the ratio respiratory of total tuberculosis was approximately the same for both.

Sex For the five-year period 1931 to 1935 the death rate from respiratory tuberculosis for males exceeded that for females by 53 percent among white persons and by 10 percent among the colored, at ages 1 to 74 combined. In the age range 5 to 24, however, the mortality for females was higher than that for males, among both white and colored policyholders. At the age period 10 to 14 the death rate for white girls was nearly $2\frac{1}{2}$ times that for white boys. Beginning with age 25 and beyond, males in each race record definitely and consistently higher rates than females.

Color The respiratory tuberculosis death rate among colored children is notoriously high. This fact appears clearly in Table 8. During the most recent five-year period, in the ages under 20 the mortality among the colored was from seven to 14 times as high as among white persons.

Trend of Mortality

In the 25-year period under survey the rapid decline in the death rate from respiratory tuberculosis paralleled that for all forms of tuberculosis in each color-sex group. The two trends, as has already been indicated, are intimately related. In both series white persons in each sex showed a more pronounced decline in death rate than the colored. The trends for respiratory tuberculosis appear in Table 9; Chart V exhibits the time series graphically. In Appendix Table C appear annual death rates by color, sex, and broad age periods, for the years 1911 to 1935.

TABLE 9
TUBERCULOSIS OF THE RESPIRATORY SYSTEM†
Averages of Annual Death Rates, and Trend of Mortality
By Color, Sex, and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Department
1911 to 1917 and 1921 to 1935

AGE PERIOD YEARS	AVERAGE OF DEATH RATES PER 100,000				ANNUAL TREND AS PERCENT OF AVERAGE RATE			
	WHITE		COLORED		WHITE		COLORED	
	Males	Females	Males	Females	Males	Females	Males	Females
1911 to 1917								
1 to 74*....	240.1	135.1	366.5	325.7	-2.7	-3.3	-0.6	-0.9
1 to 4.....	16.4	17.5	111.2	130.5	+0.8	-1.2	-1.1	-1.9
5 to 9.....	7.4	10.5	78.8	101.7	+2.4	-2.1	-2.5	-0.5
10 to 14.....	12.0	33.0	117.4	278.7	-1.7	-1.7	-0.1	-0.3
15 to 19.....	107.3	152.4	436.5	592.4	-6.5	-0.9	+ †	+0.5
20 to 24.....	240.5	229.9	543.2	601.3	-5.3	-2.2	-2.1	-2.3
25 to 34.....	379.4	238.5	534.7	442.0	-4.3	-4.5	-0.2	-1.0
35 to 44.....	521.3	197.3	541.5	318.6	-2.9	-4.8	+0.8	-2.5
45 to 54.....	444.8	135.1	443.1	217.9	+0.4	-2.7	-1.2	+1.1
55 to 64.....	341.3	127.2	395.6	170.9	-†	-2.2	-1.9	-0.5
65 to 74.....	246.8	123.6	307.1	150.0	+0.5	-4.9	-0.3	+4.4
1921 to 1935								
1 to 74*....	85.1	61.2	186.9	188.3	-5.1	-6.5	-1.9	-3.7
1 to 4.....	8.1	7.6	63.7	63.8	-4.8	-3.8	-2.8	-3.3
5 to 9.....	3.1	3.6	33.2	33.9	-8.3	-5.9	-6.1	-6.0
10 to 14.....	4.3	11.8	49.8	112.5	-8.4	-10.3	-6.6	-6.6
15 to 19.....	35.4	72.2	221.0	359.9	-9.0	-8.7	-3.9	-3.8
20 to 24.....	84.0	124.0	303.6	409.3	-8.0	-6.8	-2.7	-3.9
25 to 34.....	114.7	104.8	270.2	274.4	-6.2	-6.1	-1.2	-3.1
35 to 44.....	155.1	73.7	258.8	165.5	-4.8	-6.7	-0.6	-3.5
45 to 54.....	181.1	59.5	232.8	123.6	-3.6	-6.2	-0.5	-3.1
55 to 64.....	169.3	62.4	202.0	103.8	-2.8	-4.0	-1.0	-2.2
65 to 74.....	148.9	72.8	177.7	94.2	-3.7	-3.6	-2.9	-2.5

*Standardized for age. †Less than 0.05.

†Including acute disseminated tuberculosis.

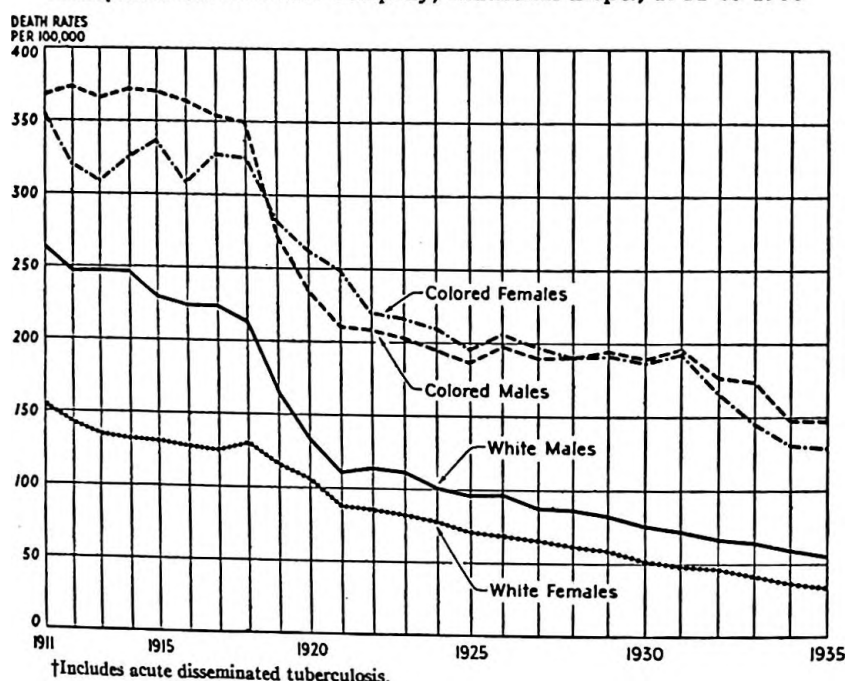
NOTE—Figures in boldface indicate significant trends.

Importance of Early Treatment in Respiratory Tuberculosis

From its very inception the public health movement against tuberculosis in this country has stressed the value of early diagnosis and prompt treatment. The wisdom of this practice has been unequivocally demonstrated by the experience of the Metropolitan

CHART V
TUBERCULOSIS OF THE RESPIRATORY SYSTEM†
 Standardized Annual Death Rates per 100,000
 By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



Life Insurance Company among employees treated at the Company's Sanatorium at Mount McGregor. In the period 1914 to 1926 a total of 1,448 patients were discharged alive from the Sanatorium. Follow-up of these cases revealed that the subsequent mortality among the patients discharged who were in the incipient stage of the disease on admission to the Sanatorium, was only 29 percent higher than the average death rate for all the Company's employees. This result, in view of the seriousness of the disease, must be looked upon as highly satisfactory. The moderately advanced cases showed a mortality $5\frac{1}{2}$ times the average and four times the death rate of those who were in the early stages of the disease. The cases which were far advanced on admission registered a subsequent death rate 17 times the average and about 13 times the subsequent mortality of the incipient cases. The record proves also that persons with pulmonary tuberculosis can be restored to health and normal working capacity. The ability to work is, however, distinctly affected by the stage of the disease on admission to the Sanatorium. Tracing the cases discharged from

the Sanatorium to the anniversary of their discharge in 1927, it was found that as many as 71 percent of the patients entering when the disease was in its incipency were still able to work. This compares with 50 percent in the moderately advanced group and only 30 percent in the far advanced group. Only 7 percent of the incipient cases were definitely known to be unable to work, as compared with 16 percent of the moderately advanced, and with 23 percent of the far advanced cases. If considered in relation to the number of those alive on the anniversary date, these differences would be even more marked, for a relatively greater number of the more advanced cases were dead. Only 5 percent of the incipient cases were dead at the 1927 anniversary, as against 23 percent of the moderately advanced cases and 42 percent of the far advanced cases.

Occupation and Respiratory Tuberculosis

Occupation plays an important part in the incidence and mortality of respiratory tuberculosis. The lower tuberculosis death rate among females than among males during the principal working years of life is striking evidence of this fact. Respiratory tuberculosis is especially prevalent among workers exposed to dust; the very highest death rates from the disease are recorded among persons exposed to stone dusts which contain a very large percentage of free silica. Included in this group are a large number of miners, pottery workers, stone cutters, cutlers and grinders, polishers, glass workers, and others. In some of these occupations the death rate from tuberculosis is extremely high. A study of mortality among the granite cutters of Barre, Vt., disclosed a death rate from pulmonary tuberculosis almost 10 times that of the general adult population of the State. An investigation in a Connecticut factory revealed that axe grinders and polishers had a death rate 12 times that for other employees in this factory; exposure to silica dust constituted the chief difference in working conditions. Even more striking evidence is provided by a study into the occupational mortality of persons insured under Ordinary policies made by the larger Life insurance companies. This investigation showed that respiratory tuberculosis was responsible for 20 percent of all the deaths among gold and silver miners, 29 percent of the deaths of copper miners, and 50 percent of the total deaths among lead and zinc miners.

A number of occupations in which there is exposure to organic dust have been associated with high death rates from pulmonary

tuberculosis, although the mortality among persons in these industries does not reach the figures for those exposed to silica dust. Among these are barbers and hairdressers, furniture and other wood workers, bakers, textile mill workers, hatters and hat workers (both wool and fur felt), and cigar makers and tobacco workers. The last-named occupation has long been recognized as one with an especially high incidence of tuberculosis. In addition to the dust hazard, there is exposure to nicotine and often to the general insanitary conditions of such workshops. But it is necessary to point out that in this industry there are other unfavorable factors; wages are relatively low, and the work attracts many men of poor physique and low resistance.

Work under unfavorable conditions of high heat and high humidity, coupled with alternate exposure to cold, may be responsible in large measure for acute respiratory diseases which, in turn, undoubtedly serve to kindle quiescent pulmonary tuberculosis. This probably accounts in large measure for the high tuberculosis death toll among laundry workers.

There are other employments in which there is a relatively high incidence of tuberculosis, although they are not associated with any definite industrial risk. Among these are tailors and other clothing workers, cobblers, and slaughter- and packing-house employees. Clerical workers and bookkeepers also have a higher than average incidence. Here the factors of confinement, poor ventilation, and fatigue undoubtedly play their part in reducing resistance to infection.

TUBERCULOSIS OF THE MENINGES AND THE CENTRAL NERVOUS SYSTEM

The second most important site of fatal tuberculosis is that of the meninges and the central nervous system. During the 25 years under review, tuberculous meningitis was charged with 17,033 deaths among the Industrial policyholders of the Metropolitan Life Insurance Company. The standardized annual death rates for the period averaged 5.4 per 100,000 at ages 1 to 74 years.

Mortality by Age, Sex, and Color

The average death rates by age, sex, and color for the entire period of this review, 1911 to 1935, and for the quinquennia at the beginning and at the end of the series, are presented in Table 10.

Age Although deaths from tuberculosis of the meninges and the central nervous system occur at all ages, the mortality from the disease is heavily concentrated in infancy and childhood. Among white children tuberculous meningitis was responsible for well over half of the deaths from tuberculosis as a whole at ages 1 to 4, and for approximately one half the deaths from all forms of the disease at 5 to 9 years. In this investigation data are not available for ages under 1 year, but from figures relating to the general population we find that the highest death rates from tuberculous meningitis occur in infancy. Chart VI exhibits graphically the age distribution of the mortality from tuberculosis of the meninges and the central nervous system among Metropolitan Industrial policyholders, ages 1 to 74 years, by sex and color, for the period 1931 to 1935.

Sex For the five-year period 1931 to 1935 the death rate among males was somewhat higher than that among females, in the aggregate. The sex ratio varies, however, with age. Among white policyholders there is little sex difference in the death rate under age 5, but in the next age group, 5 to 9 years, the male rate exceeds the female by 20 percent. Between ages 10 and 24, however, the death rates for females are from 14 to 33 percent higher than for males. At ages 25 and over, males again recorded the higher death rate. Among colored persons the mortality among

TABLE 10
TUBERCULOSIS OF THE MENINGES AND THE
CENTRAL NERVOUS SYSTEM

Averages of Annual Death Rates per 100,000

By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
WHITE						
1 to 74*.....	5.0	2.2	8.5	4.8	2.1	8.3
1 to 4.....	27.4	10.4	48.8	27.1	10.1	51.1
5 to 9.....	7.6	3.6	12.8	7.4	3.0	13.2
10 to 14.....	3.2	1.4	4.5	3.6	1.6	5.0
15 to 19.....	2.5	1.3	3.5	3.1	1.7	4.3
20 to 24.....	2.2	1.2	2.9	2.4	1.6	3.4
25 to 34.....	2.0	0.9	3.2	1.4	0.8	1.9
35 to 44.....	1.9	0.9	3.5	1.0	0.5	1.8
45 to 54.....	1.4	0.7	2.2	0.7	0.4	1.2
55 to 64.....	1.2	0.8	2.4	0.6	0.4	1.0
65 to 74.....	0.7	0.4	0.8	0.6	0.4	1.1
COLORED						
1 to 74*.....	10.7	7.2	15.5	9.5	5.9	14.2
1 to 4.....	54.7	30.6	87.4	51.0	27.5	83.8
5 to 9.....	17.2	12.3	27.8	15.9	8.5	23.6
10 to 14.....	8.3	6.1	10.3	8.6	4.6	14.0
15 to 19.....	8.2	6.8	9.7	6.1	8.0	3.9
20 to 24.....	5.6	3.9	7.2	3.8	3.7	3.8
25 to 34.....	3.7	3.3	3.6	2.8	2.1	2.7
35 to 44.....	3.6	3.1	4.1	2.5	1.8	4.1
45 to 54.....	2.1	2.2	1.6	1.5	1.1	3.2
55 to 64.....	2.1	1.2	1.7	1.9	0.9	2.8
65 to 74.....	1.5	1.7	2.2	1.0	0.0	1.3

*Standardized for age.

males exceeded that among females at every age period, except 15 to 19 years.

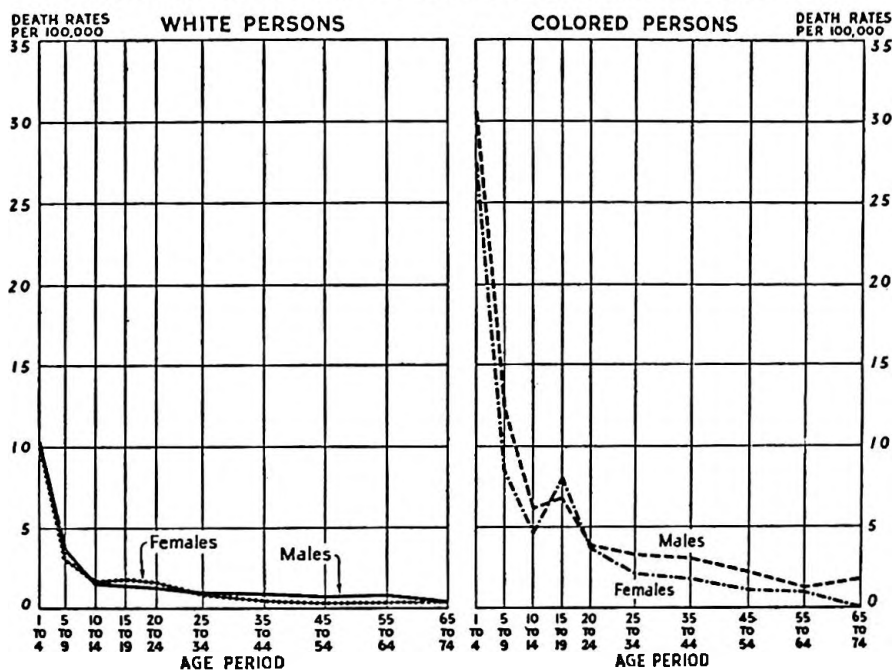
Color The death rate from tuberculous meningitis among colored males averaged over $3\frac{1}{4}$ times and that among colored females over $2\frac{3}{4}$ times the rates for the corresponding groups among white persons, in the period 1931 to 1935. Moreover, there was an excess colored mortality at every age period.

CHART VI

TUBERCULOSIS OF THE MENINGES AND THE CENTRAL NERVOUS SYSTEM

Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935



Trend of Mortality

There has been a downward trend in the mortality rate from meningeal tuberculosis of approximately the same percentage as from pulmonary tuberculosis. Among white persons the average death rate from each of these forms of tuberculosis was approximately 75 percent less in the quinquennium 1931 to 1935 than in the five years 1911 to 1915; among colored persons in the same interval, the mortality from each disease declined about 55 percent. In each form of the disease the most marked decline for total persons occurred between 1918 and 1921.

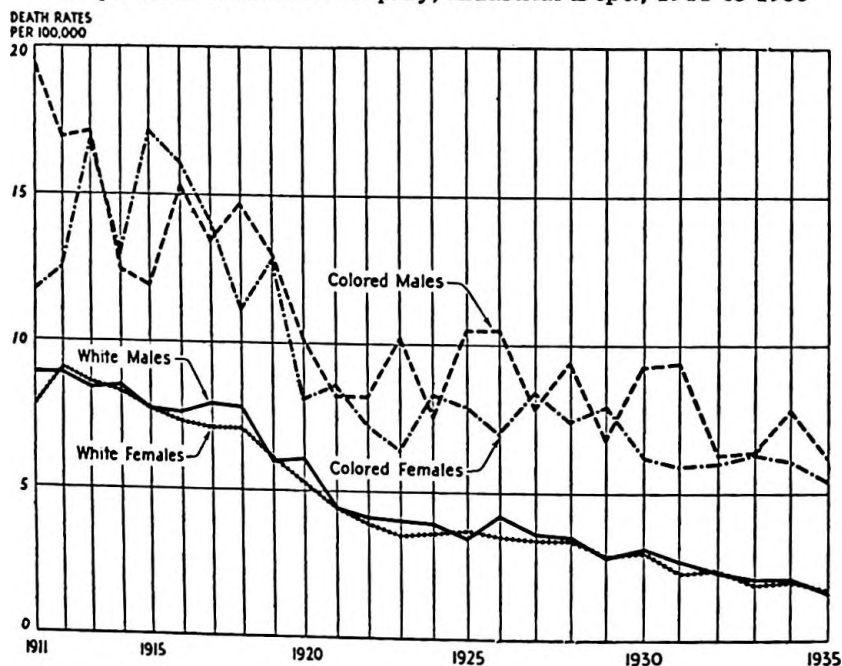
This parallelism is not surprising when the truth of Koch's statement, "Human sputum is the main source of human tuberculosis," is realized. With the decline in the number of cases of advanced pulmonary tuberculosis, and the consequent decrease in the number of infectious foci, a corresponding decline in the incidence and mortality from other forms of the disease is to be expected.

CHART VII TUBERCULOSIS OF THE MENINGES AND THE CENTRAL NERVOUS SYSTEM

Standardized Annual Death Rates per 100,000

By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



The annual death rates from tuberculous meningitis, by color and sex, at ages 1 to 74 are given in Appendix Table C; Chart VII presents graphically the time series for the 25-year period.

TUBERCULOSIS OF THE INTESTINES AND PERITONEUM

In numerical importance tuberculosis of the intestines and peritoneum ranks below both respiratory and meningeal tuberculosis. In the period 1911 to 1935 a total of 10,848 deaths among the weekly premium-paying policyholders of the Metropolitan Life Insurance Company was charged to tuberculosis of the intestines, peritoneum, mesentery, and retroperitoneal glands. This number accounts for 2.7 percent of the total deaths charged to tuberculosis in this group during these 25 years. The average of the standardized annual death rates was 3.3 per 100,000. Unfortunately, our data are not so compiled as to display the mortality rates from peritoneal and intestinal tuberculosis separately.

Intestinal tuberculosis may be primary in children, but at later ages it is most frequently secondary to the pulmonary form.³ Clinical experience shows that in chronic pulmonary tuberculosis secondary involvement of the intestines is relatively common. Evidences of intestinal involvement are found by autopsy in from 50 to 80 percent of persons who die of pulmonary tuberculosis.

Peritoneal tuberculosis is frequently a complication of acute miliary or of chronic pulmonary tuberculosis. Extension from the Fallopian tubes is said to be largely responsible for the excess of this form of tuberculosis among women.

Mortality by Age, Sex, and Color

Table 11 gives the death rates from tuberculosis of the intestines and peritoneum by age, sex, and color for the years 1911 to 1935 combined, and for the first and last five-year periods of the series.

Age In recent years the age curve of the mortality among white males differed somewhat from those for the other color-sex groups, in that it reached its peak at the older ages. In the groups other than white males, the maximum death rates were recorded at adolescence and early adult life, with second peaks at the later ages. The very highest rates from tuberculosis of the intestines and peritoneum in the period 1931 to 1935 were registered among colored women at ages 15 to 24.

³When pulmonary tuberculosis and intestinal tuberculosis are jointly reported, the rule of statistical practice is to charge the death to tuberculosis of the respiratory system.

TABLE 11
TUBERCULOSIS OF THE INTESTINES AND PERITONEUM
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
WHITE						
1 to 74*.....	2.4	0.9	4.3	2.8	1.1	4.9
1 to 4.....	3.1	0.9	6.3	2.7	0.5	5.5
5 to 9.....	1.2	0.5	2.0	1.1	0.3	2.3
10 to 14.....	0.9	0.4	1.2	1.3	0.4	2.4
15 to 19.....	1.7	0.7	2.2	2.6	1.3	3.5
20 to 24.....	1.9	0.6	3.4	3.7	1.8	5.8
25 to 34.....	2.3	1.1	4.3	3.1	1.3	5.3
35 to 44.....	3.0	1.1	5.5	3.4	1.3	6.6
45 to 54.....	3.1	1.1	5.7	3.3	1.2	5.9
55 to 64.....	3.9	1.5	7.7	3.4	1.4	6.6
65 to 74.....	4.9	1.9	9.1	4.7	1.6	7.3
COLORED						
1 to 74*.....	10.2	5.7	16.2	11.8	6.1	19.9
1 to 4.....	13.2	2.3	30.8	9.3	1.8	15.2
5 to 9.....	9.3	3.0	16.4	9.4	3.5	17.0
10 to 14.....	10.3	6.2	14.2	11.7	4.9	20.5
15 to 19.....	14.9	8.1	19.7	19.6	10.3	34.7
20 to 24.....	11.1	6.7	17.8	15.9	10.5	25.0
25 to 34.....	8.0	6.4	13.0	12.7	7.9	19.2
35 to 44.....	8.4	5.5	12.8	10.9	5.2	19.0
45 to 54.....	9.3	5.8	9.9	7.3	3.8	10.8
55 to 64.....	9.7	6.7	18.7	8.6	5.3	15.4
65 to 74.....	7.5	8.0	7.9	8.2	4.9	18.7

*Standardized for age.

Sex Tuberculosis of the intestines and peritoneum is the one form of tuberculosis that regularly shows higher death rates for females than for males. Among both white and colored the excess female over male mortality extends over the years of adolescence and childbearing. Our data, therefore, suggest that there is some connection between tuberculous peritonitis and the physiological changes in the female sex organs which appear in adolescence and during the process of childbirth. In early child-

hood and after middle age there are not any great differences between the male and female rates.

Color Tuberculosis shows a greater excess colored over white mortality for the intestines and peritoneum than for any other site of the body. During the last five years of our study, 1931 to 1935, the death rate for colored males was over six times that of white males; that of colored females was over $5\frac{1}{2}$ times that of white females. At ages 10 to 14, colored boys had a death rate more than 15 times that of white boys; colored girls at these ages had a death rate more than 12 times that of white girls.

Trend of Mortality

The death rate from tuberculosis of the intestines and peritoneum showed a proportionately greater decline during the 25-year period than did that from tuberculosis of any other of the sites for which our data are classified. Comparing the first and last five years of our study, the decline amounted to 75 percent, as is shown in Table 12.

The reasons for this decline are not entirely clear. There can be little doubt, however, that the elimination of tuberculous cattle has been one important factor. Among women the decline in the birth rate may have lessened the danger of tuberculous peritonitis.

TABLE 12
TUBERCULOSIS OF THE INTESTINES AND PERITONEUM
Five-Year Averages of Annual Death Rates* per 100,000
By Color and Sex. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

YEARS	TOTAL PERSONS	WHITE		COLORED	
		Males	Females	Males	Females
1911 to 1935.....	3.3	2.4	2.8	10.2	11.8
1931 to 1935...	1.4	0.9	1.1	5.7	6.1
1926 to 1930...	2.2	1.4	1.9	7.8	8.7
1921 to 1925...	2.8	1.9	2.6	7.8	9.5
1916 to 1920...	4.4	3.2	3.6	13.3	15.0
1911 to 1915...	5.7	4.3	4.9	16.2	19.9
Percent decline 1931-1935 since 1911-1915.....	75.4	79.1	77.6	64.8	69.3

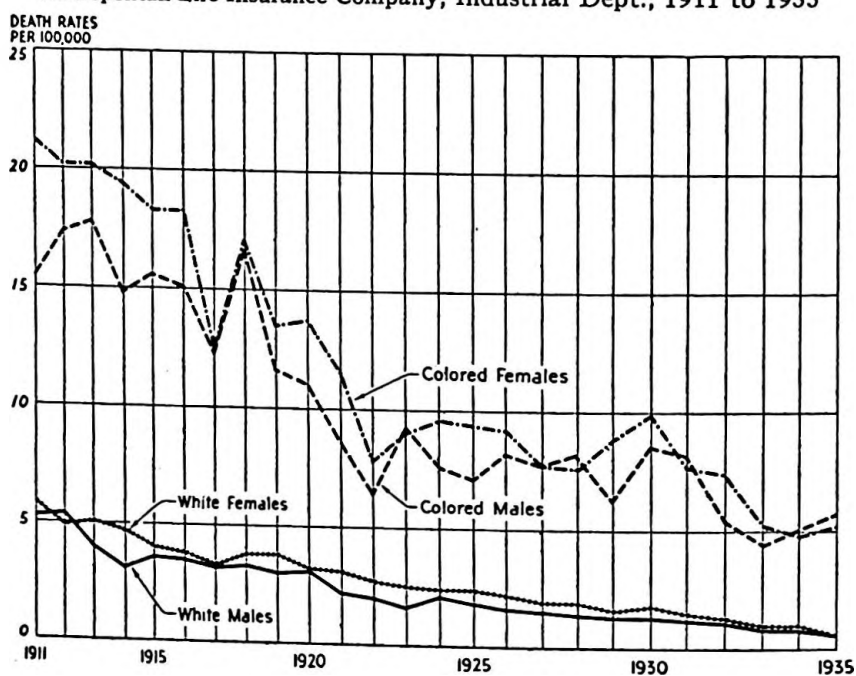
*Standardized for age, and in the case of Total Persons, also for color and sex.

Owing to the increasing practice of abdominal surgery, it is possible that greater precision of diagnosis may have assigned to other causes, *e.g.*, cancer, deaths which had formerly been attributed to tuberculosis.

The death rates by color and sex for each year of our series are presented in Appendix Table C. Chart VIII displays graphically the trend for each color-sex group for ages 1 to 74 years.

CHART VIII
TUBERCULOSIS OF THE INTESTINES AND PERITONEUM
 Standardized Annual Death Rates per 100,000
 By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



TUBERCULOSIS OF OTHER ORGANS AND CHRONIC DISSEMINATED TUBERCULOSIS⁴

The term "tuberculosis of other organs," as here used, is more inclusive than the title of this designation in the International List of Causes of Death. In this text the term is employed to cover titles 34, 35, 36, and 37b of the 1920 revision of the International List.

During the 25-year period 1911 to 1935 a total of 10,378 deaths among Metropolitan Industrial policyholders at ages 1 to 74 was charged to these causes. This number comprised 2.6 percent of all tuberculosis deaths. The standardized annual death rates for the period averaged 3.3 per 100,000.

The average death rates for each color-sex group, by age, for the entire period covered by this review and for the first and the last quinquennium of the series, are given in Table 13.

Because of the miscellaneous nature of the various forms of tuberculosis grouped under this title, detailed discussion of the death rates by age, sex, and color would be meaningless. The following comparisons for the period 1931 to 1935 will suffice: Among white persons the death rate for males was 50 percent higher than for females; and among the colored the male rate exceeded the female by 29 percent. Colored males recorded a rate $2\frac{1}{2}$ times that of white males, and colored females a rate almost three times that of white females.

As is to be expected, the decline in the death rate in this miscellaneous group shows the same general characteristics as we have noted regarding tuberculosis of all other forms. This group contains a number of deaths from tuberculosis of bovine origin. This may be an element in the great improvement during the 25 years under consideration. In this period many active measures have been taken to obtain tuberculosis-free dairy herds, and in addition the practice of pasteurizing milk has become widespread. As a result, there is much less tuberculosis of bovine origin and hence fewer deaths arising from this source.

⁴Included under this chapter heading are: (34) Tuberculosis of the vertebral column; (35) Tuberculosis of the joints; (36) (a) Tuberculosis of the skin, (b) Tuberculosis of the bones (vertebral column excepted), (c) Tuberculosis of the lymphatic system (mesenteric and retroperitoneal glands excepted), (d) Tuberculosis of the genito-urinary system, (e) Tuberculosis of other organs—breast, heart, liver, pancreas, spleen, stomach, etc.; and (37b) Chronic disseminated tuberculosis.

TABLE 13

TUBERCULOSIS OF OTHER ORGANS AND
CHRONIC DISSEMINATED TUBERCULOSIS

Averages of Annual Death Rates per 100,000

By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
WHITE						
1 to 74*.....	3.6	2.1	5.8	2.4	1.4	3.7
1 to 4.....	3.2	1.1	6.8	2.1	1.0	4.3
5 to 9.....	2.0	0.6	3.9	1.6	0.4	3.4
10 to 14.....	1.9	0.6	4.0	1.7	0.6	3.2
15 to 19.....	3.0	1.4	5.6	2.0	0.9	3.1
20 to 24.....	3.4	1.9	5.1	2.3	1.4	3.6
25 to 34.....	3.8	3.0	6.0	2.5	1.5	4.3
35 to 44.....	3.9	2.8	5.0	2.7	2.0	4.0
45 to 54.....	4.2	3.1	5.9	2.8	2.0	3.3
55 to 64.....	6.3	4.2	11.6	3.3	2.2	3.2
65 to 74.....	7.8	5.0	7.8	4.3	3.4	5.6
COLORED						
1 to 74*.....	8.8	5.3	12.3	5.6	4.1	8.5
1 to 4.....	10.3	4.1	17.0	8.2	2.2	18.3
5 to 9.....	7.6	2.3	15.5	5.3	3.1	9.7
10 to 14.....	7.7	3.2	11.1	6.3	3.0	9.5
15 to 19.....	11.0	4.9	11.3	6.6	5.6	10.9
20 to 24.....	11.3	9.1	12.4	6.0	6.0	8.6
25 to 34.....	8.5	7.3	10.8	4.6	4.0	4.0
35 to 44.....	6.3	4.7	9.3	4.2	3.5	5.9
45 to 54.....	7.6	6.2	9.0	4.3	4.5	4.1
55 to 64.....	9.2	5.3	13.3	5.0	3.5	8.1
65 to 74.....	11.1	4.5	20.4	7.6	8.9	10.3

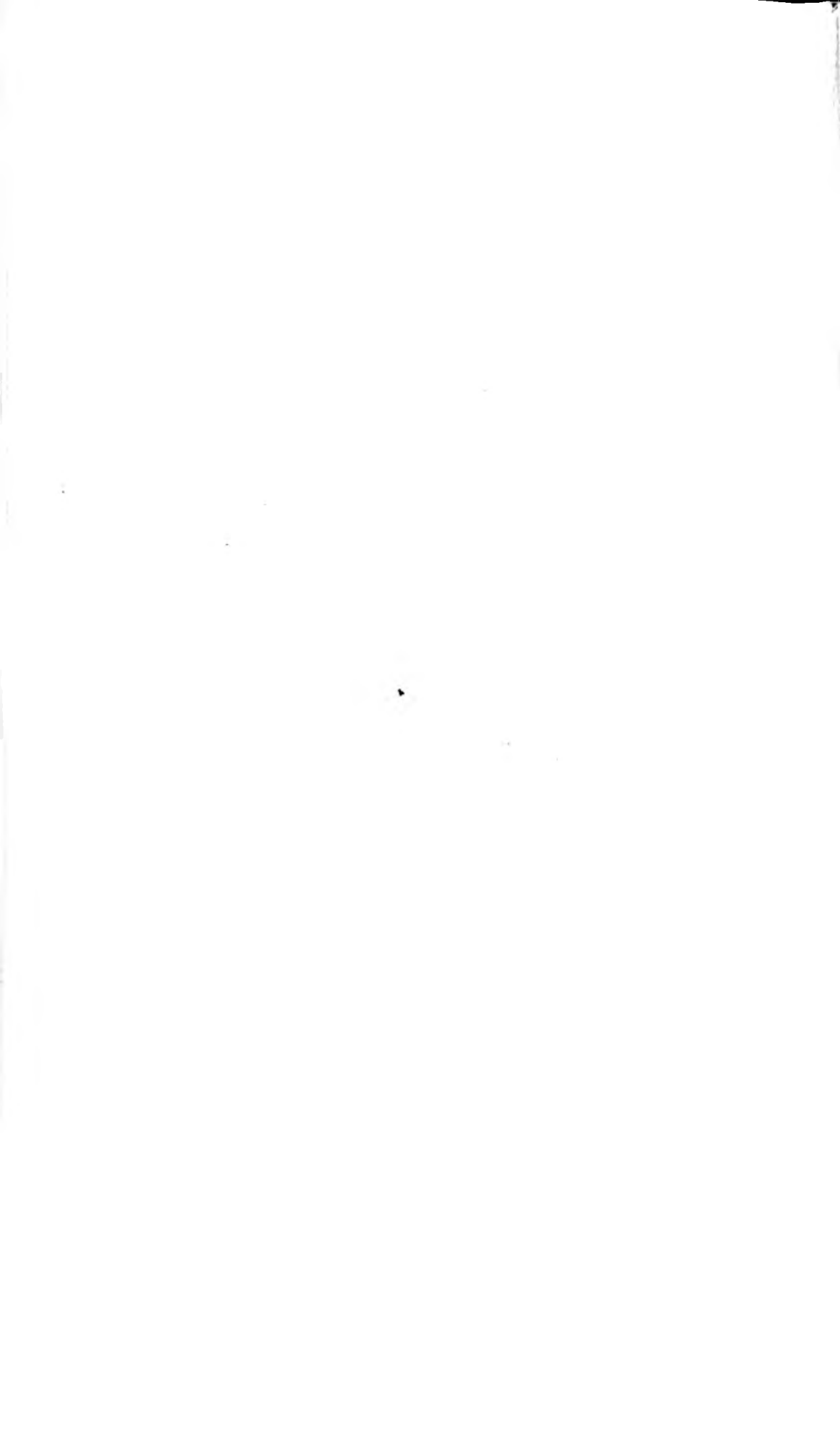
*Standardized for age.

The annual death rates from tuberculosis of "other organs" and chronic disseminated tuberculosis by sex and color for the 25-year period, are presented in Appendix Table C.

CHAPTER VI

INFLUENZA AND PNEUMONIA

THE DISEASES AS A GROUP	117
LOBAR PNEUMONIA	145
BRONCHOPNEUMONIA	152
INFLUENZA	157



INFLUENZA AND PNEUMONIA AS A GROUP

It is typical of infectious diseases—the class to which influenza and pneumonia belong—that their prevalence varies markedly from year to year, with the possibility ever present of these variations rising to the scale of a serious epidemic. A number of the infectious diseases we have learned to control very effectively, and the modern civilized state no longer stands in dread of the violent epidemics of smallpox, cholera, plague, typhus, etc., which in past centuries wrought fearful destruction of life. These outbreaks we know how to prevent; but against a disease such as influenza we have as yet no effective protection. We have no guarantee that there may not be a repetition of the pandemic of 1918–1919; nor, if such event should occur, should we be in much better position today than we were 20 years ago to beat down the enemy. As regards pneumonia, however, the situation is much more hopeful, as we shall see in a later section of this chapter.

Aside from these epidemic outbreaks, influenza and pneumonia (here classed together for reasons to be discussed presently) are to some extent endemic, and although their maximum mortality is in the cold months, they are an important cause of death throughout the year, and at every age period. The high case fatality which attends some forms of the diseases comprised in this group makes them justly feared, and all these factors together lend a prime importance to the topic of this chapter. Moreover, the fact that research in serum therapy has brought the medical profession to the threshold of vastly improved methods of treating the pneumonias has stimulated widespread current interest in these diseases.

Classification of Deaths

The grouping together under the title “Influenza and Pneumonia” of a certain aggregation of different causes of death is not a matter of choice, but is forced upon us through statistical necessity. A proper understanding of this fact is necessary in the discussion of the material collected in this chapter, and as the circumstances surrounding this problem of classification are somewhat complex it is desirable at the beginning to devote a section specifically to this technical aspect of the subject.

Influenza and pneumonia, although they are distinctly different

diseases, frequently occur together. Influenza by itself is rarely fatal, death usually resulting from complicating conditions, of which the most frequent is pneumonia. It is clear, then, that the change in the rules governing the allocation of deaths reported as due jointly to these diseases, which has occurred during the 25-year period, seriously disturbs the comparability of the death rates from these two causes respectively at different calendar periods within the quarter century here covered.

Prior to 1921, deaths certified as due to influenza and lobar pneumonia, jointly, were allocated to the latter. This classification procedure was reversed, however, in 1921 when the Third Decennial Revision of the International List of Causes of Death was first used in American mortality statistics. When the Commission charged with the revision of the International List met in 1920, the ravages of the influenza epidemic of 1918-1919 were still fresh in the minds of its members, and more especially the high frequency of pulmonary involvement in fatal cases of influenza. The Commission accordingly made provision for the separate classification of deaths from influenza "with pulmonary complications specified" and "without pulmonary complications specified." As a result of this change, beginning with 1921, influenza and lobar pneumonia, when reported on the same death certificate, have been assigned to influenza, whereas from 1911 to 1920 deaths so certified had been allocated to the pneumonia. In view of the fact that the number of cases involved in this change runs into many thousands each year, valid comparison of the mortality rates for the 25-year period as a whole is not possible for either influenza or pneumonia separately. The only practical way for us to overcome this difficulty is to consider influenza and pneumonia as a group. In the case of bronchopneumonia, however, the classification procedure has been uniform throughout the 25-year period; deaths certified as due to the combination of influenza and bronchopneumonia have been consistently allocated to the former.

The disadvantages of treating influenza and pneumonia as a unit statistically are obvious. Such classification brings together diseases distinctly different etiologically, pathologically, and clinically. Moreover, lobar pneumonia, the deadliest of all the infectious diseases which are numerically important as causes of death in the United States, causes many thousands of deaths each year in which influenza plays no part. In addition, public health interest is particularly concerned with each of these diseases separately, and it is only by attacking each disease entity that

means of control and prevention may be discovered. It is for these reasons that this chapter, in addition to discussing influenza and pneumonia as a combination, will deal separately with the individual diseases over the period for which comparable data are available.

In considering lobar pneumonia and bronchopneumonia as disease entities, we are conforming to the orthodox classification of these diseases which distinguishes them on the basis of differences in pathological processes and anatomical distribution of lesions. In the newer classification of the pneumonias, based on the etiology of these diseases, deaths attributed to these conditions are divided into more than 30 distinct groups, according to the type of causative organism involved. In the insurance experience under consideration, no data are available based on the etiological classification of these diseases.

Importance as Causes of Death

During the 25-year period 1911 to 1935 there were 391,023 deaths¹ among Metropolitan Industrial policyholders, ages 1 to 74 years, allocated to influenza and the various forms of pneumonia. Of this total, 108,254, or 27.7 percent, occurred in the pandemic period 1918 to 1920, inclusive. The standardized annual death rates for the quarter century as a whole averaged 128.6 per 100,000; for the 22 "normal" years, those exclusive of the pandemic period, the average was 102.2; and for the three years 1918 to 1920, inclusive, the death rates averaged 322.3 per 100,000. Influenza and pneumonia combined ranked third among the causes of death, not only for the 25 years as a whole, but also at the beginning and at the end of the period. In 1911 this group of diseases was out-ranked only by tuberculosis and heart disease; in 1935 by heart disease and cancer.

Influenza and pneumonia, taken together, are among the leading causes of death not only at ages 1 to 74 combined, but also at every period of life. Among insured white children ages 1 to 4, these diseases in the quinquennium 1931 to 1935 accounted for more than one death out of every four; among young colored children these infections were responsible for one third of the total deaths at these ages. At the succeeding age period, 5 to 9 years,

¹This total does not include deaths from pneumonia when secondary to diseases other than influenza, nor postoperative, hypostatic, and terminal pneumonias, which, whenever the information permits, are charged to the disease to which the pneumonia was secondary, or, in case of operation, to the condition for the relief of which the operation was undertaken. Furthermore, the total does not include the numerically unimportant deaths from capillary bronchitis for the years 1911 to 1920.

about one death out of eight was attributed to influenza and pneumonia. Beyond the years of early childhood these deaths constituted a somewhat smaller yet appreciable proportion of the total at every age period.

The importance of these diseases in the total mortality picture is further evident from their rank among the causes of death. At no period of life did influenza and pneumonia fall below fifth place; they filled third place in the broad age range 15 to 44, and ranked either first or second at the childhood ages.

The mortality picture of this group of diseases would be incomplete without reference to their importance as contributory causes of death; and this applies in particular to pneumonia. No statistics of jointly reported causes of death have been compiled for this insurance experience, but there is available a tabulation made by the United States Bureau of the Census in 1925, and it may safely be assumed that the association shown therein between "primary" and "contributory" diseases does not differ essentially from that which obtains currently, both in the population at large and among Metropolitan Industrial policyholders.

On examination of these Census Bureau figures one is immediately impressed with the fact that pneumonia (bronchopneumonia in particular) is a factor in causing tens of thousands of deaths every year, in addition to those for which any record appears in the usual mortality reports. Either pneumonia or influenza, in fact, was cited as a contributory cause in no less than 57,243 deaths out of a total of 536,901 deaths for which any contributory cause whatever was reported by physicians in 1925. The various forms of pneumonia were reported as a causative factor in 47,760 deaths, or 9 percent of the above total. With the exception of chronic heart disease and diseases of the arteries, the pneumonias led the list of complicating causes.

The Diseases Considered Separately

The relative importance of influenza and lobar and bronchopneumonia, separately, in the period for which comparable data are available, 1921 to 1935, are shown in Table 1. One fact of striking interest is that deaths from lobar pneumonia² constituted about half (51.0 percent) the total mortality from influenza and pneumonia combined. Bronchopneumonia was responsible for more than one quarter (26.3 percent) of the total. Thus, all forms

²Approximately 95 percent of the deaths allocated to "pneumonia, lobar and unspecified" were definitely reported as due to lobar pneumonia. Furthermore, a large part of the remaining 5 percent were undoubtedly also cases of true lobar pneumonia.

TABLE 1
INFLUENZA AND PNEUMONIA
Number of Deaths and Death Rates* per 100,000
Total Persons. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1921 to 1935

CAUSE OF DEATH	NUMBER OF DEATHS	PERCENT OF TOTAL DEATHS		AVERAGES OF ANNUAL DEATH RATES* PER 100,000
		ALL CAUSES	INFLUENZA AND PNEUMONIA	
Influenza and Pneumonia....	206,007	10.1	100.0	87.2
Influenza.....	46,668	2.3	22.7	19.0
Pneumonia—all forms.....	159,339	7.8	77.3	68.3
Bronchopneumonia.....	54,161	2.6	26.3	23.3
Pneumonia, lobar and unspecified.....	105,178	5.2	51.0	45.0

*Standardized for color, sex, and age.

of pneumonia combined accounted for more than three out of every four deaths in this group of diseases. Deaths from influenza were responsible for 22.7 percent of the deaths in the group during the 15-year period. Moreover, as can be seen from the table, each of these diseases was far from being a negligible item in the total mortality.

Mortality by Age, Sex, and Color

While, as has already been indicated, the group of diseases here considered is somewhat heterogeneous, they have sufficient points in common to justify at least a brief consideration of the incidence of their mortality by age, sex, and color, for the group as a whole. The data for the period 1911 to 1915 and for the recent quinquennium 1931 to 1935, appear in Table 2; the figures for the recent period are presented graphically in Chart I.

Age An inspection of Table 2 shows clearly that the death rates from this group of diseases rise to their highest levels at the two extremes of life, and especially at the older ages. The minimum mortality occurs in the age group 10 to 14 years. Among white males, for example, the average death rate in the years 1931 to 1935 was 105.4 per 100,000 at ages 1 to 4, dropped sharply to 12.1 at 10 to 14, and then rose to a maximum of 433.8 at 65 to 74 years.

The experience here analyzed does not enable us to follow the

TABLE 2
INFLUENZA AND PNEUMONIA
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Department, 1931 to 1935 and 1911 to 1915

AGE PERIOD YEARS	DEATH RATES PER 100,000										PERCENT CHANGE 1931-1935 SINCE 1911-1915			
	WHITE					COLORED					WHITE		COLORED	
	MALES		FEMALES			MALES		FEMALES			Males	Females	Males	Females
	1931 to 1935	1911 to 1915	1931 to 1935	1911 to 1915		1931 to 1935	1911 to 1915	1931 to 1935	1911 to 1915					
1 to 74*	78.3	140.4	54.5	104.2		153.0	222.2	116.2	182.7		-44.2	-47.7	-31.1	-36.4
1 to 4	105.4	241.4	92.6	228.0		201.0	548.7	181.7	520.1		-56.3	-59.4	-63.4	-65.1
5 to 9	20.3	29.0	18.6	29.5		32.1	56.1	28.3	70.7		-30.0	-36.9	-42.8	-60.0
10 to 14	12.1	13.3	12.2	15.6		27.3	33.5	23.0	45.4		-9.0	-21.8	-18.5	-49.3
15 to 19	19.4	25.6	15.4	20.4		61.7	74.2	50.1	77.0		-24.2	-24.5	-16.8	-34.9
20 to 24	22.4	35.7	18.6	24.7		69.8	113.9	66.1	84.8		-37.3	-24.7	-38.7	-22.1
25 to 34	39.4	78.5	30.3	38.3		122.7	142.8	83.6	81.3		-49.8	-20.9	-14.1	+ 2.8
35 to 44	86.1	153.0	44.9	65.1		179.9	210.4	111.1	118.8		-43.7	-31.0	-14.5	- 6.5
45 to 54	140.2	238.0	67.4	127.9		274.0	310.6	168.5	201.4		-41.1	-47.3	-11.8	-16.3
55 to 64	244.1	409.3	153.3	315.6		379.9	520.6	283.5	427.7		-40.4	-51.4	-27.0	-33.7
65 to 74	433.8	780.0	362.8	791.0		633.1	881.9	591.5	902.2		-44.4	-54.1	-28.2	-34.4

*Standardized for age.

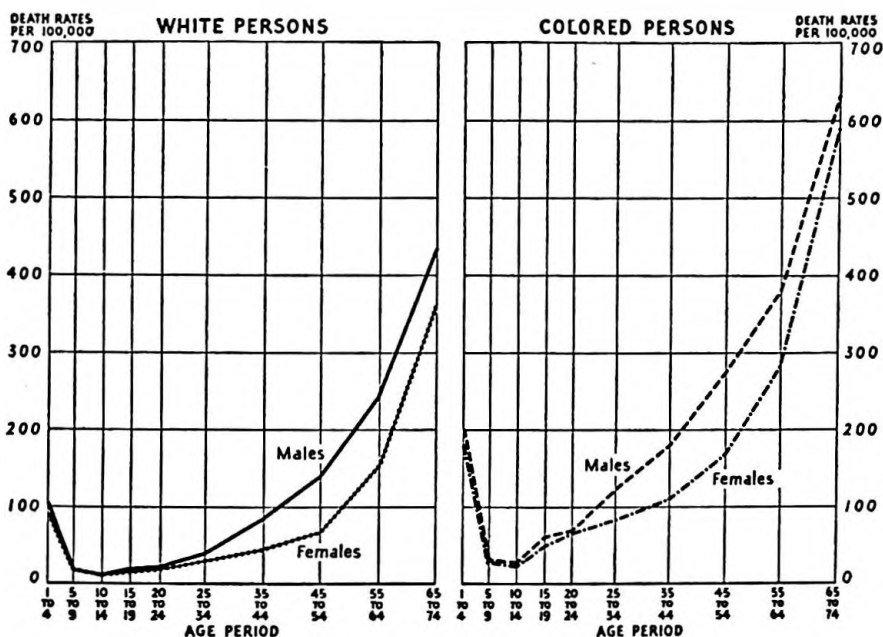
CHART I

INFLUENZA AND PNEUMONIA

Averages of Annual Death Rates per 100,000

By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935



age incidence into the two extremes of life. Analysis of the mortality records for the general population of the United States fills in the picture, showing very clearly that the vulnerability of the very young and the very old finds expression in high mortalities from this group of diseases among infants under one and among aged persons 75 and over, the figures rising to the highest levels at these two extremes of age.

Sex The mortality is by no means equal for the two sexes. The excess of the male over the female death rate, at ages 1 to 74 combined, amounted to 44 percent among white persons and 32 percent among the colored in the five-year period 1931 to 1935. Moreover, at virtually every period of life the males have a higher death rate than the females, with an excess running from 9 percent at ages 5 to 9, to well over 100 percent at ages 45 to 54 among white persons. The age group 10 to 14 is exceptional in that at this period of life there is practically no difference in the age incidence of the two sexes. Among the colored, likewise, an excess of the male over the female death rate is observed,

though the ratios at the several ages differ somewhat from those among white persons. The very high excess of the male over the female death rate at ages 35 to 54, where it amounts to practically 100 percent, is at least in part related to occupational exposure of the male. This topic will be discussed somewhat in detail in a later section. That the difference is not altogether an occupational characteristic is shown to be extremely probable by the fact that even in the age group 1 to 4 years there is a 14 percent excess of the male death rate over the female, among white persons.

Color The death rate among colored persons is about twice that for whites. The maximum excess of the colored over the white rate occurs at ages 15 to 34, at which age period it is over 200 percent.

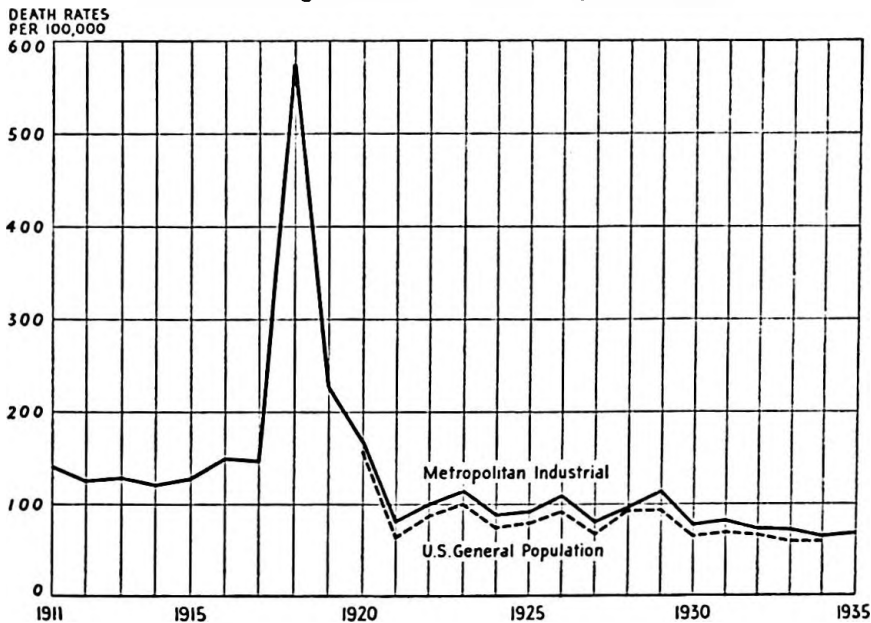
The excess mortality from these causes among colored persons, as measured by the figures cited, is so great that there can be no doubt about its representing a real difference, even though some allowance must be made for less precise certification of the cause of death among the colored. It is not improbable that many cases of terminal pneumonia, which among white persons would have been more accurately classified under the primary cause, in the case of colored persons have been ascribed to pneumonia.

Trend of Mortality

The mortality curve for influenza and pneumonia exhibits three distinct phases in the 25-year period 1911 to 1935. In the years before the pandemic, 1911 to 1917, the trend of the death rate was neither markedly upward nor downward. The second phase covers the years 1918 to 1921, during which the curve rose abruptly to a towering maximum in 1918 and then descended almost as rapidly to a point in 1921 definitely lower than the prepandemic level. This episode in the history of these diseases is treated somewhat in detail in a later section of this chapter. The final phase of the experience embraces the 15-year period from 1921 to 1935 which, like the first period, shows no definite upward or downward trend, although it is true that the death rates in the closing years of the series were the lowest in the entire 25-year period. These facts are graphically illustrated in Chart II; the standardized annual death rates appear in Appendix Table C. The chart shows likewise that there is no essential difference in the trends for the general population of the United States and for these Industrial policyholders.

CHART II
INFLUENZA AND PNEUMONIA
Standardized Annual Death Rates per 100,000
Total Persons. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935
 and U. S. Registration States of 1920, 1920 to 1934



Each of the four color-sex groups shows essentially the same characteristics as the experience as a whole. Mainly as a result of the fact that the descending limb of the epidemic curve was longer than the ascending one, the death rate at the end of the 25-year period was materially lower than that in the initial quinquennium. This is evident from Chart III. The percent decline between 1911 to 1915 and 1931 to 1935 was 44 for white males, 48 for white females, 31 for colored males, and 36 for colored females. Moreover, the mortality from this group of diseases declined at virtually every age period; the greatest percent declines were registered in childhood and at the older ages. The figures appear in Table 2.

The World Pandemic

From the standpoint of the total number of human lives which it destroyed, the world pandemic of influenza in 1918-1919 far overshadowed the World War as the outstanding event in the history of the 25-year period covered by this review.

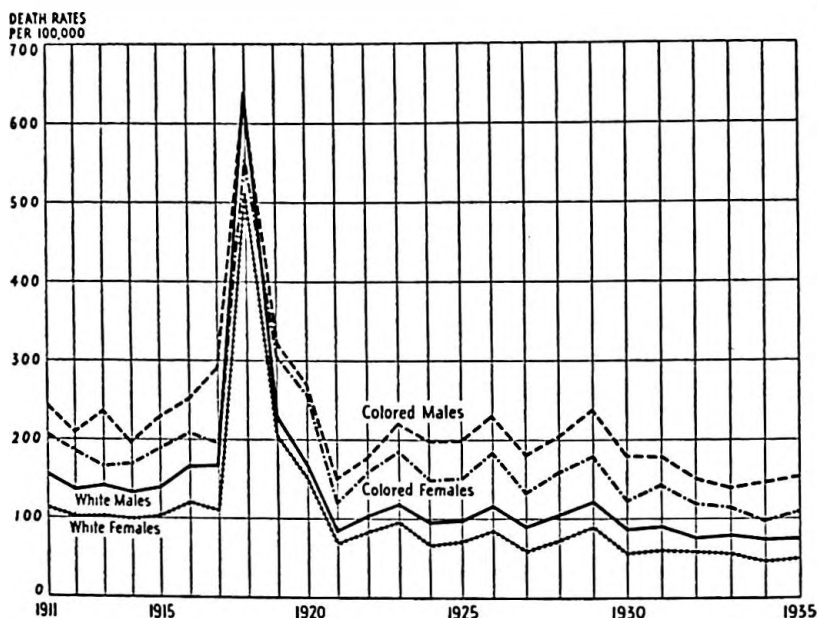
CHART III

INFLUENZA AND PNEUMONIA

Standardized Annual Death Rates per 100,000

By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



The disease was not a new one, nor was this by any means the first time that it occurred in pandemic form. It appears that influenza has been known since 250 B.C. Hippocrates, in fact, speaks of an epidemic in 412 B.C., which many believe to have been influenza. Epidemics, more or less similar to that of 1918-1919, have occurred through the centuries of the Christian Era. Among the more outstanding is that described in the *English Annals* in 1510. During the year 1658 another epidemic occurred in England and still another in 1675. In one respect, at least, this 1675 epidemic resembled that of 1918, for Sydenham spoke of the high mortality of influenza among pregnant women as one of its noteworthy characteristics. There is a record of a major outbreak in Dublin in 1693; and in describing it one authority called attention to the fact that (as was also the case in 1918-1919) old people were not affected to any great extent. Other widespread epidemics, concerning which the records are more or less reliable, include a very persistent one in 1732, which spread from Germany to Italy and thence to England; another in 1742 and 1743, which affected all Europe; and others in 1758, 1762 (again, all over

Europe), 1766, 1775, 1780 (when the disease appeared in France and subsequently throughout the world); one in 1782 which started in Russia and extended to Denmark, England, France, Italy, Spain, Portugal, and then to America. Edward Gray, in describing this epidemic definitely gave the opinion that influenza was a contagious disease and that there were "carriers" of the disease.

In 1789 and 1790 there was a major epidemic in America and President Washington was among those who were ill. More or less severe outbreaks occurred in Europe in 1799, 1802-1803, 1831, 1836-1837, 1846-1847, 1857-1858, and 1860, together with a series of outbreaks extending from 1870 to 1875.

In the great epidemic which started in 1889, the highest death rate was among children and old people, and deaths were more frequent among males than among females. This outbreak, like that of 1918-1919, was probably world-wide, and one author estimated that 40 percent of the world's population was affected.

During the pandemic of 1918-1919 it is conservatively estimated that the world toll of influenza and its complications was from 6,000,000 to 10,000,000 lives. Even the higher figure would seem to be too small, inasmuch as it has also been estimated that about 6,000,000 persons died in India alone from influenza. At any rate, it is certain that the pandemic was the cause of more deaths in a few months than were all the military operations of the World War in over four years.

The Epidemic of 1918-1919 in the United States

In the United States alone deaths from influenza and its complications in the 1918-1919 epidemic have been estimated to number between 450,000 and 600,000. The actual total cannot be ascertained even for that part of the United States then comprised within the Registration Area for Deaths, as pneumonia uncomplicated by influenza took its usual large death toll during the fall and winter months of the epidemic period. It may accordingly be assumed that a sizable percentum of the deaths charged to pneumonia were not of influenzal origin. On the other hand, there were undoubtedly thousands of instances in which influenza was actually the principal cause of death, but which were allocated in the mortality statistics to other diseases. When due allowance is made for all of these conditioning factors, it can be safely estimated that there were well over 500,000 deaths from influenza

and its complications in the United States during the first phase of the world pandemic.

The 1918 epidemic first appeared in the United States in the port of Boston during the first week of September of that year. The disease spread rapidly through the country from its Boston focus. The most stringent quarantine measures were of little avail in checking the epidemic, although they did keep it within reasonable bounds of control in certain instances, two Pittsburgh military camps being notable examples. The epidemic, in fact, followed the general direction of those that had preceded it, that is, from east to west along the main lines of transportation. Even before the end of September virtually the entire country was affected.

There were two distinct phases of the epidemic in the United States. The first began in the late summer of 1918 and extended well into 1919; the second was a recrudescence which developed late in 1919, reached its peak in January 1920 and subsided in the late spring of that year.

It is, however, with the first or major phase, and more particularly with the peak months, September to December 1918, that students of the epidemiology of influenza are chiefly concerned; for the influenza that then prevailed was of far greater infectivity and virulence than that observed not only during the 1920 recrudescence, but in all previous and subsequent epidemics of influenza of which there is any record. Furthermore, the age distribution of the deaths was strikingly different from prior or subsequent influenza outbreaks. The higher age groups (55 years and over) which had contributed the great majority of the deaths in influenza outbreaks prior to 1918, suffered relatively slight increases. Another striking characteristic of the pandemic was the grave danger to pregnant women of the type of influenza that prevailed, a characteristic that was not present in most previous outbreaks, although it had been noted in one or two of them.

Excess of Pandemic Mortality Above Normal

Prior to 1918 the highest standardized death rate from influenza and pneumonia among the Industrial policyholders of the Metropolitan Life Insurance Company, both sexes and ages 1 to 74 years combined, was 149.8 per 100,000—recorded in 1916—and the average annual rate for seven years, 1911 to 1917, was 134.1. The death rate increased in 1918 to 575.0 per 100,000, that is, to substantially 4.3 times the average for the preceding seven-year period.

The contrast, of course, is much more pronounced if instead of establishing comparison for the year as a whole a comparison is made for the months most heavily struck by the epidemic and the period immediately preceding the outbreak. Table 3 shows the death rates per 100,000 years of life by months and by quarters from October 1918 to June 1919 with the data for the "norm" period October 1917 to September 1918. The magnitude of the epidemic is here very apparent, the death rate for influenza and pneumonia in the quarter ended with December 1918 expressed on an annual basis, being 1747 per 100,000 or 11.5 times the rate of 152 registered in the "norm" period.

Excess Mortality Over Average by Age, Sex, and Color

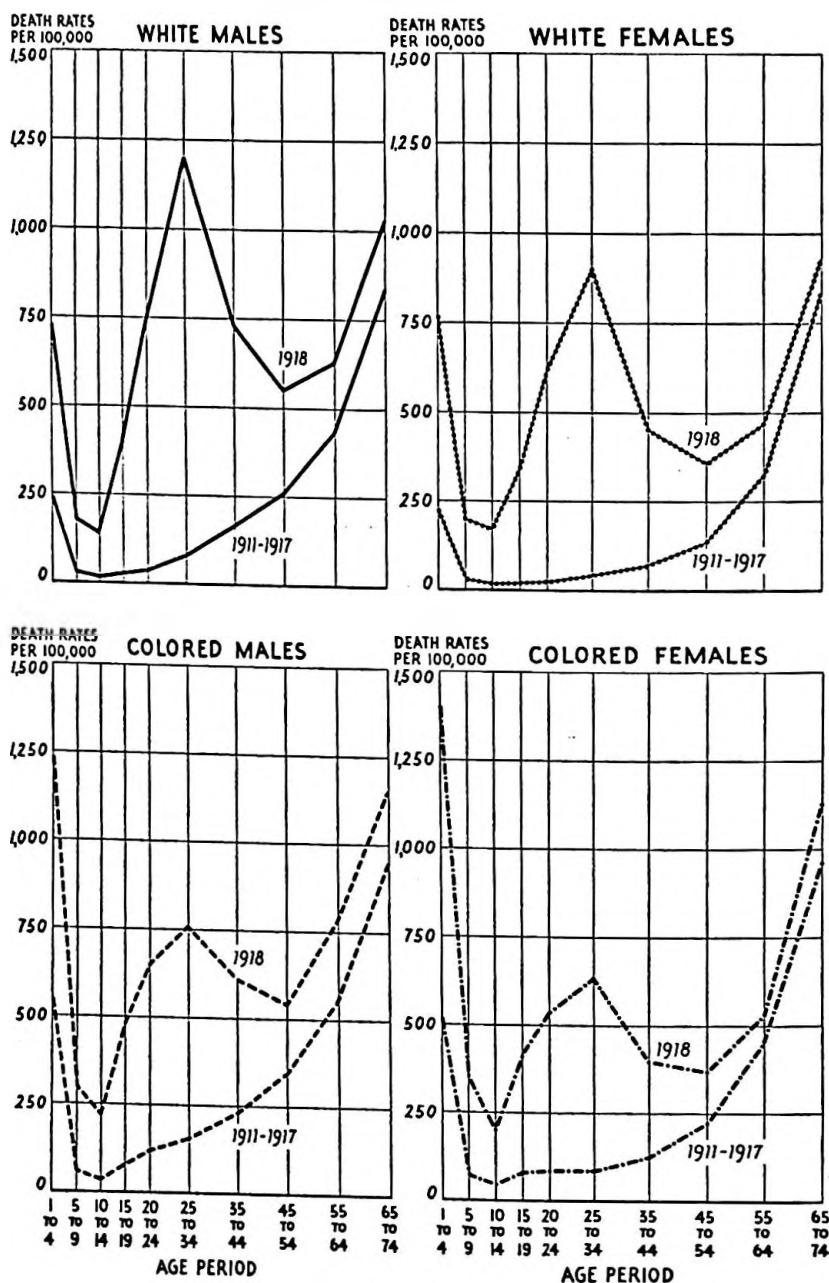
The age incidence of the mortality during the pandemic was highly atypical, as is seen at a glance in Chart IV. In this set

TABLE 3
INFLUENZA AND PNEUMONIA
Death Rate per 100,000 Years of Life in Each Month
and by Quarters, October 1918 to June 1919
By Color and Sex. All Ages

Metropolitan Life Insurance Company, Industrial Department

CALENDAR PERIOD	DEATH RATE PER 100,000 YEARS OF LIFE				
	TOTAL PERSONS	WHITE		COLORED	
		Males	Females	Males	Females
October 1918 to June 1919	774	789	763	767	767
By months:					
October.....	3,395	3,674	3,325	2,816	2,664
November.....	1,035	1,091	1,010	944	945
December.....	810	768	833	807	902
January.....	662	607	672	741	869
February.....	387	354	382	515	517
March.....	362	325	358	528	488
April.....	167	160	169	288	297
May.....	104	97	89	204	182
June.....	31	29	28	60	42
By quarters:					
October to December.	1,747	1,844	1,723	1,522	1,504
January to March....	470	428	471	594	625
April to June.....	105	95	95	184	174
"Norm" period:					
October 1917 to September 1918.....	152	164	116	316	215

CHART IV
INFLUENZA AND PNEUMONIA
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years
 Metropolitan Life Insurance Company, Industrial Department
 1918, and 1911 to 1917



of charts the age incidence during the year 1918 is exhibited side by side with what may be termed the normal age incidence represented by the average experience over the years 1911 to 1917. For each color and sex group the outstanding feature peculiar to the curve of age distribution of the epidemic mortality is a strongly marked peak in the age group 25 to 34. This peak at the central age group, superimposed upon the U-shaped distribution of the normal age incidence, produces for the epidemic a curve more like a W. The two troughs of the W fall at the age groups 10 to 14 and 45 to 54, respectively, in each color and sex group. At the youngest and oldest ages included in the chart, both during the epidemic and at ordinary times, the age incidence rises to high levels.

The peak at the central age groups during the epidemic is a phenomenon peculiar to that period. Some minor epidemics which have occurred since have followed essentially the age distribution of normal times, except that the entire curve of incidence was raised above the average.

As might be expected from the peculiar age incidence, the excess mortality during the epidemic was very unevenly distributed over the various color, sex, and age groups. The pertinent facts are clearly brought out in the first two panels of Table 4, in which a comparison is shown between the death rates from influenza and pneumonia in 1918 and the corresponding average death rate in the period 1911 to 1917. It is particularly instructive in this table to examine the figures in the last two columns, which show the ratio (expressed in percent) of the death rates in 1918 to those of 1911 to 1917. Among white males at all ages from 1 to 74 this ratio is 433 percent, the corresponding figure for females being 476 percent. But this figure for all ages is the resultant of widely varying individual figures at the several ages of life. The glaringly outstanding fact is that from ages 15 to 34 the ratio rises to very high figures, with maxima of 1985 percent for white males and 2479 percent for white females at ages 20 to 24. The data are shown in graphic form in Chart V.

Among colored persons also the mortality in 1918 rises far above the average of the preceding essentially normal years, but the excess is not nearly as great as in the case of white persons. For the age group 1 to 74, as a whole, the excess among colored males is 266 percent, among colored females 294 percent, and at no age group does the excess among males rise much above 600 percent, and among females much over 750 percent.

TABLE 4
INFLUENZA AND PNEUMONIA

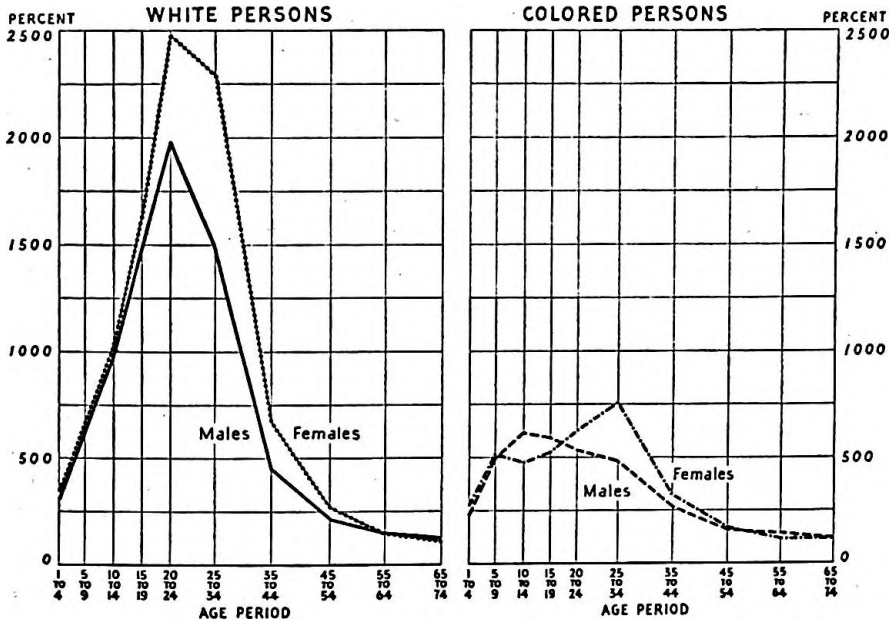
Death Rates for 1918 and 1911 to 1917 Compared
By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Department

AGE PERIOD YEARS	MALES		FEMALES		PERCENTAGE: 1918 OF 1911-1917 RATE	
	1918	1911-1917	1918	1911-1917	Males	Females
DEATH RATES PER 100,000 AMONG WHITES					WHITE	
1 to 74*.....	640.1	147.9	511.5	107.4	433	476
1 to 4.....	732.2	239.2	768.2	225.2	306	341
5 to 9.....	180.2	29.0	197.7	29.4	621	672
10 to 14.....	137.7	14.2	170.0	16.6	970	1,024
15 to 19.....	403.7	27.2	336.4	20.7	1,484	1,625
20 to 24.....	746.2	37.6	619.7	25.0	1,985	2,479
25 to 34.....	1,199.8	80.1	899.4	39.3	1,498	2,289
35 to 44.....	731.8	163.8	452.8	67.9	447	667
45 to 54.....	551.0	260.5	357.4	133.8	212	267
55 to 64.....	630.4	435.4	467.0	327.3	145	143
65 to 74.....	1,027.2	835.7	931.2	836.4	123	111
DEATH RATES PER 100,000 AMONG COLORED					COLORED	
1 to 74*.....	628.9	236.3	552.5	188.2	266	294
1 to 4.....	1,234.0	546.8	1,401.1	514.4	226	272
5 to 9.....	294.9	59.3	366.3	71.2	497	514
10 to 14.....	217.0	35.2	200.8	42.1	616	477
15 to 19.....	477.5	80.4	415.6	79.5	594	523
20 to 24.....	648.4	121.5	534.7	85.3	534	627
25 to 34.....	758.0	157.3	634.9	83.9	482	757
35 to 44.....	612.9	230.0	398.2	124.0	266	321
45 to 54.....	540.8	342.7	369.1	218.5	158	169
55 to 64.....	783.5	555.5	528.7	447.7	141	118
65 to 74.....	1,148.0	946.9	1,127.1	963.0	121	117
PERCENTAGE COLORED OF WHITE DEATH RATES						
1 to 74*.....	98	160	108	175		
1 to 4.....	169	229	182	228		
5 to 9.....	164	204	185	242		
10 to 14.....	158	248	118	254		
15 to 19.....	118	296	124	384		
20 to 24.....	87	323	86	341		
25 to 34.....	63	196	71	213		
35 to 44.....	84	140	88	183		
45 to 54.....	98	132	103	163		
55 to 64.....	124	128	113	137		
65 to 74.....	112	113	121	115		

*Standardized for age.

CHART V
INFLUENZA AND PNEUMONIA
 Percentage 1918 of 1911 to 1917 Death Rate
 By Color, Sex, and Age. Ages 1 to 74 Years
 Metropolitan Life Insurance Company, Industrial Department



The third panel of Table 4 presents a comparison of the ratio which the colored mortality rate from influenza and pneumonia constituted of the white mortality rate, in the pre-pandemic period, 1911 to 1917, and in the peak pandemic year, 1918, by sex and age.

The table shows that the effect of the pandemic was to reduce materially the ratio of the colored to the white mortality. Attention is directed in particular to the age ranges between 20 and 55 years among males, and 20 and 45 years among females, where the death rate for colored persons in 1918 actually dropped below that of the white, as compared with the heavy excess for the colored prior to the pandemic year.

The age incidence and other characteristics of the mortality during the pandemic were so markedly different from those ordinarily observed in influenza, that one suspects, in the pandemic, a distinct disease entity. Some authorities have suggested that the peculiar nature of the pandemic was due not to influenza itself but rather to secondary invaders, such as certain bacterial organ-

isms, notably some of the streptococci, to which there may have been some immunity, either natural or acquired, in older persons.

Effect of Pandemic on Mortality Rate from All Causes Combined in 1918

The standardized death rate, in the year 1918, from all causes combined, among Metropolitan Industrial policyholders at ages 1 to 74 years, was 16.7 per 1,000, as compared with the average of 12.7 for the seven years immediately preceding—an excess of 31 percent. The largest excess among the four color-sex groups was 33.5 percent for white females, followed by 31.7 percent for white males, 20.9 percent for colored females, and 20.3 percent for colored males. These figures repeat in another way our previous observation that the pandemic raised the mortality among white persons more than it did that among Negroes, and that the increase was greater among females than among males.

However, this excess mortality from all causes combined did not extend to all ages. In fact, in each of the three age groups 45 to 54, 55 to 64, and 65 to 74 the death rate in 1918 was actually lower than or much the same as the prepandemic average. This is a remarkable fact, for, as was seen in Table 4, the death rate from influenza and pneumonia did rise considerably in 1918 even at these later ages. It follows that the death rate from some other causes, as recorded, must have been below average at these ages in 1918. A partial explanation of these facts is found in the reflection that chronic sufferers from degenerative diseases were no doubt specially vulnerable to attacks of influenza and pneumonia, and were carried off by the epidemic, their deaths being in many cases reported (rightly or wrongly) as due to the acute disease. But this explanation is inadequate, for it would not account for the death rate from all causes combined actually falling below the average at the age at which the chronic degenerative diseases are prevalent. This is an unexplained phenomenon which shows itself in even more significant form when the course of events in the years following the pandemic is studied.

Effect of Pandemic on 1918 Puerperal Mortality

A direct indication of the effect of the influenza pandemic on the mortality arising from pregnancy and childbirth is afforded by comparison of the 1918 death rates from diseases of the puerperal state with the average for the period of seven years immediately preceding 1918.

Among white females of childbearing age, that is, 15 to 44 years, the puerperal death rate rose in 1918 to the peak figure of the 25-year period under study, namely, 100.2 per 100,000, which marked a rise of 49 percent over the prepandemic mean. The 1918 puerperal death rate among colored females of childbearing age was also at its high point (99.4 per 100,000), but the rise over the prepandemic average was only 20 percent. In the entire series of 25 years, 1918 is the single instance in which the death rate from puerperal diseases among insured white women of childbearing age exceeded that among Negro women of the same age range. In other words, the adverse effect of the influenza pandemic was greater upon pregnant and parturient white women than upon Negro women.

A remarkable fact about this increase is that it arose not through increase in deaths from the most important puerperal causes—these actually showed decreases—but from a numerically less important group.

It was the mortality reported from "abortion," "miscarriage," and "premature birth" (the so-called "accidents of pregnancy") that was increased most by the pandemic, although deaths, largely "at term," reported as due to "childbirth," "labor," and "parturition" (which come under the general head of "accidents of labor") also occurred in 1918 at a higher rate than for any year before or since this pandemic year. Among white females, ages 15 to 44, the death rate in 1918 for both groups of diseases substantially tripled the prepandemic average among white women and doubled the average among Negro women.

On the other hand, the 1918 world pandemic did *not* raise the mortality from puerperal septicemia, and puerperal albuminuria and convulsions, which diseases, taken together, both before and since the pandemic, were responsible every year for approximately two thirds of the mortality from all diseases of the puerperal state combined. In 1918 the puerperal septicemia death rate among white females dropped to one of the lowest points recorded up to that year. At ages 15 to 44 years, it was only 25.5 per 100,000 in 1918, as compared with an average of 28.0 for the seven years 1911 to 1917. The death rate from puerperal albuminuria and convulsions for white women, in 1918, was only 16.8 per 100,000, as against the average of 18.2 for 1911 to 1917. Among colored females at these ages the 1918 puerperal septicemia mortality rate was also lower than the prepandemic average, but the difference was by no means as pronounced as for white women. Among

Negro females, however, the pandemic does appear to have raised somewhat the death rate from puerperal albuminuria and convulsions.

Aftereffects of the Influenza Pandemic on the Subsequent Death Rate from Certain Causes

In the years immediately following the pandemic there was observed a drastic decline in the death rate in practically every age group from certain degenerative and infectious diseases. Even in 1919, which included the closing months of the first phase of the pandemic, there were recorded pronounced declines from the preceding year in the mortality from all causes combined (32 percent), from tuberculosis (18 percent), heart disease (20 percent), chronic nephritis (16 percent), and cerebral hemorrhage (7 percent).

It is true that important factors, aside from the violent upheaval caused by influenza, have operated to bring about changes in the death rates from these diseases since 1918, as set forth in detail in special chapters relating to each disease. Nevertheless, some light on the effect of the pandemic on the subsequent mortality from these four chronic conditions is afforded by comparing the average mortality rate for each for a period prior to the peak

TABLE 5
DECLINE IN DEATH RATE FROM SPECIFIED DISEASES
From the Period 1911-1917 to the Period 1919-1925
Total Persons. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Department

CAUSE OF DEATH	AVERAGE ANNUAL DEATH RATES PER 100,000*				PERCENT DECLINE	
	1911-1917	1919-1925	1918	1919	1919-1925 Since 1911-1917	1919 Since 1918
ALL CAUSES OF DEATH	1,274.4	971.5	1,670.5	1,133.8	23.8	32.1
Tuberculosis —all forms.	218.0	124.7	201.5	165.3	42.8	18.0
Organic heart disease	154.7	130.6	156.5	124.9	15.6	20.2
Chronic nephritis . . .	110.5	77.7	98.2	83.0	29.7	15.5
Cerebral hemorrhage	80.7	68.5	75.0	69.8	15.1	6.9

*Standardized for color, sex, and age.

year of the pandemic with the average for a period of equal duration immediately following the pandemic. Such a comparison shows that the average tuberculosis death rate for the seven-year period 1911 to 1917 was 218.0 per 100,000, whereas the average for the seven years 1919 to 1925 was only 124.7 per 100,000, a drop of 43 percent. The corresponding decreases for organic heart disease, chronic nephritis, and cerebral hemorrhage were 16 percent, 30 percent, and 15 percent, respectively.

Table 5 shows the average death rates for all causes combined and for these four chronic diseases, for the two seven-year periods, and for the years 1918 and 1919, together with the corresponding percent declines.

The reason for the general and drastic decline in the death rate from these important causes, in the wake of the influenza epidemic, is not clear. There is one seemingly obvious explanation, which, however, is not borne out by the facts. It has often been supposed that this decline in death rates was merely a result of the wiping out by the epidemic, in one fell swoop, of a large number of physically impaired persons, *i.e.*, those with chronic ailments, such as heart disease or nephritis. In other words, according to this explanation, deaths were merely hastened which, but for the pandemic, would have been spread out over a period of years. This supposition, except possibly as it relates to the younger ages, is not in harmony with the facts regarding the death rates from all causes combined and from influenza and pneumonia during the pandemic year. For (1) the death rate from all causes at the older ages did not increase in 1918 as it would have done if there had been a weeding-out process of impaired persons at these ages; (2) the pandemic was notable for its high prevalence among younger people whose fate is not relevant to a discussion of the happenings as regards degenerative diseases characteristic of later life. Furthermore, the view that the pandemic was selective in its action against physically inferior persons is contradicted by the fact that there was high fatality among vigorous young men.³

The sweeping postpandemic decline in the death rate from degenerative diseases must have been due, therefore, to causes other than the seemingly obvious one suggested, causes nevertheless related in some way to the pandemic. It is possible that this

³In some degree the high mortality of the younger men may have been attributable to greater frequency of contact or exposure. At the time, great numbers of young men were gathered in training camps in which crowding was not uncommon; young women also, in far larger than normal numbers, were at work in factories. But this factor of differential exposure can hardly explain the differences in age incidence, for among older persons males, as well as females, had relatively low death rates from influenza.

reduction in the death rate at the older ages was due to a lower incidence, after 1918, of those intercurrent infections, which so often hasten the death of older persons afflicted with chronic degenerative diseases. It must be admitted that this explanation is entirely hypothetical, and no clinical evidence to support it is available. An alteration of the bacteriological or immunological picture may have played a part. It is possible that the infections were less virulent in nature during the years following the pandemic than in the years preceding it, or that the population had better resistance to infection, or both. It is also conceivable, though not very likely, that actuated by the cautious habits acquired during the pandemic, people continued for some time to observe measures emphasized during the pandemic (such as avoiding of crowds), with the result that the transmission of infection was reduced.

Occupation in Relation to Influenza and Pneumonia

Occupation has a very definite influence on the chances of death from influenza and pneumonia. Occupation largely determines income and hence the general conditions of life. Certain groups of workers may, on this account alone, be more susceptible to pneumonia infection than their more fortunate fellows. In point of fact, the relationship between low income and a high incidence of pneumonia is quite well established by a number of American and English investigators.⁴ Table 6, compiled from Miss Whitney's

TABLE 6
STANDARDIZED DEATH RATES FROM PNEUMONIA PER
100,000 GAINFULLY OCCUPIED MALES
Ages 15 to 64 in 10 States in 1930. By Occupation Classes*

OCCUPATION CLASS	DEATH RATE PER 100,000
All gainfully occupied males in selected occupations.....	69.3
Professional men.....	38.8
Agricultural workers.....	43.4
Clerks and kindred workers.....	50.5
Proprietors, managers, and officials.....	53.0
Skilled workers and foremen.....	59.7
Semiskilled workers.....	71.6
Unskilled workers.....	135.9

*Compiled from Table 8 in *Death Rates by Occupation* by Jessamine S. Whitney, Statistician, National Tuberculosis Association, June 1934.

⁴A similar relation between economic status and mortality was found to prevail in the influenza-pneumonia epidemic of 1918-1919, as reported by several investigators, in particular, J. D. CRAIG and L. I. DUBLIN, "The Influenza Epidemic of 1918," *Transactions of the Actuarial Society of America*, vol. 20, p. 134; and E. SYDENSTRICKER, "The Incidence of Influenza Among Persons of Different Economic Status During the Epidemic of 1918," *U. S. Public Health Report*, January 23, 1931.

study, *Death Rates by Occupation*, based on data of the United States Census Bureau, 1930, shows the tendency for the pneumonia death rate to rise as we go down the occupational scale, from officials, etc., to the skilled, the semiskilled, and to the unskilled workers.

Certain of the items in Table 6 may be considered out of line, so far as mere income status is concerned. That agricultural workers should have a low pneumonia death rate, even though their income as a class is not at all high, will not surprise anyone who is familiar with the fact that rural death rates generally run lower than urban death rates. Similarly it can readily be understood that office workers (clerks and kindred workers) should appear in a favorable position on the list, since they are sheltered from the hazards of industrial labor. Lastly, in explanation of the fact that professional men are at the head of the list, it may be pointed out that for the most part they are relatively favorably situated as regards income, occupational hazards, and intelligence in matters pertaining to health. On the other hand, within a given economic class the pneumonia mortality of the several occupational groups varies materially according to the working conditions associated with particular occupations.

The ill-effects of certain unhealthful working conditions as compared with the influence of occupational class, are also suggested by the fact that the death rates of adult males in the main working period of life, are much higher than those of adult females, as is clearly seen in Table 2. Broadly speaking, men and women policyholders come from the same homes; it is in their occupational exposure that they differ.

Determination of the specific types of hazards associated with a high incidence of pneumonia is unfortunately difficult; owing to the fact that there is no comprehensive analysis of death rates by causes for any considerable number of occupations in the United States. However, an analysis of the proportion of deaths from pneumonia to total deaths from all causes for those policyholders who died during the years 1922 to 1924, points definitely to the causal relationship existing between certain hazards and the high proportion of deaths from this disease. Seventy-four occupational classes were studied.

The harmful effect of industrial environment favoring the development of pneumonia is shown in the abnormally high percentage of deaths from that cause among the iron foundry workers. Pneumonia accounted for 15.9 percent of all deaths among these

workers, while only 7.7 percent of the deaths among all occupied males were attributed to this cause. The percentage of deaths was well above the average at every age of the main working period of life, 15 to 64 years. In the age period 25 to 34, it was over three times the average. The very lowest relative percentage was found in the period 35 to 44 years, and even here it is 86 percent above the average. Not only did iron foundry workers have the highest percentage of deaths from pneumonia of any occupational class, but there were actually more deaths from this cause among them than from any other cause. This was true of no other occupational group included in the investigation.

TABLE 7
PERCENT OF DEATHS FROM PNEUMONIA
Of Deaths from All Causes in Specified Occupations
White Males. Ages 15 Years and Over
Metropolitan Life Insurance Company, Industrial Dept., 1922 to 1924

OCCUPATION OR INDUSTRY	DEATHS (15 YEARS AND OVER)		PERCENT OF DEATHS FROM PNEUMONIA		STANDARD- IZED RATIO*
	All Causes	Pneumonia	Crude for Ages 15 Years and Over	Standard- ized for Ages 15-64 Years	
ALL OCCUPATIONS COMBINED.....	105,467	8,138	7.7	8.0	100.0
Iron and steel molders and foundry workers.....	1,234	196	15.9	17.6	220.0
Cordage and hemp mill operatives.....	79	9	11.4	14.8	185.0
Polishers, iron and steel products.....	105	12	11.4	14.7	183.8
Coal miners (underground)	1,960	241	12.3	12.0	150.0
Iron and steel mill workers	1,587	167	10.5	11.4	142.5
Rubber factory operatives.	439	45	10.3	10.8	135.0
Hucksters and peddlers...	932	93	10.0	10.6	132.5
Roofers.....	179	20	11.2	10.5	131.3
Longshoremen and steve- dors.....	594	63	10.6	10.4	130.0
Brick, tile, and terra-cotta workers.....	199	18	9.0	10.2	127.5
Boiler makers.....	367	32	8.7	9.9	123.8
Glass workers.....	323	31	9.6	9.6	120.0
Laborers.....	10,240	934	9.1	9.6	120.0
Blacksmiths.....	876	75	8.6	9.6	120.0
Miners (underground, except coal).....	225	20	8.9	9.4	117.5

*The percentage of deaths (8.0) shown in Column 4 for all occupations combined was taken as 100. The standardized percentage for each occupation divided by 8.0 gives the standardized ratio. For details of standardization see Bulletin 507 of the U. S. Bureau of Labor Statistics, page 18.

Several occupations, in addition to the iron foundry workers, showed percentages of deaths from pneumonia well above the average. Table 7 shows the percentage of deaths from pneumonia in the 15 occupational classes having the highest figures.

Examination of the data in Table 7 indicates that three distinct types of hazards are closely associated with a high percentage of deaths from pneumonia, namely, dust, extreme heat, and sudden variations in temperature or exposure to the weather. The only noteworthy exceptions to these general findings are the low percentages of deaths found for cutlers and grinders, brass foundry workers, and pottery workers, all of whom are exposed to the hazards which in common experience have been found associated with a high percentage of deaths from pneumonia. The number of deaths from all causes for each of these classes was small. Their low percentages may, therefore, be due to chance variation.⁵

Not much is known of the relative mortality from influenza and pneumonia among men engaged in different occupations during the pandemic of 1918. One class—bituminous coal miners—which in normal periods shows a high incidence of pneumonia, apparently suffered very severely in the last quarter of that year. Figures of mortality during the period of the epidemic are available for a total of about 4,700 miners insured in the Group Life and Health Division of the Metropolitan Life Insurance Company. The experience included a considerable number of miners in West Virginia and Pennsylvania.

In all, 64 deaths occurred among these coal miners from either influenza or pneumonia during the three months under investigation. This is equivalent to an annual death rate of 54 per 1,000. In other words, 5 percent of the miners would have died if the influenza epidemic had prevailed with the same severity over the entire year as in the last quarter. Among all occupied males aged 15 years and over, the rate from influenza-pneumonia in the same three months was 22 per 1,000, or less than half as high.

Some evidence has been adduced to show that workers exposed to certain chemicals suffered less from influenza than others during the epidemic, but the data are far from conclusive. The situation is worthy of further investigation. Not only should the incidence of influenza and pneumonia among chemical workers be carefully studied, but researches along the line of that carried out in the iron

⁵Other studies on this subject, leading to essentially similar results are the following: Bulletin 207 of the U. S. Bureau of Labor Statistics; Decennial Report on Occupational Mortality by the Registrar General of England and Wales, 1921-1923; "Frequency of Pneumonia Among Iron and Steel Workers," U. S. Public Health Service, Bulletin 202.

and steel industry by the United States Public Health Service should be made for every important industry. Here is a most promising field for studying the effects of physical conditions as contributory causes of these respiratory diseases.

Geographic Distribution of Pneumonia

The death rates for pneumonia in the general populations of the United States and Canada clearly indicate that there are certain well-defined regions or belts in both countries where the pneumonia mortality rate runs much above the average. This is shown in Chart VI. In this map the States shown in solid black and in "cross-hatch" had pneumonia rates for 1932-1933 which were well above the average for these countries.

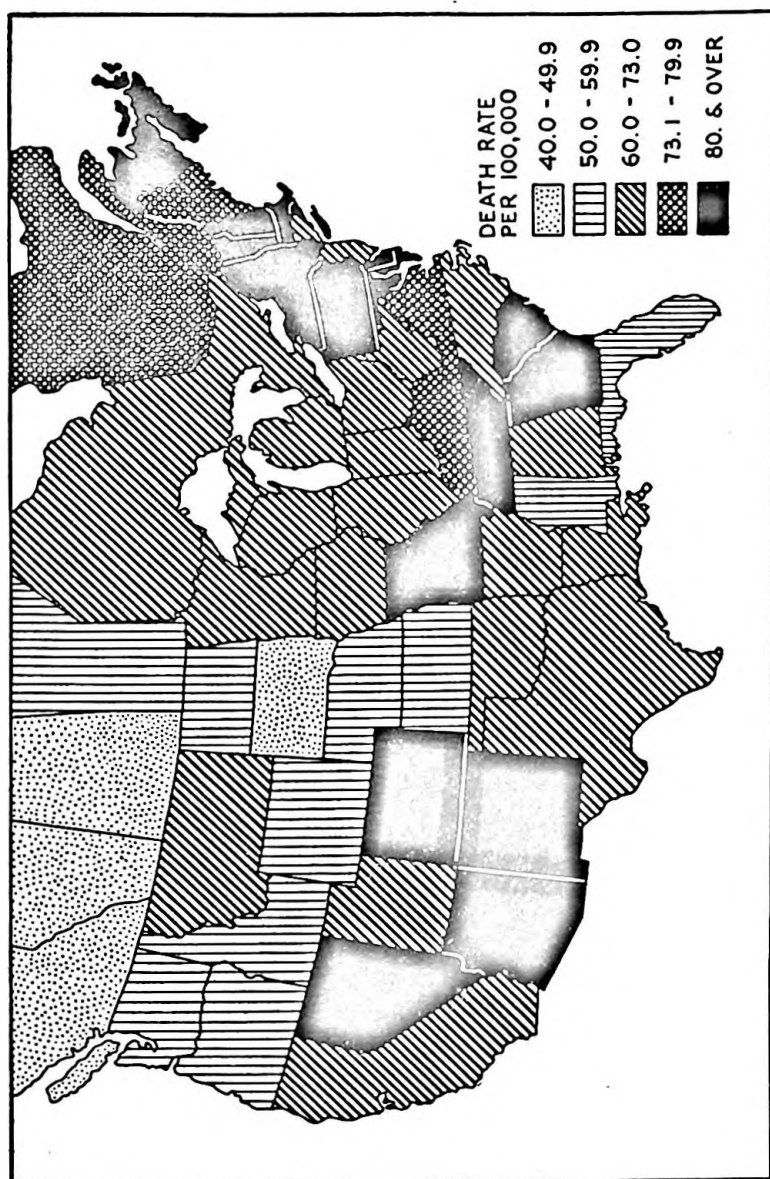
It is at once apparent that there are two clear-cut pneumonia belts. In the East, beginning with the Canadian Provinces of Quebec, Prince Edward Island, Nova Scotia, and New Brunswick, and continuing down the Atlantic Coast to Florida, every State with four exceptions (Connecticut, New Jersey, North Carolina, and Florida⁶) has an above-average pneumonia death rate. In this Eastern pneumonia belt we find such excessively high rates as 103 per 100,000 for Delaware, 97 for Maryland, 95 for New Brunswick, 89 for Massachusetts, 88 for New York, 84 for Vermont and Nova Scotia, 82 for Prince Edward Island and New Hampshire, and 81 for Pennsylvania, South Carolina, and Georgia. Included in this same belt are two noncoastal States, Tennessee with a pneumonia rate of 81 per 100,000 and Missouri with 91. This belt also includes Maine, Virginia, and Kentucky, all with pneumonia mortalities well in excess of the average for the United States.

The second pneumonia belt consists of four States in the Mountain Region, and it is interesting to observe that these commonwealths (Colorado, New Mexico, Arizona, and Nevada) are the only States west of Missouri where there is a high pneumonia death rate. It is in these Mountain States that we find the highest pneumonia death rates in the country, the figure for Nevada being 106 per 100,000, that for Arizona 99, and that for both New Mexico and Colorado, 98.

The map brings out the fact that high latitude and cold climate are not necessarily reflected in high mortality from pneumonia; for the very lowest pneumonia rates in either country are found in the Canadian Provinces of Saskatchewan, British Columbia, and Alberta, as well as in South Dakota, which has the lowest

⁶In all of these four, except Florida, the death rate very closely approaches the average.

CHART VI
GEOGRAPHIC DISTRIBUTION OF PNEUMONIA MORTALITY
United States and Canada, 1932-1933



pneumonia rate in the United States. South Dakota lies in the same latitude as New York and New England, where the pneumonia death rate runs very high. And there is the further evidence supplied by the high rates in warm climates like those of South Carolina, Georgia, Arizona, and New Mexico. It is also apparent that a high percentage of Negro population does not necessarily imply a high pneumonia rate for white persons and Negroes combined (although the Negro mortality from this disease is much higher than that among the whites); for, although South Carolina and Georgia have very high pneumonia mortality rates, the figures for Florida and Mississippi, with their large Negro populations, run about one third lower than the average for the country as a whole. It is equally evident that high average humidity does not, in itself, produce high pneumonia mortality. It does appear, however, that the combination of a cold climate and low average humidity operates in favor of a low pneumonia death rate, for this is the condition found in such Canadian Provinces as Alberta and Saskatchewan and in a number of American States where the pneumonia death rate runs consistently low.

It is true that all of the four Mountain States, which form the pneumonia belt in that section, also record, year after year, high death rates from tuberculosis. But high or low death rates from these two diseases do not always go hand in hand. New England, for example, has a high pneumonia death rate combined with a tuberculosis mortality figure that is well below the average. The same is true of Pennsylvania. It is a fact, nevertheless, that 13 of the 19 States which have above-average pneumonia death rates also register more or less excessive figures for tuberculosis. In all probability the pneumonia mortality in Colorado, Arizona, and New Mexico, as well as that from tuberculosis, would be considerably lower if calculations were made on the basis of deaths among permanent white residents alone. The large proportion of Mexican and Indian populations in the States of Arizona and New Mexico also plays some part in accounting for their high death rates from pneumonia.

LOBAR PNEUMONIA

As has been pointed out in an earlier section, the data here analyzed enable us to deal separately with lobar pneumonia, bronchopneumonia, and influenza. In the remaining sections these diseases will accordingly be taken up separately so far as the data permit of such analysis.

Lobar pneumonia, although treated as a disease entity in this chapter, is actually a group of diseases. More than 95 percent of the cases of lobar pneumonia are caused by pneumococci. Up to the present time 32 different types of pneumococci have been isolated, and future discoveries may prove that this list is not complete. However, in from 50 to 60 percent of the cases Type I or Type II pneumococcus is the causative agent; about 10 percent are caused by Type III. The remaining cases are distributed among the other 29 varieties of micro-organisms.

Lobar pneumonia is the deadliest of the numerically important acute diseases, killing about one out of every four who contract the infection. In the United States 58,650 deaths in 1934 were classified under the title "lobar and unspecified pneumonia"; this total does not include the many thousands of deaths charged to other diseases in which lobar pneumonia played a contributory role. Lobar pneumonia, unlike influenza, is not epidemic under usual conditions. The disease is prevalent throughout the year, but its incidence is concentrated in the winter and spring months, at which time the number of deaths from the disease is about five times that in midsummer.

In the 15-year period 1921 to 1935, there were 105,178 deaths among Metropolitan Industrial policyholders, ages 1 to 74, allocated to lobar and unspecified pneumonia.⁷ This total constituted 5.2 percent of the deaths from all causes in this 15-year period, and 51 percent of the deaths from influenza and pneumonia as a group. The standardized annual death rates for the disease averaged 45.0 per 100,000. Lobar pneumonia alone is a leading cause of death, ranking seventh in the list in the years 1921 to 1935.

Mortality by Age, Sex, and Color

The average death rates for lobar pneumonia by age, sex, and color for the 15-year period 1921 to 1935 and separately, for its

⁷Approximately 95 percent of the deaths allocated to "pneumonia, lobar and unspecified" were definitely reported as due to lobar pneumonia. Furthermore, a large part of the remaining 5 percent were undoubtedly cases of true lobar pneumonia.

earliest and latest quinquennia are shown in Table 8. The figures for the recent five-year period, 1931 to 1935, are presented graphically in Chart VII.

Age An inspection of Chart VII shows that the death rate from lobar pneumonia is relatively high at ages 1 to 4, from which point it drops sharply to its minimum at 5 to 9 years among colored persons and 10 to 14 among white persons. Beyond these ages the death rates in each color-sex group rise progressively with advancing age to their maxima at the older ages.

Sex The sex differential in the mortality from lobar pneumonia is more pronounced than that for either bronchial pneumonia or influenza. The death rate for males at ages 1 to 74 combined was $1\frac{2}{3}$ that for females, in the quinquennium 1931 to 1935. The excess of the male over the female death rate obtained at each age period. Even in early childhood we find a definite sex differential in mortality, the male death rate exceeding that for the female by 21 percent among white children and 45 percent among

CHART VII
PNEUMONIA, LOBAR AND UNSPECIFIED
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935

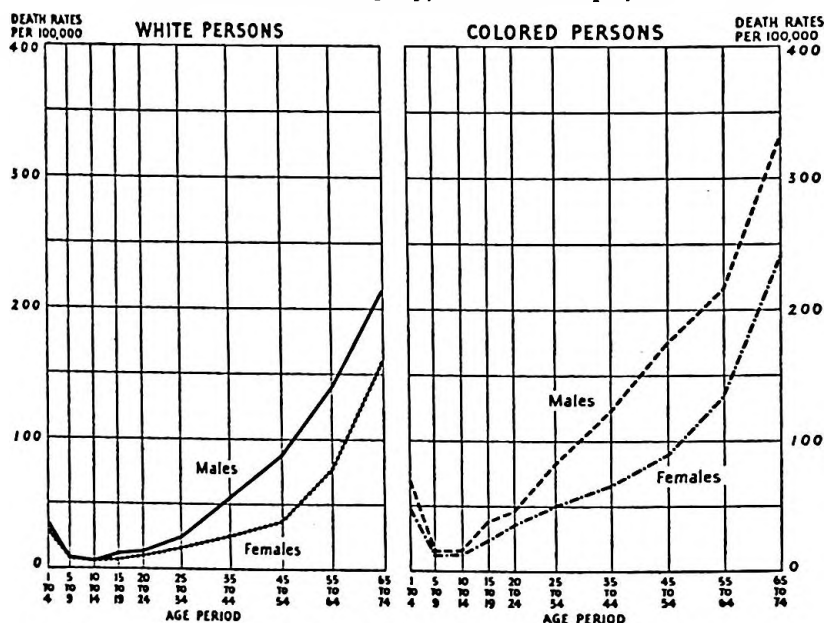


TABLE 8
PNEUMONIA, LOBAR AND UNSPECIFIED
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1921 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000						PERCENT DECLINE 1931-1935 SINCE 1921-1925	
	MALES			FEMALES			Males	Females
	1921 to 1935	1931 to 1935	1921 to 1925	1921 to 1935	1931 to 1935	1921 to 1925		
WHITE								
1 to 74*....	51.3	43.1	55.2	32.1	25.9	37.3	21.9	30.6
1 to 4....	44.8	35.1	52.3	38.5	29.1	47.0	32.9	38.1
5 to 9....	11.1	9.1	12.4	9.4	8.2	10.8	26.6	24.1
10 to 14....	6.8	6.4	7.3	7.6	6.2	8.9	12.3	30.3
15 to 19....	14.7	12.1	17.3	9.1	7.7	10.5	30.1	26.7
20 to 24....	16.9	13.9	18.9	13.0	10.4	15.3	26.5	32.0
25 to 34....	29.5	25.2	32.1	18.7	16.6	20.5	21.5	19.0
35 to 44....	65.0	55.2	68.0	29.4	25.5	32.7	18.8	22.0
45 to 54....	103.8	87.2	107.5	45.2	36.9	50.9	18.9	27.5
55 to 64....	166.7	139.6	176.3	98.5	77.2	113.9	20.8	32.2
65 to 74....	253.2	215.5	275.4	208.1	161.5	253.4	21.8	36.3
COLORED								
1 to 74*....	103.7	89.0	106.8	65.5	54.8	73.1	16.7	25.0
1 to 4....	104.5	69.1	132.9	83.0	47.7	110.1	48.0	56.7
5 to 9....	19.4	14.9	22.4	15.7	12.0	19.9	33.5	39.7
10 to 14....	18.2	16.0	21.8	18.9	12.5	25.4	26.6	50.8
15 to 19....	45.4	38.6	49.0	35.6	23.4	42.2	21.2	44.5
20 to 24....	65.6	46.5	74.8	41.7	35.4	41.8	37.8	15.3
25 to 34....	94.2	82.4	92.9	54.3	50.0	56.0	11.3	10.7
35 to 44....	140.7	122.9	134.5	72.5	65.6	70.6	8.6	7.1
45 to 54....	188.4	174.7	177.7	96.4	89.7	98.1	1.7	8.6
55 to 64....	238.0	216.0	242.3	156.2	134.4	180.1	10.9	25.4
65 to 74....	363.4	329.8	367.2	265.9	240.4	310.1	10.2	22.5

*Standardized for age.

the colored. In the remaining ages of childhood the differences are not so marked. The most pronounced excess is found in the age range 35 to 54 years, where the death rate for males runs from approximately twice to $2\frac{1}{3}$ times that for females. At the upper end of the age scale the mortality for males exceeds that for females by one third.

The higher death rate among males at the main working periods of life is readily explained. First, the mortality from pneumonia is particularly high in various occupations where males alone are employed, and where they are exposed to hazards closely associated with a high incidence of pneumonia. This phase is discussed on pages 138 ff. Second, alcohol is an important predisposing factor; and it is generally recognized that chronic alcoholics, of whom a large majority are males, are particularly susceptible to pneumonia; and, furthermore, that they have a much higher case fatality rate than do other individuals of the same age. Third, there is the important consideration that men, as a class, lead less careful and less sheltered lives than do women; that men are thus subject to higher attack rates of practically all the severe infections and that they are less likely to survive such infections. One need only consult any mortality report showing the deaths from important infectious diseases, by sex, to confirm the fact that there is generally higher mortality incidence among males. Diseases like typhoid fever, influenza, dysentery, erysipelas, tuberculosis, syphilis, and malaria, as well as pneumonia, are good examples of this phenomenon.

The reasons underlying the higher male death rate in childhood and in old age are by no means so clear. Medical literature, in fact, while mentioning the relatively higher mortality among boys, fails to tell, or even to speculate, as to what factors are operative in bringing this about. It is a fact, however, that almost all of the communicable diseases of childhood, year after year, kill more boys than girls. The reason for this as regards lobar pneumonia is just as obscure as it is in the case of diseases like measles, scarlet fever, diphtheria, acute poliomyelitis, and epidemic cerebrospinal meningitis.

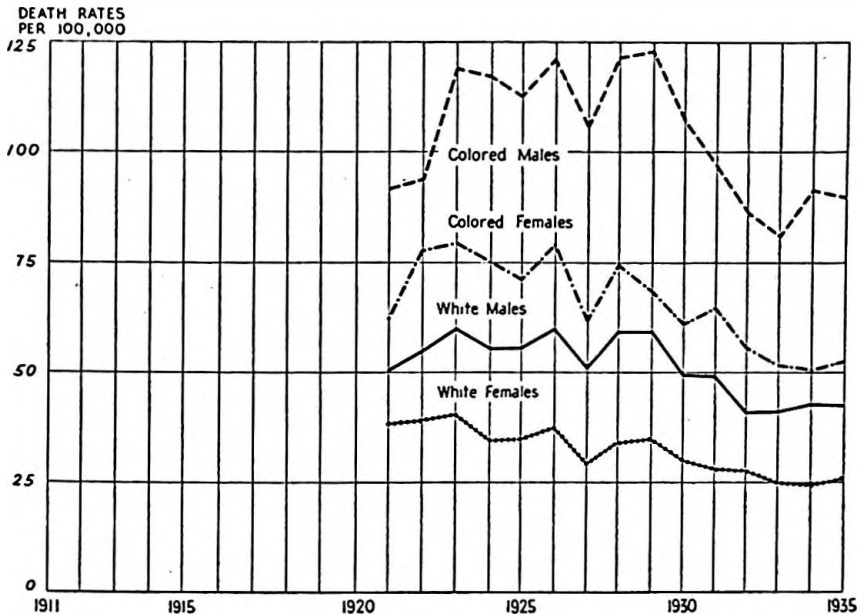
Color The death rate for lobar pneumonia among insured Negroes—both males and females—was more than double that for white persons in the five-year period 1931 to 1935. Moreover, the lobar pneumonia death toll among Negroes far exceeds that among white persons throughout life. The lowest percentage colored mortality of white is 146, and is found for females in the age group 5 to 9 years. Between ages 15 and 35 years the percentages run well over 300.

Trend of Mortality

The death rate from lobar pneumonia registered a pronounced drop between 1921 to 1925 and 1931 to 1935, not only at ages 1 to

CHART VIII
PNEUMONIA, LOBAR AND UNSPECIFIED
Standardized Annual Death Rates per 100,000
By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1921 to 1935



74 combined, but also at every age period. The magnitude of the decline in death rate varied, however, with age. The greatest fall among white persons occurred at ages 1 to 4. The drop in the mortality among Negroes, although substantial, has not kept pace with the decrease among white persons.

The Modern Treatment of Lobar Pneumonia

The great loss of life caused by the influenza-pneumonia pandemic of 1918-1919 gave the impetus for the organization, by the Metropolitan Life Insurance Company in 1919, of a special Influenza-Pneumonia Commission to investigate the cause, modes of dissemination, and epidemiology of this group of diseases. Special regard was paid to the problems of specific immunity and serum treatment. The work of this Commission has contributed substantially to the knowledge and treatment of this disease.

Up to the present time more than 30 different types of pneumococcus have been isolated, but the large majority of the cases of pneumonia have been found to fall into relatively few types, the case fatality varying from type to type, as does also the response

to the specific serum. The pertinent facts are briefly set forth in Table 9. The table shows in the second column the approximate number of cases, out of an estimated total of 200,000, which fall into each of the main categories. The third and fourth columns indicate in round numbers the case fatality of each type among those patients who have not had serum treatment, as compared with those who have. Speaking broadly, it can be said that serum treatment reduces the case fatality by about 50 percent, though the ratio differs somewhat for the types shown in the table. Type III, which does not appear in the table, has so far resisted all efforts to lower the mortality by the use of serum.

The figures shown in the table indicating the effect of the use of the serum are based on cases in which the treatment was applied within four days of onset. Early application of this treatment is of the utmost importance, and somewhat better results even than shown in the table may be obtainable where treatment is applied very promptly. Since in each case the particular type must be determined, the development of the typing technique has been a very important feature in the fight against the disease.

Although the efficacy of treatment depends upon the prompt administration of the specific serum indicated in each case, it is better to give the serum late in the course of the disease than not to administer it at all. Even under optimal conditions of adminis-

TABLE 9
ESTIMATED* DISTRIBUTION OF CASES OF LOBAR
PNEUMONIA BY CERTAIN TYPES
And Case Fatality Rates in These Types With and Without
Serum Treatment

TYPE OF PNEUMONIA	DISTRIBUTION OF CASES†	CASE FATALITY, PERCENT‡	
		Without Serum	With Serum
TOTAL LOBAR PNEUMONIAS	200,000	25	13
I	60,000	30	10
II	30,000	40	20
V	14,000	30	15
VII	10,000	25	10
VIII	16,000	20	10
Others	70,000	15	—

*Total number of cases estimated on basis of 50,000 deaths from lobar pneumonia.

†Based on ratios used by Dr. E. S. ROGERS, New York State Department of Health, in

"The New York State Program for the Control of Pneumococcus Pneumonia," *American Journal of Public Health*, February 1937, page 133.

tration of the serum, one cannot hope to save every patient, as is clear from Table 9. Pneumonia, of whatever type, still remains an extremely dangerous disease, and the battle for its control is clearly a public health problem of the first magnitude.

At the present time serum therapy is our most effective weapon; other methods promising a degree of success are in the process of development, but for the time being, at any rate, they seem to be of secondary importance. According to the best authority, if serum treatment were widely applied throughout the country, the mortality from lobar pneumonia could be reduced one half. It behooves every health organization, therefore, to disseminate as widely as possible knowledge of the advantages which are to be derived from the serum treatment of pneumonia. If this knowledge is to be successfully applied it will be necessary to have adequate laboratory facilities for typing, and to have available a supply of serum which can be given without charge to those unable to pay for the commercial product. In short, as do all other public health problems, the control of pneumonia depends upon the education of the public and the cooperation of the medical profession with all those agencies which are engaged in public health activity. At the present time the Metropolitan Life Insurance Company is engaged in an active campaign to combat the disease by urging early diagnosis, medical and nursing care, professional and lay education, and particularly, in the light of recent scientific advances, sputum typing and specific intravenous serum therapy. To that end the Company is cooperating with State medical societies and health departments and is giving special support to the work of the New York State Bureau of Pneumonia Control. There is every reason to hope and expect that through these concentrated efforts a still further reduction will be effected in the mortality from this dangerous disease.

BRONCHOPNEUMONIA

Bronchopneumonia, like lobar pneumonia, is caused by a variety of organisms, the most common being the pneumococcus. In bronchopneumonia, however, the pneumococci of Types I and II, which account for a majority of the cases of lobar pneumonia, are present only infrequently. In the bronchial form of the disease, Type III pneumococcus and the higher types are the more common. Furthermore, in a sizable proportion of the cases, the causative organism is other than the pneumococcus.

Bronchopneumonia is an important cause of death. In the United States there were 42,000 deaths attributed to this disease in 1934. The disease is also secondary to other infections. In a study made by the Bureau of the Census of deaths reported in 1925, it was found that the reports of bronchopneumonia as a contributory cause were not much less frequent than those in which it was given as the primary cause. One half of the deaths from whooping cough and more than half the deaths from measles were complicated by bronchopneumonia. The totals would be much higher if all of the cases in which bronchopneumonia appeared were so reported.

Among Metropolitan Industrial policyholders, ages 1 to 74 years, bronchopneumonia was charged with 87,595 deaths⁸ in the quarter century 1911 to 1935. These deaths accounted for 2.7 percent of the total from all causes combined and for 22.4 percent of the deaths from influenza and pneumonia.

Mortality by Age, Sex, and Color

Although data for bronchopneumonia are available for the full 25-year period in this review, Table 10 presents the average death rates for the 15-year period 1921 to 1935 so that the reader may have figures for bronchopneumonia comparable with those for lobar pneumonia and influenza.

Age The contour of the age curves for the bronchopneumonia mortality among the Industrial policyholders of the Metropolitan Life Insurance Company, by color and sex, in the recent 5-year period 1931 to 1935, are shown in Chart IX. The highest death rates for the disease between ages 1 and 74 are found in the upper age ranges and there is also a peak at the period of

⁸Does not include capillary bronchitis for the years 1911 to 1920. Deaths from this disease are, however, numerically unimportant.

TABLE 10
BRONCHOPNEUMONIA
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1921 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000						PERCENT CHANGE 1931-1935 SINCE 1921-1925	
	MALES			FEMALES			Males	Females
	1921 to 1935	1931 to 1935	1921 to 1925	1921 to 1935	1931 to 1935	1921 to 1925		
WHITE								
1 to 74*.....	24.4	20.9	26.2	19.6	15.9	22.8	-20.2	-30.3
1 to 4.....	74.6	48.8	94.7	66.5	44.2	84.8	-48.5	-47.9
5 to 9.....	7.1	6.0	8.7	7.2	5.5	8.8	-31.0	-37.5
10 to 14.....	2.9	2.6	3.3	3.4	2.7	4.2	-21.2	-35.7
15 to 19.....	3.5	2.9	3.4	3.3	2.7	4.0	-14.7	-32.5
20 to 24.....	4.3	3.6	4.7	3.8	3.5	4.1	-23.4	-14.6
25 to 34.....	6.6	5.9	6.5	5.2	5.2	5.4	- 9.2	- 3.7
35 to 44.....	16.0	15.3	14.9	8.8	7.9	9.0	+ 2.7	-12.2
45 to 54.....	30.0	29.1	27.6	16.5	14.9	16.6	+ 5.4	-10.2
55 to 64.....	66.5	62.7	66.3	48.4	44.0	52.1	- 5.4	-15.5
65 to 74.....	159.4	151.7	160.9	143.4	123.4	169.9	- 5.7	-27.4
COLORED								
1 to 74*.....	41.6	33.9	45.6	37.0	29.5	41.3	-25.7	-28.6
1 to 4.....	196.9	103.2	253.6	172.0	102.6	217.0	-59.3	-52.7
5 to 9.....	14.9	11.8	16.5	14.5	9.4	18.3	-28.5	-48.6
10 to 14.....	6.4	6.6	8.1	8.5	5.8	9.9	-18.5	-41.4
15 to 19.....	9.8	10.3	10.5	11.6	11.3	11.6	- 1.9	- 2.6
20 to 24.....	11.1	10.6	9.6	14.1	14.7	14.8	+10.4	- 0.7
25 to 34.....	13.5	17.6	10.2	12.4	12.0	11.4	+72.5	+ 5.3
35 to 44.....	24.3	25.6	22.2	16.6	16.5	16.0	+15.3	+ 3.1
45 to 54.....	41.9	44.1	39.1	26.8	28.6	23.8	+12.8	+20.2
55 to 64.....	71.5	76.0	66.7	63.1	57.3	68.6	+13.9	-16.5
65 to 74.....	148.2	149.3	144.0	151.4	154.5	141.8	+ 3.7	+ 9.0

*Standardized for age.

childhood. Bronchopneumonia shows a far higher rate at ages 1 to 4 than do the other diseases considered in this chapter.

Bronchopneumonia is a disease which registers by far its highest death rate in the first year of life—a period not covered in this study. For the country as a whole, almost one third of all the deaths from bronchopneumonia occur in infancy, where this disease takes third rank among all the causes of death. In the third month

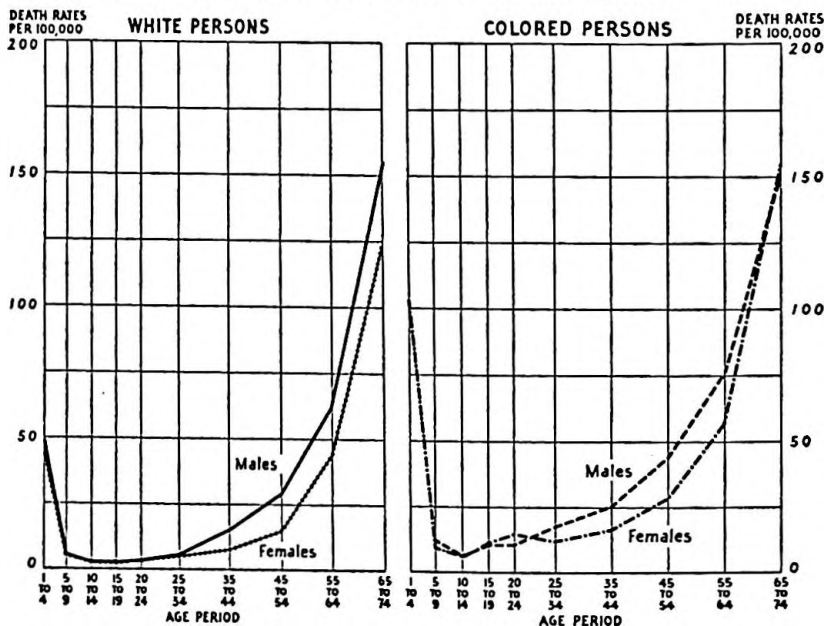
it ranks second in importance and in the second month of life, indeed, it is actually the leading cause of death.

Sex Bronchopneumonia as a cause of death has a decided sex differential, but its excess mortality among males is by no means so pronounced as that of lobar pneumonia. For example, at ages 1 to 74 years combined, the lobar pneumonia mortality rate was approximately two thirds higher among white males than that among white females, whereas in the case of bronchopneumonia the male rate was only one third higher. Among Negroes, the very pronounced excess among males, observed for lobar pneumonia, is not in evidence for bronchopneumonia; the difference between the rates for the two sexes is, in fact, only 15 percent. In lobar pneumonia the death rate for males exceeds that for females at every age range and for each of the color groups, usually with a large margin. In bronchopneumonia, on the other hand, when an excess of the male over the female death rate is in evidence at all, that excess is negligible; and at a few age periods the bronchopneumonia mortality rate actually runs higher among females than among males.

CHART IX BRONCHOPNEUMONIA

Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935



Color As in the case of both lobar pneumonia and influenza, there is a decided color differential in the mortality from bronchopneumonia. At ages 1 to 74 years, during the five-year period 1931 to 1935, the average death rate for colored males (33.9 per 100,000) was 62 percent higher than that for white males; and the differential among females was even larger, namely, 86 percent. Examination of the rates by color-sex-age groups shows that for this same five-year period the death rate of Negroes exceeded that of the whites by decided margins, except in the single instance of the age period 65 to 74 years among males, where white men are shown to have registered a slightly higher death rate than colored men.

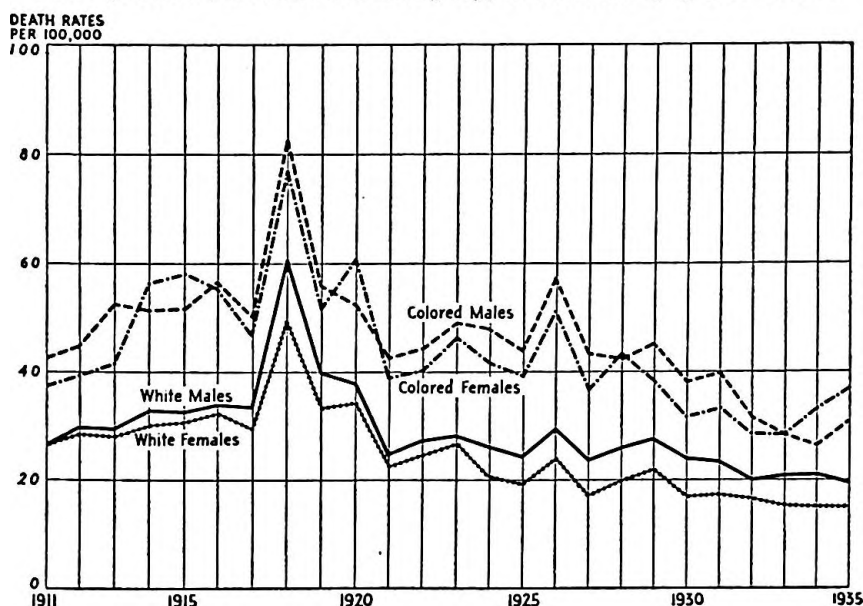
Trend of Mortality

For bronchopneumonia it is possible to present a series of death rates over the full 25-year period covered by this report. In the years 1911 to 1917, prior to the epidemic, the mortality showed a slight upward trend. In 1918 the death rate rose abruptly and then fell rapidly to 1921. In the 15 years to the close of the series the

CHART X BRONCHOPNEUMONIA

Standardized Annual Death Rates per 100,000
By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



death rate showed a further downward tendency. The lowest death rate, 18.6 per 100,000, was recorded in 1935. The trend picture for each color-sex group, presented in Chart X, is essentially the same as that for total persons.

For reasons already given, the percent change in death rate for bronchopneumonia has been computed for the two periods 1921 to 1925 and 1931 to 1935. The data are shown in Table 10. Each color and sex group at ages 1 to 74 showed a lower mortality at the close of the 15-year period than at the beginning. In each color-sex group the largest declines were registered at ages 1 to 4 years. Among white females decreases were evident at every age period. Among white males the mortality showed a decline at every age except 35 to 44 and 45 to 54. Among colored persons, however, increases were recorded at virtually every age period beyond 25.

INFLUENZA

An outstanding characteristic of influenza is its proneness to flare up from time to time into widespread and virulent epidemics. The most devastating of these outbreaks in the annals of medical history falls within the quarter century under our review, and has already been described at length in an earlier part of this chapter.

Knowledge concerning the etiology of influenza is only in recent years beginning to unravel from out of a tangle of false clues. The work of Laidlaw and his associates in England, and of Francis and others in America, shows that this disease is caused by a filterable virus, and is constantly present in endemic form throughout the world. Progress is also being made in discovering the characteristics of this disease, and present indications hold out promise of its ultimate control.

In 1934 influenza caused about 22,000 deaths in the United States. About 14,000 of these were specified as being complicated by respiratory conditions. Undoubtedly, the actual number of deaths in which respiratory complications were present exceeded the number reported as such. In the total damage caused by the disease we should include also the thousands of nonfatal cases in which the victim is left with impairments of the respiratory, nervous, or circulatory system. Influenza shows an even more marked concentration of deaths in the winter and spring seasons than do the pneumonias. The deaths at the seasons of maximum prevalence are from eight to nine times those in the summer months.

In the 15-year period 1921 to 1935 influenza accounted for 46,668 deaths among the Industrial policyholders of the Metropolitan Life Insurance Company, ages 1 to 74 years. These deaths constituted 2.3 percent of the deaths from all causes and for 22.7 percent of the deaths from influenza and pneumonia. The death rates from influenza over the 15-year period averaged 19.0 per 100,000.

Mortality by Age, Sex, and Color⁹

The average death rates from influenza by age, sex, and color for the 15-year period 1921 to 1935, and separately, for the initial and final quinquennia of the period are shown in Table 11. The data for the recent five-year period are presented graphically in Chart XI.

⁹For the atypical distribution during the pandemic of 1918-1919 see the special section dealing with that topic.

Age The highest death rates for influenza are registered in the highest age group included in this experience, 65 to 74 years. The mortality is also relatively high in early childhood, ages 1 to 4, where the death rate exceeds that for any other age group up to 45 years among white males and 55 years among white females. Immediately following the period 1 to 4 years the death rate drops sharply in each of the color and sex groups. The curve

TABLE 11
INFLUENZA

Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1921 to 1935

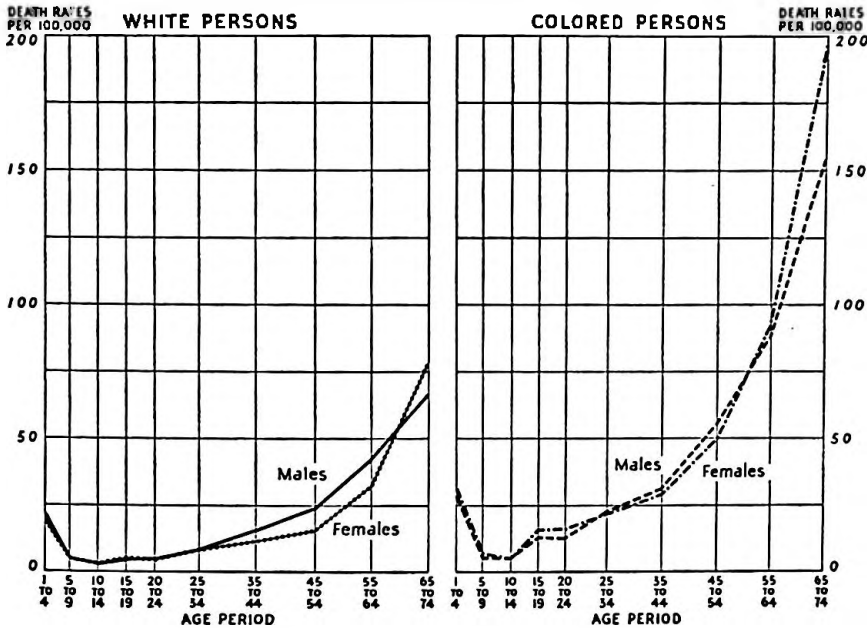
AGE PERIOD YEARS	DEATH RATES PER 100,000						PERCENT CHANGE 1931-1935 SINCE 1921-1925	
	MALES			FEMALES			Males	Females
	1921 to 1935	1931 to 1935	1921 to 1925	1921 to 1935	1931 to 1935	1921 to 1925		
WHITE								
1 to 74*.....	18.1	14.4	18.0	16.5	12.7	16.9	-20.0	-24.9
1 to 4.....	28.8	21.5	28.7	24.9	19.2	23.4	-25.1	-17.9
5 to 9.....	6.1	5.3	5.6	5.7	4.9	5.6	-5.4	-12.5
10 to 14.....	3.7	3.1	4.2	4.1	3.2	4.4	-26.2	-27.3
15 to 19.....	6.8	4.4	7.4	6.3	5.1	6.6	-40.5	-22.7
20 to 24.....	6.7	5.0	7.1	7.2	4.6	8.2	-29.6	-43.9
25 to 34.....	10.0	8.3	10.2	10.4	8.5	10.2	-18.6	-16.7
35 to 44.....	19.0	15.6	18.3	14.7	11.5	14.7	-14.8	-21.8
45 to 54.....	27.4	24.0	25.4	20.0	15.6	20.3	-5.5	-23.2
55 to 64.....	48.4	41.8	47.8	42.0	32.1	43.4	-12.6	-26.0
65 to 74.....	94.7	66.5	100.2	104.2	78.0	113.7	-33.6	-31.4
COLORED								
1 to 74*.....	37.7	30.1	37.0	38.9	31.9	38.3	-18.6	-16.7
1 to 4.....	44.7	28.7	44.3	42.4	31.5	44.0	-35.2	-28.4
5 to 9.....	8.1	5.5	8.4	9.2	6.8	10.9	-34.5	-37.6
10 to 14.....	7.1	4.8	8.2	8.4	4.7	11.8	-41.5	-60.2
15 to 19.....	15.0	12.9	15.6	21.6	15.5	21.2	-17.3	-26.9
20 to 24.....	18.4	12.7	17.1	22.5	16.1	24.8	-25.7	-35.1
25 to 34.....	25.5	22.6	21.2	24.5	21.6	22.7	+ 6.6	+ 4.8
35 to 44.....	37.9	31.4	38.9	36.1	29.0	32.9	-19.3	-11.9
45 to 54.....	59.0	55.2	56.9	56.2	50.1	52.2	-3.0	-4.0
55 to 64.....	112.4	87.9	112.3	114.0	91.7	113.1	-21.7	-18.9
65 to 74.....	200.4	154.0	201.5	218.1	196.6	208.9	-23.6	-5.9

*Standardized for age.

CHART XI INFLUENZA

Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935



reaches its lowest point at 10 to 14 years, and then rises practically continuously throughout the subsequent age periods.

Sex The sex differential in mortality for influenza is considerably less than that for either lobar pneumonia or bronchopneumonia. At ages 1 to 74 combined the death rate for white males was 13 percent higher than that for white females in the quinquennium 1931 to 1935; among colored persons, however, there was virtually no sex differential in mortality.

Up to age 35 there were no noteworthy differences between the rates for the two sexes among the white policyholders, although among the Negroes, at these lower age groups, the differences were a little more noticeable, with the rates for young Negroes running somewhat higher among females. Beginning with age 35, however, and extending up to 65, the influenza death rate was predominantly higher among white males than among white females. It was somewhat higher among Negro males than females between ages 25 and 55. At higher ages the picture changes abruptly, and we find among white women at ages 65 to 74 and among colored

women from 55 on, influenza death rates much in excess of those for the males.

Color For the period 1931 to 1935 the influenza death rate of insured Negro males was more than double that for white males; among Negro females the mortality was $2\frac{1}{2}$ times that for white females. Moreover, an excess of the colored over the white death rate obtained at every age period without exception. The degree of excess, however, varied markedly with age. In each sex the minimum excess of the colored over the white death rate was recorded at 5 to 9 years.

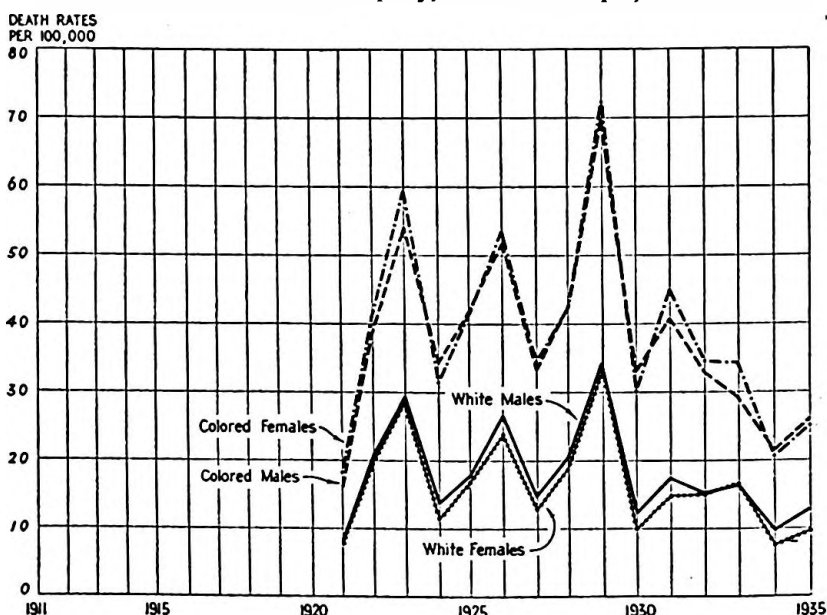
Trend of Mortality

The mortality from influenza showed no definite upward or downward trend over the period 1921 to 1930, inclusive. From 1931 to 1935, however, there is indication of a downward trend among white males and white females, and a very definite downward trend among colored males and colored females. Considering the period as a whole, the curve gives the appearance of a succession

CHART XII INFLUENZA

Standardized Annual Death Rates per 100,000
By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1921 to 1935

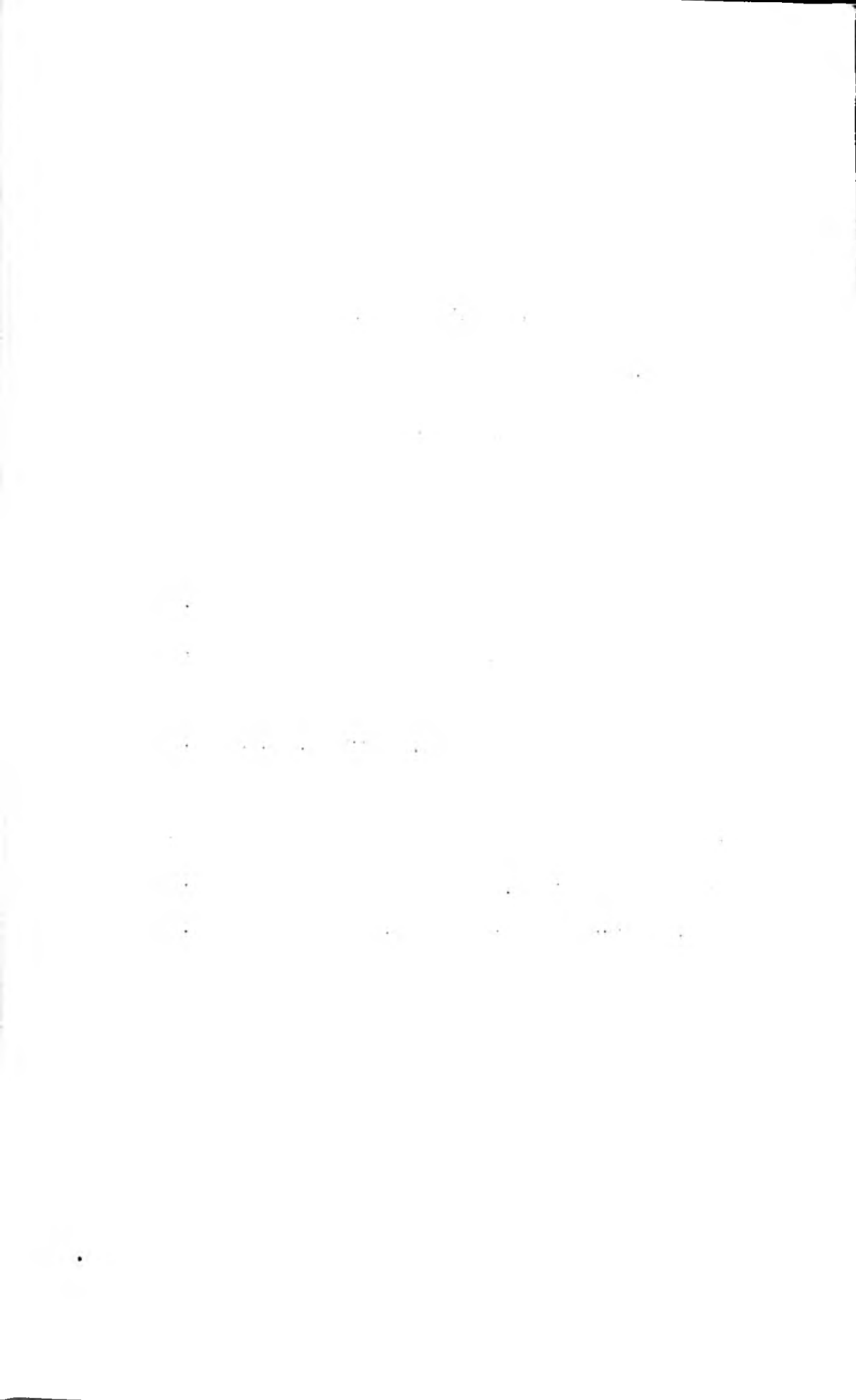


of saw teeth, marked by three definite maxima in the years 1923, 1926, and 1929. The last-mentioned year recorded the highest death rate in the entire 15-year series, namely 36.9 per 100,000 at ages 1 to 74 combined. The fluctuations in the closing quinquennium of the series are less marked than those in the decade preceding these years, and they lie on a lower level. Comparison of the rates in the period 1931 to 1935 and those in the period 1921 to 1925 shows that among white persons the death rate in the later quinquennium was 20 percent lower for males than that in the earlier quinquennium, and 25 percent lower for females. Among the colored, the difference in level is somewhat less. This change in level between the two quinquennia is observed at virtually every age period and in each color and sex group. Chart XII shows the time series for white and colored persons, by sex, at ages 1 to 74 combined.

CHAPTER VII

CANCER

CANCER—ALL FORMS	165
CANCER OF THE STOMACH, LIVER	186
CANCER OF THE PERITONEUM, INTESTINES, AND RECTUM . .	194
CANCER OF THE FEMALE GENITAL ORGANS	200
CANCER OF THE BREAST	206
CANCER OF THE BUCCAL CAVITY	210
CANCER OF THE SKIN	214
CANCER OF OTHER OR UNSPECIFIED ORGANS	219



CANCER—ALL FORMS

Classification of Cancer Deaths

The term "cancer" in vital statistics embraces all types of malignant growths, but the overwhelming majority of deaths classified under the cancer rubric are reported as due to carcinomas, sarcomas, or epitheliomas. In the present investigation, deaths attributed to the various forms of malignant neoplasms are classified in accordance with the 1920 revision of the International List of Causes of Death, which comprises six specific anatomic classes and one miscellaneous group. It has been found desirable, however, to introduce data based on more detailed classifications in several of these groups.

Deaths reported as due to cancer of two or more parts of the body are assigned, in accordance with standard practice, to the part first affected, if known. If information as to the primary site of the cancer is not available and cannot be obtained, preferential assignment is determined by reference to the Manual of Joint Causes of Death. It is the accepted practice of vital statisticians, in classifying joint causes of death, to prefer the term "cancer" to all but external causes and a few of the more deadly infectious diseases—typhus fever, Asiatic cholera, plague, yellow fever, leprosy, glanders, anthrax, rabies, and tetanus. Thus only a negligible percentage of deaths in which malignant tumors are known to play a part appear under other than cancer titles.

Accuracy of Cancer Mortality Statistics

That the importance of cancer as a cause of death has been, and still is, understated cannot be denied. This results primarily from the failure of physicians correctly to diagnose the disease. Of secondary and relatively minor importance is the desire of a physician, who has diagnosed a cancer, to soften the shock for the family of the deceased by assigning the death to another cause in the death certificate.

It is impossible to estimate with any accuracy the degree of understatement inherent in existing cancer mortality statistics. One important point to be noted, however, is that the data have become increasingly complete and accurate during the period covered by this experience. Microscopic examination of suspected tissue has increased along with hospitalization, operation,

and post-mortem examination. Furthermore, diagnostic aids—radiography, for example, and the various types of endoscopes—have been perfected and more widely employed.

That the diagnosing of cancer has increased in accuracy is noted by Swartout,¹ who has compared the post-mortem findings with ante-mortem diagnoses in two hospital experiences: Cabot's, at the Massachusetts General Hospital prior to 1912, and that of the New Haven (Conn.) Hospital for the years 1922 to 1933. Unfortunately, Cabot reported on a limited number of sites, but in each instance, Swartout showed, the later hospital experience registered a higher percentage of successful diagnoses than the earlier one. For cancer of the esophagus the percentage of successful diagnoses had increased from 80 to 90, for cancer of the stomach from 72 to 85, and for cancer of the colon from 74 to 83. Both the Massachusetts General and the New Haven Hospitals have been among the leading institutions in the country, so that these data may be considered comparable. Obviously, less adequately equipped hospitals would show a higher percentage of error in diagnosis, not to mention the margin of error in unhospitalized cases.

Importance of Cancer as a Cause of Death

In the 25-year period from 1911 to 1935, a total of 262,046 deaths from malignant tumors was reported among the Industrial policyholders of the Metropolitan Life Insurance Company at ages 1 to 74 years. The standardized annual death rates for the period average 81.4 per 100,000. Cancer accounted for 8.2 percent of the total number of deaths in this group of policyholders and, over the quarter century as a whole, ranked fourth in the list of causes of death.

The position of cancer as a cause of death changed materially in the period under review. In 1911 it ranked seventh; in 1935 it was second only to heart disease. This change in the position of cancer has been due more to declines in the death rates from certain diseases which formerly outranked it than to the increase in the recorded cancer death rate itself. In 1911 the standardized death rate from cancer in this experience was 75.8 per 100,000; in 1935 it was 86.8, an increase of 14.5 percent.

The number of deaths from cancer in this experience, and their distribution according to the important sites of the body where the cancer occurred, are presented in Table 1.

¹SWARTOUT, H. O. "Ante-Mortem and Post-Mortem Diagnoses." *New England Journal of Medicine*. Vol. 211, September 20, 1934. Pages 539-542.

TABLE 1
MORTALITY FROM CANCER BY ORGANS OR PARTS AFFECTED
Number of Deaths and Average Death Rates per 100,000
By Sex. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

ORGAN OR PART AFFECTED	TOTAL PERSONS			MALES			FEMALES		
	NUMBER OF DEATHS	PERCENT OF DEATHS		NUMBER OF DEATHS	PERCENT OF DEATHS		NUMBER OF DEATHS	PERCENT OF DEATHS	
		All Causes	All Forms of Cancer		All Causes	All Forms of Cancer		All Causes	All Forms of Cancer
CANCER—all forms.....	262,046	8.2	100.0	86,696	5.8	100.0	175,350	10.3	100.0
Buccal cavity†.....	8,095	0.3	3.1	6,456	0.4	7.4	1,639	0.1	0.9
Stomach, liver†.....	84,051	2.6	32.1	36,933	2.5	42.6	47,118	2.8	26.9
Peritoneum, intestines, and rectum..	35,632	1.1	13.6	12,368	0.8	14.3	23,264	1.4	13.3
Female genital organs.....	52,704	1.7	20.1	.....	.....	.....	52,704	3.1	30.1
Breast.....	26,324	0.8	10.0	250	§	0.3	26,074	1.5	14.9
Skin.....	4,315	0.1	1.6	2,285	0.2	2.6	2,030	0.1	1.2
Other organs, or of organs not specified†.....	50,925	1.6	19.5	28,404	1.9	32.8	22,521	1.3	12.7
									11.1

*Standardized for age, sex, and color. **Standardized for age and color. †Excluding the pharynx. ‡Including the pharynx. §Less than 0.05.

The table shows that for the entire group of insured persons, cancers of the stomach and liver, together the leading sites for malignant tumors, comprised about one third of all the deaths attributed to cancer in the 25 years 1911 to 1935. The relative numerical importance of the various organs of the body as sites of fatal cancers varies with sex. Among males the digestive tract was charged with 56.9 percent of the deaths from cancer; among females it was responsible for 40.2 percent of the total. Cancers of the female genital organs accounted for 30.1 percent and cancers of the breast for 14.9 percent of the deaths from malignant tumors among women. Cancer of the breast among males is rare. On the other hand, cancers of the buccal cavity constituted 7.4 percent of all cancer deaths among males, whereas among women they were less than 1 percent of the total. Unfortunately, the residual group includes deaths involving the male genital organs, and hence a direct comparison by sex cannot be made for this group.

Mortality by Age, Sex, and Color

The death rates from all forms of cancer combined by age, sex, and color for the 25-year period as a whole, and for the initial and final quinquennia of that period, are presented in Table 2.

Age Although deaths from cancer occur throughout the life cycle, the disease is essentially one of middle adult life and old age. The mortality from cancer in each color-sex group increases progressively and irreversibly with advancing age from a minimum at ages 5 to 14 years to a maximum at 65 to 74 years, the highest age group included in this insurance experience. At first the death rate rises gradually, but at ages 25 to 34 it advances abruptly, particularly among females. At ages 25 to 54 years the mortality among females in both white and colored rises far more rapidly than that for males. Past age 45 the rate in each color and sex class increases by large increments at successive age periods; the death rates among white policyholders, however, increase much more rapidly and reach higher maxima than do those for the colored. Chart I shows graphically the age distribution of the cancer mortality in each color-sex class for the period 1931 to 1935.

Sex Throughout the 25-year period the recorded cancer death rate among females, both white and colored, exceeded that for males at ages 1 to 74 years combined. Owing to the fact that

TABLE 2
CANCER—ALL FORMS

Averages of Annual Death Rates per 100,000

By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
WHITE						
1 to 74*.....	75.4	85.8	66.6	89.6	89.9	91.4
1 to 24*.....	3.1	3.8	2.8	2.8	3.3	2.7
25 to 44*.....	23.5	25.1	23.0	51.7	48.4	57.8
45 to 74*.....	352.9	403.5	308.3	385.1	390.3	385.3
1 to 4.....	3.7	3.9	3.9	3.6	4.0	4.0
5 to 9.....	2.0	2.7	1.6	1.7	2.1	1.6
10 to 14.....	1.8	2.6	1.5	1.8	2.3	1.2
15 to 19.....	3.5	4.2	2.9	2.8	3.1	2.7
20 to 24.....	4.8	5.8	4.6	4.5	5.1	4.1
25 to 34.....	9.8	11.1	9.1	20.9	21.8	20.9
35 to 44.....	41.4	43.5	41.2	92.1	83.4	106.4
45 to 54.....	157.4	169.3	150.4	231.3	222.5	246.6
55 to 64.....	416.0	461.3	367.7	428.0	433.0	431.6
65 to 74.....	765.8	930.5	627.1	722.4	766.1	675.6
COLORED						
1 to 74*.....	44.4	58.3	33.2	87.1	94.9	83.9
1 to 24*.....	2.5	3.0	1.3	3.2	3.7	2.5
25 to 44*.....	19.2	21.1	17.3	72.7	75.6	75.0
45 to 74*.....	197.6	267.0	144.7	338.0	373.0	319.2
1 to 4.....	2.5	2.6	2.3	3.5	5.4	2.3
5 to 9.....	1.8	3.0	0.8	1.3	1.3	0.4
10 to 14.....	1.7	2.2	0.4	1.2	1.0	0.8
15 to 19.....	2.7	2.8	2.3	3.3	3.8	3.2
20 to 24.....	3.9	4.7	1.3	7.1	7.7	6.0
25 to 34.....	8.7	9.0	8.3	34.7	37.0	36.9
35 to 44.....	33.1	36.9	29.1	122.7	126.4	125.0
45 to 54.....	103.5	132.5	88.8	240.7	256.0	245.2
55 to 64.....	233.7	311.4	179.2	382.4	420.7	365.9
65 to 74.....	385.9	549.4	233.3	519.9	602.7	434.8

*Standardized for age.

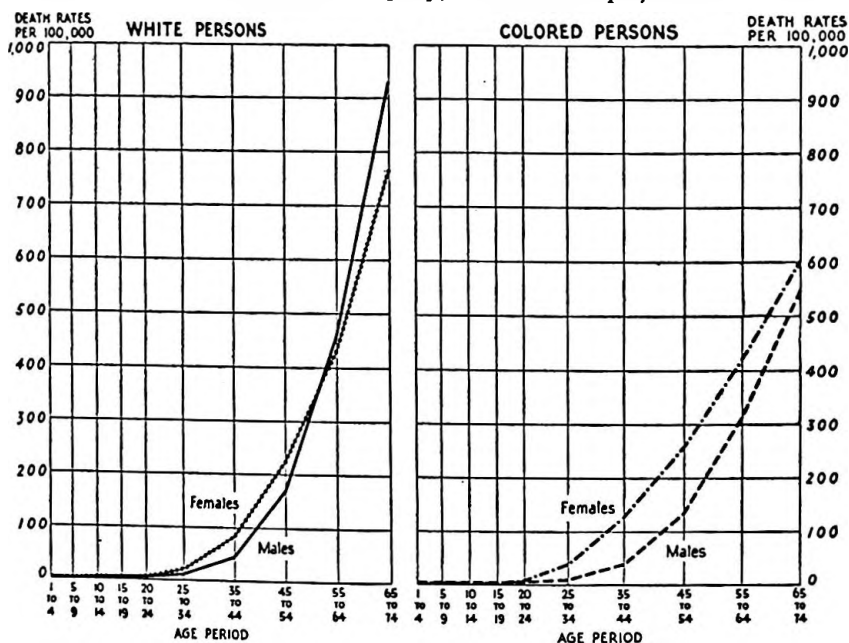
the death rate among men increased during the quarter century under survey, while that for women remained practically stationary, the excess female over male mortality declined considerably.

CHART I CANCER—ALL FORMS

Averages of Annual Death Rates per 100,000

By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935



For the quinquennium 1911 to 1915 the percentage female of male rate, at ages 1 to 74, was 137 among white persons and 253 among the colored; for the years 1931 to 1935 the corresponding percentages were 105² and 163.

Further analysis of the data discloses wide differences in the sex ratio of cancer mortality by age and color. Among white

²A number of factors have contributed to this current equality of cancer death rates in the two sexes. Probably of greatest importance are the improvements in diagnostic methods and the increased opportunities for their use, which have particularly tended to increase the rates among males. A high proportion, probably 80 percent, of male cancers are inaccessible, as compared with about 50 percent among females, and the death rates among the former were susceptible of increase from the operation of these factors alone, without actual increase in either the incidence or mortality of cancer among them.

In England and Wales the shift in the sex ratio of cancer mortality was first observed in 1924. (See *The Registrar-General's Statistical Review of England and Wales, 1931*. H. M. Stationery Office, London, 1934 Text, page 55.) There are several plausible reasons why this should have occurred earlier in that country than in our experience. In the first place our data refer only to persons 1 to 74 years of age, and omit an age period (over 75 years) in which the male mortality appears to be considerably in excess of that among females. The effect of omitting this age group, therefore, has been to keep the combined male rate on a relatively lower plane than would have been the case had the data for all ages been included, and its meeting with the level female rate was thus postponed.

Another factor of possible bearing in the matter is the relative availability of medical service and hospitalization to the average Englishman and to the average Metropolitan Industrial policyholder. Both groups are highly urbanized, but it is possible that the National Insurance Act of 1911 in England and Wales, which offered diagnostic facilities, hospitalization, and medical care to upward of 40 percent of the population, may have increased the opportunity for the accurate diagnosis of cancers among males and may thus have helped to bring about the change in sex ratio in England at an earlier date than would otherwise have been the case.

policyholders, in the recent five-year period, females recorded a higher death rate than males only at ages 25 to 54 years. Under age 25 the rate among white males exceeded that for white females by a small margin. However, during the active childbearing ages, 25 to 44 years, when cancer-inducing injuries to the uterine cervix become an important factor, white women registered a death rate about twice that among white men. For the following 10 years of life the excess mortality among females declines, and at ages 55 to 74 years the cancer death rate for white males again exceeds that for white females.

Somewhat in contrast with the experience among white policyholders, the cancer death rate for colored females exceeded that for colored males at each broad age period into which our insured population has been divided. At ages 25 to 44 years the standardized rate for colored females averaged more than $3\frac{1}{2}$ times that for colored males. Table 3 presents the sex ratio data by color and age.

Among both white and colored persons the ratio female to male mortality reaches its maximum between the ages of 25 to 44

TABLE 3
CANCER—ALL FORMS

Percentage Female of Male Death Rate
By Color and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	WHITE			COLORED		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
1 to 74*.....	119	105	137	196	163	253
1 to 24*.....	90	87	96	128	123	192
25 to 44*.....	220	193	251	379	358	434
45 to 74*.....	109	97	125	171	140	221
1 to 4.....	97	103	103	140	208	100
5 to 9.....	85	78	100	72	43	50
10 to 14.....	100	88	80	71	45	200
15 to 19.....	80	74	93	122	136	139
20 to 24.....	94	88	89	182	164	462
25 to 34.....	213	196	230	399	411	445
35 to 44.....	222	192	258	371	343	430
45 to 54.....	147	131	164	233	193	276
55 to 64.....	103	94	117	164	135	204
65 to 74.....	94	82	108	135	110	186

*Ratios calculated on basis of standardized death rates.

years, when the incidents and consequences of childbearing levy a particularly heavy toll on female lives. The greater disparity in the recorded death rate for males and females among colored persons may be due, in part, to the fact that colored women register a higher birth rate and receive less adequate obstetrical care than white women. The departure of the female from the male age curve at least five years earlier in life among colored than among white persons, possibly reflects the much higher birth rate for colored than for white women at the adolescent ages. The sex ratio of the cancer death rate among colored policyholders, particularly at the older ages, must be regarded with caution. There is evidence to support the belief that the rate among colored males is greatly understated; the greater relative accessibility of the female organs affected by cancer makes for easier diagnosis and for less understatement among colored females.

Color Over the 25-year period the death rate among white males was consistently higher than that for colored males. The excess white mortality at ages 1 to 74 decreased, however, from 101 percent in 1911 to 1915, to 47 percent in 1931 to 1935. This change in color ratio reflects the fact that the cancer death rate among colored males increased more rapidly than that for the whites. In the recent five-year period, as well as in the initial quinquennium of the period under review, the mortality among white males exceeded that for colored males at each broad age period. These facts are summarized in Table 4.

Among females the picture is somewhat different. Even in the early period 1911 to 1915 the rate among white females was only 9 percent in excess of that for colored females. In recent years colored females actually showed by a small margin the higher mortality. Moreover, the rates for colored females exceed those for the whites at every age period except 5 to 14, and past 55 years.

Trend of Mortality

During the 25 years under review, a moderate but significant upward trend characterized the *recorded* mortality from all forms of cancer among the Industrial policyholders of the Metropolitan Life Insurance Company. The standardized death rate in this group, ages 1 to 74 years combined, rose from 75.8 per 100,000 in 1911, to 86.8 per 100,000 in 1935. The average annual increment was 0.5 percent of the mean rate for the period, 81.4 per 100,000. Although the course of the cancer death rate has been

TABLE 4
CANCER—ALL FORMS

Percentage White of Colored Death Rate
By Sex and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
1 to 74*.....	170	147	201	103	95	109
1 to 24*.....	124	127	215	88	89	108
25 to 44*.....	122	119	133	71	64	77
45 to 74*.....	179	151	213	114	105	121
1 to 4.....	148	150	170	103	74	174
5 to 9.....	111	90	200	131	162	400
10 to 14.....	106	118	375	150	230	150
15 to 19.....	130	150	126	85	82	84
20 to 24.....	123	123	354	63	66	68
25 to 34.....	113	123	110	60	59	57
35 to 44.....	125	118	142	75	66	85
45 to 54.....	152	128	169	96	87	101
55 to 64.....	178	148	205	112	103	118
65 to 74.....	198	169	269	139	127	155

*Ratios calculated on basis of standardized death rates.

generally upward, the rise has not been without interruption. From 1911 to 1917 the rate rose steadily, reaching 80.7 in the latter year. In 1918, however, the death rate declined to 75.8 per 100,000 (exactly the rate recorded in 1911) and in 1919 to 75.6 per 100,000, the minimum point of the 25-year series. From this low point the mortality curve manifested a general upward trend to the end of the series. The standardized death rate from cancer for the period 1931 to 1935 was 12 percent higher than that for the years 1911 to 1915.

A point of special interest is the abrupt drop in the death rate for the year 1918. This drop in mortality may have resulted, in part at least, from incomplete reporting of cancer deaths during the height of the influenza pandemic. In general, one might be inclined to attribute some of the decline in the death rate for a particular disease in 1918 to the outbreak of influenza, which took a particularly heavy toll during the last quarter of that year. But it is difficult to do this in the case of cancer, in view of the wide difference in the age distribution of the deaths from the two

diseases. The influenza of that year was particularly fatal among young adults, whereas cancer is a disease that appears in mortality statistics largely at ages above 45 years. Some authorities have attributed this drop, which occurred in other countries as well as in the United States, to the restricted diet of war times. Unfortunately, our figures give no clue as to the correctness of this view.

Trend of Mortality by Color and Sex

The rise in the death rate for our aggregate experience was due for the most part to the strong upward trends in the recorded mortality among males, both white and colored. Among white females, the group that registered the highest average mortality, the death rate showed no definite upward or downward trend over the 25-year period. This is, at once, the most striking and most encouraging fact to emerge from this review. The fact that such a large and important group of our insured population exhibits no increase in cancer mortality, leads to the hope that extension of the present-day methods of diagnosis and treatment to other population groups may stem, and ultimately turn back, what appeared a few years ago to be an irresistible tide of increasing cancer mortality.

Of the three other population groups, it is of interest to note that the tendency toward increasing cancer death rates was least among colored females, among whom the second highest death rate was reported; somewhat greater among white males, who ranked third, and strongest among colored males, among whom the reported cancer death rate, especially in the earlier years of this experience, was so low as to create suspicion regarding the quality of medical care they received.

In summarizing the tendencies in the cancer death rates by color and sex, it appears that the rate of increase varies inversely with the level of the recorded death rate. That the recorded death rates among females are both high and fairly stable probably reflects the fact that a relatively high proportion—about half—of the fatal cancers among females affect accessible sites in which diagnosis is not particularly difficult. Among males, on the other hand, about 20 percent of fatal cancers diagnosed occur in accessible organs. Consequently the male rates have been particularly subject to apparent increases simply because medical knowledge and diagnostic methods have improved. The sharp rise in the recorded mortality among colored males, in view of the relatively

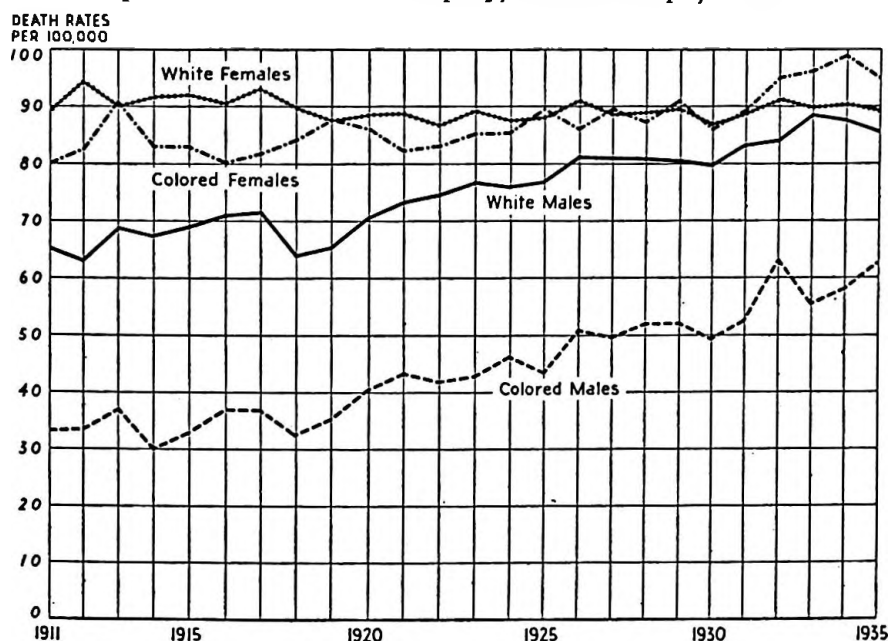
CHART II

CANCER—ALL FORMS

Standardized Annual Death Rates per 100,000

By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



low death rate in this group, probably has been due to the discovery of an increasing number of cases rather than to a real increase in the incidence of the disease.

Standardized death rates from cancer by color, sex, and broad age periods, for each year of our experience, are given in Appendix Table C. The course of the recorded mortality by color and sex is shown graphically in Chart II.

Trend of Mortality by Age

The trends of cancer mortality among Metropolitan Industrial policyholders by color, sex, and age, for the period 1911 to 1935, are presented in Table 5.

For the period under review, the cancer death rates among white males increased in each of the age groups for which our data have been analyzed. Among white females, slowly increasing rates were noted at ages below 34 years. In the age range 35 to 54, however, the mortality manifested a significant downward trend. Only in the age period 65 to 74 years did the cancer

TABLE 5
CANCER—ALL FORMS
Averages of Annual Death Rates, and Trend of Mortality
By Color, Sex, and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	AVERAGE OF DEATH RATES PER 100,000				ANNUAL TREND AS PERCENT OF AVERAGE RATE			
	WHITE		COLORED		WHITE		COLORED	
	Males	Females	Males	Females	Males	Females	Males	Females
1 to 74*.....	75.4	89.6	44.4	87.1	+1.3	-0.1	+2.8	+0.6
45 to 74*.....	352.9	385.1	197.6	338.0	+1.4	+0.1	+3.1	+0.8
1 to 24*.....	3.1	2.8	2.5	3.2	+1.5	+0.1	+2.8	+1.7
25 to 34.....	9.8	20.9	8.7	34.7	+1.2	+0.3	+0.7	+0.3
35 to 44.....	41.4	92.1	33.1	122.7	+0.3	-1.2	+1.3	+0.1
45 to 54.....	157.4	231.3	103.5	240.7	+0.6	-0.6	+2.2	+0.2
55 to 64.....	416.0	428.0	233.7	382.4	+1.2	+ †	+2.7	+0.8
65 to 74.....	765.8	722.4	385.9	519.9	+2.0	+0.6	+4.2	+1.5

*Death rates standardized for age. †Less than 0.05.
 Note:—Figures in boldface indicate significant trends.

death rate among white females display an upward trend worthy of note.

Colored males, as did the white, showed increasing death rates in each age period. There is no sound reason for believing that either the incidence or the mortality of cancer actually increased so rapidly among colored males. It must be, rather, that this increase reflects, in a measure, general improvement in diagnostic technique and, probably to a larger degree, improvement in the quality of medical service available to colored persons in urban areas during this 25-year period.

The trends of the cancer death rates among colored females at various ages present a less favorable picture than that for white females. Only slightly upward trends were noted in the death rates in the ages under 55, but beyond this age the increases in mortality were significant.

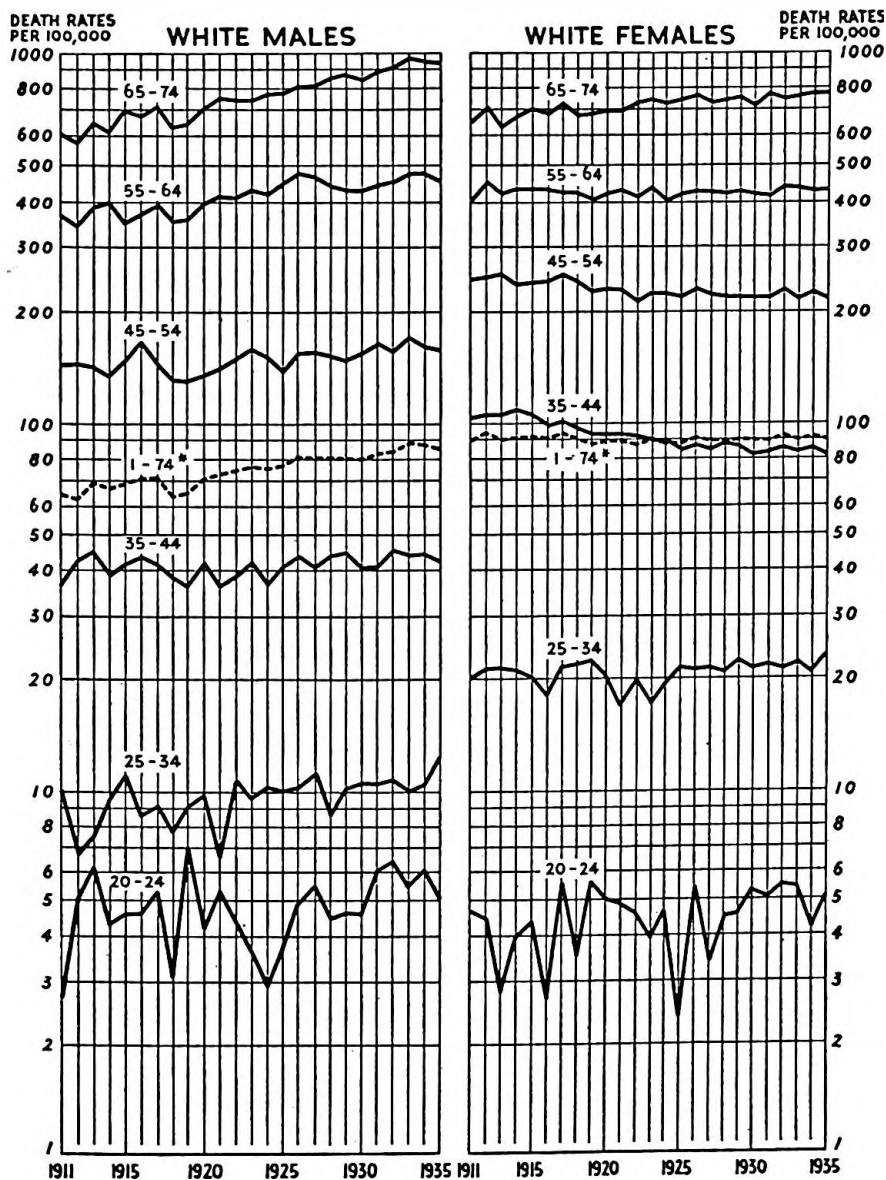
The average annual death rates and their trends at the various age periods are given in Table 5. A clearer understanding of the meaning of these figures, in so far as they relate to white persons, may be gained from the curves of age-specific death rates presented in Chart III. From the general picture displayed in the chart, it is difficult to find cause for alarm in the cancer situation, particularly among white females.

CHART III

CANCER—ALL FORMS

Annual Death Rates per 100,000 White Persons
By Sex and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



*Standardized for age.

Trends of Mortality in Insured and in General Population Compared

The death rates from cancers and other malignant tumors in the insured group and in the general population of the United States run parallel to each other, as can be seen from Chart IV. At ages 1 to 74 combined, in each experience, the average annual increment was 0.8 percent of the average rate for the period 1920 to 1934. Moreover, it is evident from Table 6 that a fairly close correspondence in trend is evident for each of the color-sex groups.

The average death rate from cancer in the general population was lower than that among our Industrial policyholders for total persons and for each color-sex group. One reason for this disparity in mortality undoubtedly is the fact that the insurance experience is composed largely of urban dwellers, who live in areas where better than average diagnostic facilities are available.

CHART IV
CANCER—ALL FORMS
Standardized Annual Death Rates per 100,000
Total Persons. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935
and U. S. Registration States of 1920, 1920 to 1934

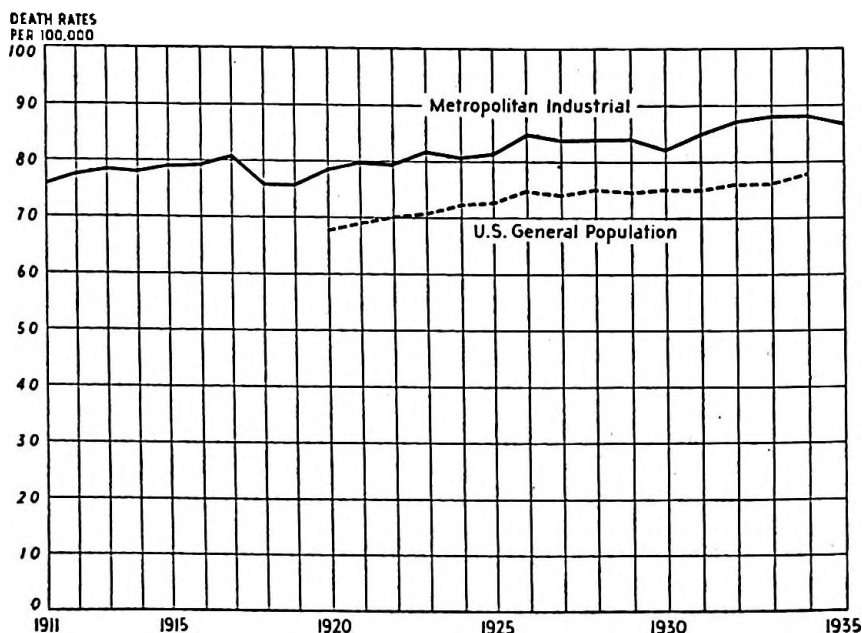


TABLE 6
CANCER—ALL FORMS

Averages of Annual Death Rates,* and Trend of Mortality
By Color and Sex. Ages 1 to 74 and 45 to 74 Years

Metropolitan Life Insurance Company, Industrial Department
and U. S. Registration States of 1920, 1920 to 1934

COLOR AND SEX	AVERAGE OF DEATH RATES* PER 100,000				ANNUAL TREND AS PERCENT OF AVERAGE RATE			
	AGES 1 TO 74		AGES 45 TO 74		AGES 1 TO 74		AGES 45 TO 74	
	M.L.I. Co.	U. S.	M.L.I. Co.	U. S.	M.L.I. Co.	U. S.	M.L.I. Co.	U. S.
TOTAL PERSONS...	83.2	73.3	373.9	326.0	+0.8	+0.8	+0.8	+0.8
White males....	79.6	63.3	374.3	291.5	+1.4	+1.3	+1.4	+1.3
White females...	88.9	84.1	385.0	364.7	+0.2	+0.4	+0.2	+0.4
Colored males...	49.3	41.7	221.3	178.3	+2.7	+3.5	+3.0	+3.7
Colored females.	88.7	87.9	345.8	340.5	+1.0	+0.9	+1.0	+0.9

*Standardized for age, and in the case of Total Persons, also for color and sex.

NOTE:—Figures in boldface indicate significant trends.

The Trend of Cancer Mortality by Organs Affected

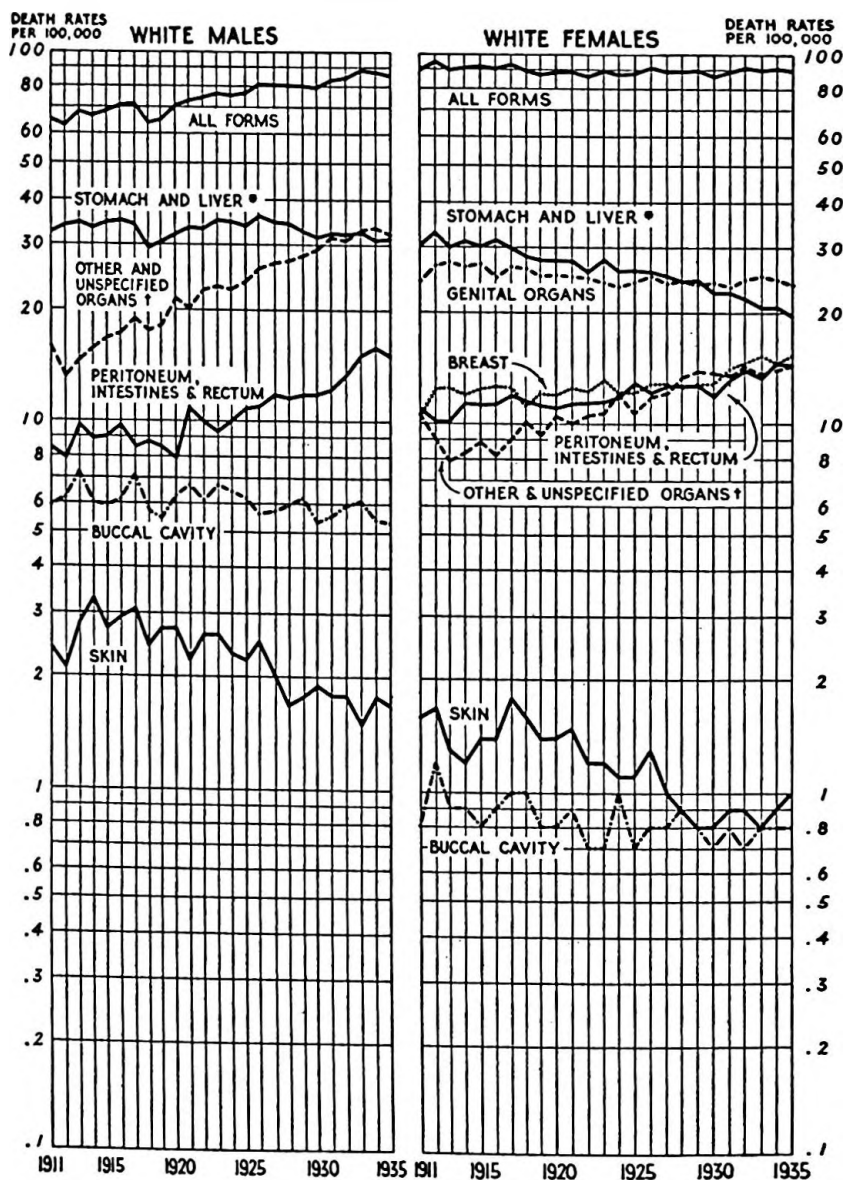
Although the trends of the cancer mortality for the various sites or organs will be fully discussed in the sections which follow, it appears desirable to present at this point a summary of the outstanding observations among our policyholders. The trend data by color and sex, for each cancer title of the 1920 International List of Causes of Death, for the period 1911 to 1935, appear in Table 7. Chart V displays graphically the course of mortality from cancer of these organs for white persons by sex; the annual death rates appear in Appendix Table C.

The major points of interest to emerge from the data relating to white persons may be briefly summarized. Malignant tumors of the buccal cavity, the stomach and liver, and the skin showed a downward trend, both for white males and white females. On the other hand, cancers of the peritoneum, intestines, and rectum, and of the miscellaneous group "Other organs or organs not specified," registered definitely increasing death rates in each sex over the 25-year period. Among white females the mortality from cancer of the genital organs declined, whereas that from cancer of the breast increased.

CHART V CANCER—BY SITE

Standardized Annual Death Rates per 100,000 White Persons
By Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



*Does not include cancer of the pharynx.

†Includes cancer of the pharynx.

TABLE 7
TREND OF MORTALITY FROM CANCER OF SPECIFIED
ORGANS OR PARTS
By Color and Sex. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

ORGAN OR PART AFFECTED	AVERAGE OF DEATH RATES* PER 100,000				ANNUAL TREND AS PERCENT OF AVERAGE RATE			
	WHITE		COLORED		WHITE		COLORED	
	Males	Fe- males	Males	Fe- males	Males	Fe- males	Males	Fe- males
CANCER—all forms...	75.4	89.6	44.4	87.1	+1.3	-0.1	+2.8	+0.6
Buccal cavity†....	6.0	0.8	2.7	1.1	-0.6	-1.0	+0.4	-1.8
Stomach, liver†....	33.0	26.4	21.1	18.6	-0.2	-1.8	+1.6	-0.1
Peritoneum, intes- tines, and rectum.	10.7	12.0	5.3	8.3	+2.6	+1.2	+4.2	+2.0
Female genital organs.....	....	25.1	....	35.9	....	-0.4	....	+0.5
Breast.....	†	12.8	†	13.7	†	+1.0	†	+ **
Skin.....	2.3	1.2	0.7	0.7	-2.3	-2.8	-2.0	+0.3
Other organs or or- gans not speci- fied§.....	23.2	11.2	14.5	8.8	+3.6	+2.4	+4.8	+2.5

*Standardized for age. †Excluding the pharynx. §Including the pharynx. **Less than 0.05. ‡Number of deaths annually too small to warrant calculation.

NOTE:—Figures in boldface indicate significant trends.

Trend of Death Rates According to Accessibility of Organs Affected

It has been contended that much of the recorded increase in cancer mortality has been due to improved diagnostic technique. As one step in investigating the correctness of this opinion, we have compiled cancer mortality statistics with special regard to the accessibility of the organ or part affected, in order to determine whether the observed increases have been restricted to inaccessible organs, for which the recorded death rates would increase with improved methods of diagnosis.

Unfortunately, we are unable to present trends for cancers of all accessible sites combined and for all inaccessible sites combined. This is due principally to the fact that our records do not permit us to draw a clear line of demarcation on the basis of accessibility through the deaths classified under the title "Cancer of other or of unspecified organs." Data for certain numerically important sites included under this title have been segregated since 1917, but the residual group of this title includes deaths

charged to cancers of the eye and orbit, the external male genital organs, the neck, the spinal cord, the spleen, and other specified, accessible and inaccessible organs, as well as a relatively small number of cases returned as "multiple cancer," "general carcinomatosis," and the like.

The trends of mortality from cancer of the various organs, by accessibility, appear in Table 8. Study of these figures is best limited to white lives. From a casual inspection of the table, one is impressed by the fact that, in general, cancers of the accessible sites show a downward trend, whereas the inaccessible sites manifest an opposite tendency. There are exceptions, however: the breast, and the rectum and anus register increasing death rates; the stomach, and the liver and gall bladder record downward trends. These exceptions require further discussion.

TABLE 8
TREND OF MORTALITY FROM CANCER, BY ACCESSIBILITY
OF ORGANS OR PARTS

By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1917 to 1935

ORGAN OR PART AFFECTED	AVERAGE OF DEATH RATES* PER 100,000				ANNUAL TREND AS PERCENT OF AVERAGE RATE			
	WHITE		COLORED		WHITE		COLORED	
	Males	Fe- males	Males	Fe- males	Males	Fe- males	Males	Fe- males
ACCESSIBLE SITES								
Buccal cavity.....	6.0	0.8	2.7	1.0	-0.8	-1.0	+0.4	-1.8
Rectum and anus....	4.1	3.4	2.2	4.2	+3.9	+1.6	+4.8	+0.6
Uterus.....	....	21.9	....	34.1	....	-1.0	....	+0.4
Breast.....	†	13.0	†	13.4	†	+1.4	†	+0.7
Skin.....	2.2	1.1	0.6	0.8	-3.2	-4.0	-0.7	+0.1
INACCESSIBLE SITES								
Stomach.....	22.3	15.3	16.4	13.6	-0.1	-1.7	+1.9	-0.2
Liver and gall bladder.	6.5	9.0	4.1	4.9	-1.1	-3.0	-**	-1.8
Intestines.....	6.5	8.3	3.3	4.1	+3.3	+1.5	+5.0	+3.1
Ovary and Fallopian tube.....	....	2.1	....	1.6	....	+6.4	....	+8.3
Bladder.....	3.7	1.5	2.2	1.4	+2.4	+1.2	+2.6	+4.1
Lung and pleura....	2.2	1.2	†	†	+9.5	+5.4	†	†
Pancreas.....	1.9	1.6	†	†	+6.3	+5.6	†	†
Prostate.....	4.1	....	4.0	....	+5.2	....	+7.7	....

*Standardized for age. **Less than 0.05. †Number of deaths annually too small to warrant calculation.

NOTE:—Figures in boldface indicate significant trends.

In so far as breast cancer is concerned, it may be that the explanation of the recorded increase in mortality lies in one of the findings of Bigelow and Lombard³ in their studies of the cancer problem in Massachusetts. Physicians in that State in 1932 were in many instances still giving cancer of organs of metastasis as the primary cause of death. As a result of this practice, out of 149 deaths attributed to cancer of the digestive tract in death certificates, seven had previously been diagnosed as cancer of the breast at the State cancer hospital. The authors believe that this practice was much more frequent in 1920 than in recent years. If they are correct in that belief, and if cancer deaths today are more generally referred to the site of original involvement rather than to the organ of metastasis, this fact may account in part, on the one hand, for the upward trend in the mortality from cancer of the breast in spite of the steadily mounting list of five-year cures registered with the American College of Surgeons, and on the other, for the significant decline in the mortality from cancers of the stomach, liver, and gall bladder.

The justification for considering rectal cancers as accessible is open to question. Ewing⁴ quotes R. Williams to the effect that "more than half the rectal cancers arise between 2 and 4 inches above the anus," whereas he says that Kraske "finds most carcinomas in the upper rectum . . ." It has recently been estimated by Rankin⁵ that two thirds of rectal cancers occur at the rectosigmoid. If this latter estimate is correct, it means that the greater proportion of rectal cancers occur at a distance of 6 inches or more from the anus, where direct visual and digital examination are exceedingly difficult. Cancers of the rectosigmoid may thus escape detection until they are so far advanced that cure is impossible. The rectosigmoid should probably be classed as an inaccessible site. The Committee on the Accuracy of Certified Causes of Death, of the American Public Health Association, in 1918 classified the diagnosis of rectal cancer as "unreliable, without autopsy, unless an operation was performed or the neoplasm was otherwise visible or accessible for direct observation."

If these facts are accepted as the explanation of the increasing death rates from cancer of the female breast and from cancers of the rectum and anus, the only death rates that actually indicate

³BIGELOW, G. H. and LOMBARD, H. L. "Change in the Massachusetts Cancer Trend." *New England Journal of Medicine*. Vol. 210, March 8, 1934. Page 526.

⁴EWING, JAMES. *Neoplastic Diseases*. Third edition. Philadelphia. W. B. Saunders Co. 1931. Page 711.

⁵RANKIN, F. W. "Choice of Operations for Cancer of the Rectosigmoid and Rectum." *American Journal of Surgery*. Vol. 24, June, 1934. Pages 759-775.

increasing cancer trends refer to organs that are inaccessible. It is a generally accepted belief that improvement in diagnostic methods, coupled with the increased opportunities for accurate diagnosis—hospitalization, operation, and post-mortem examination—is responsible for a considerable proportion of the observed increase in the death rates.

Is Cancer Mortality Increasing?

After detailed consideration of the available facts, the answer to this question is: probably not; and certainly not to the extent indicated by the crude figures.

What, then, are the facts? Year after year in the United States the number of deaths attributed to cancer has increased, but so has the population. The increasing number of deaths, therefore, is not an appropriate measure of the relative frequency of cancer mortality. The *crude* death rates obtained by dividing the number of deaths attributed to cancer each year by the mean population show a strong upward trend; there have been more cancer deaths per 100,000 of population in recent years. But with the declining birth rate and the enormous savings in human life that have been effected in childhood and in the early adult ages, a greater proportion of our population has been concentrated in the ages over 45 years, where cancer is most prevalent; the trend of the *crude* rates, therefore, is not a reliable guide.

Even when the effects of age changes in the population are eliminated from our figures by standardization, the cancer death rate for all persons combined over the period of this review has shown a significant upward trend. It is only when the death rates for the several color and sex groups are standardized and studied by anatomic subdivisions in the light of their accessibility, that we begin to get an appreciation of the facts, and even then the indicated tendencies do not always reveal a clear-cut picture of the true situation.

It has been shown before that among white females, during the period of this review, the trend of the death rate from cancer of all forms at ages 1 to 74 years has been slightly downward. Therefore, all the increase in the standardized cancer death rate among white persons has been due to the rising trend in the rate among males. When the male death rates are studied from the standpoint of the accessibility of the organs affected, it is seen that increases have occurred only in the rates from cancers of organs

that are not directly visible and have been, therefore, subject to apparent increase as diagnostic methods have improved.

Whether or not the whole of the observed increase in the death rate from inaccessible cancers may justly be attributed to improved diagnostic methods cannot be determined, but in view of the shortcomings of clinical diagnosis of internal cancers in the early years covered by this review, and of the outstanding medical progress during the period, it is not unreasonable to believe that the spread of the knowledge of new diagnostic procedures, and the increased opportunities for their use, may be responsible for a very large part, if not the whole, of the increase in the death rate.

It is obvious, then, that the cancer situation in the United States is far from alarming. Moreover, throughout the country public and private facilities for the treatment of cases are increasing rapidly. Under the stimulus of the American Medical Association and of the more specialized societies of cancer experts, cancer education and research are being encouraged, and a large body of physicians are being trained to diagnose and treat cases more effectively. There are today about 200 cancer centers throughout the country which measure up to the standards of equipment and trained personnel established by the American College of Surgeons. One hospital in New York alone is now carrying over 12,000 patients on its active file. Other institutions with similar services are springing up in various parts of the country. It is encouraging to find that in the three years 1932 to 1934 the American College of Surgeons registered almost 25,000 living patients without recurring symptoms five or more years after treatment. These efforts will undoubtedly stimulate the movement for better control of cancer throughout the United States.

CANCER OF THE STOMACH, LIVER⁶

In the quarter century covered by this review, 84,051 deaths from cancer and other malignant tumors of the organs included under this title were reported among Metropolitan Industrial policyholders at ages 1 to 74 years. These deaths comprised almost one third (32.1 percent) of the total from all forms of cancer, and 2.6 percent of the deaths from all causes combined. The standardized annual death rates from cancers of the stomach and liver at these ages averaged 28.8 per 100,000 over the 25-year period.

It is evident from these figures that we are dealing with one of the more important causes of death. Cancers classified under this title were responsible for 60 percent more deaths among these policyholders than were charged to the title of second importance, cancer of the female genital organs. Among males the stomach, liver, and other organs of this group, taken together, were by far the most important sites of fatal cancer; among females these sites ranked second only to the genital organs.

Data relating to the mortality from cancer of the stomach and from cancers of the liver, gall bladder, and biliary passages have been compiled separately beginning with 1917. Over the 19 years cancer of the stomach was reported as the cause of 46,127 deaths in the Company's group of weekly premium-paying policyholders; the average of the standardized annual death rates was 18.4 per 100,000. Deaths attributed to cancer of the stomach constituted 20.4 percent of the deaths charged to cancer (all forms) and 1.8 percent of the deaths from all causes, during the years for which separate classification was made. Cancer of the stomach was responsible for more than twice as many deaths among males as cancer of any other organ. Among females the stomach was second to the uterus in the frequency with which it was reported as the site of fatal cancer.

⁶The title Cancer of the Stomach, Liver, in the 1920 revision of the International List of Causes of Death is misleading because, in addition to the two organs specified, deaths from cancers of certain other parts of the digestive system were classified under it. Among the other inclusions were cancers of the following parts: pharynx, esophagus, gall duct, and gall bladder. In the 1920 revision of the International List, deaths from cancer of the throat were transferred from the title Cancer of Other or Unspecified Organs, and were classified under cancer of the pharynx. The effect of this transfer was to increase materially the number of deaths classified as cancer of the pharynx and incidentally, to add to the number of deaths included under the title Cancer of the Stomach, Liver. To avoid disturbing the comparability of the death rates for this title, deaths from cancer of the pharynx in this investigation were included under the title Cancer of Other or Unspecified Organs, beginning with 1917, the first year for which deaths from cancer of the pharynx were tabulated separately. However, the number of deaths annually attributed to cancer of the pharynx is so small, in comparison with the total included under this heading, that this transfer does not affect the death rate in any color-sex group by as much as 1 percent.

Cancers of the liver, gall bladder, and bile ducts were reported as the cause of 19,670 deaths in this group of policyholders during the 19-year period. This number represents 8.7 percent of all cancer deaths; the standardized annual death rates from this group of organs averaged 7.5 per 100,000 lives exposed.

Mortality by Age, Sex, and Color

The average death rates from cancers of these organs of the digestive tract, by age, sex, and color, for the quarter century 1911 to 1935, and for the five-year periods at the beginning and at the end of the series, are given in Table 9.

TABLE 9
CANCER OF THE STOMACH, LIVER†
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000						PERCENTAGE MALE OF FEMALE RATE		
	MALES			FEMALES					
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
WHITE									
1 to 74*.....	33.0	31.7	33.5	26.4	21.1	30.9	125	150	108
45 to 74*.....	160.5	156.9	160.2	126.7	102.8	145.2	127	153	110
1 to 24*.....	0.3	0.2	0.3	0.2	0.2	0.3	150	100	100
25 to 34.....	2.3	1.8	2.7	2.5	1.9	2.7	92	95	100
35 to 44.....	15.9	12.6	20.2	14.9	9.5	22.3	107	133	91
45 to 54.....	71.6	62.7	80.6	54.6	38.9	71.5	131	161	113
55 to 64.....	196.2	181.8	198.6	145.3	109.9	174.6	135	165	114
65 to 74.....	335.7	366.0	305.2	287.6	262.2	291.0	117	140	105
COLORED									
1 to 74*.....	21.1	24.3	17.5	18.6	18.2	18.5	113	134	95
45 to 74*.....	98.1	116.0	79.8	83.3	83.7	80.3	118	139	99
1 to 24*.....	0.3	0.2	0.2	0.3	0.1	0.4	100	200	50
25 to 34.....	2.8	2.0	3.6	3.8	3.2	4.8	74	63	75
35 to 44.....	14.7	14.7	13.6	16.2	13.6	17.9	91	108	76
45 to 54.....	54.1	60.7	46.5	44.4	42.1	50.4	122	144	92
55 to 64.....	116.4	134.7	103.7	98.4	92.8	101.2	118	145	102
65 to 74.....	183.8	231.4	126.6	160.9	179.8	123.3	114	129	103

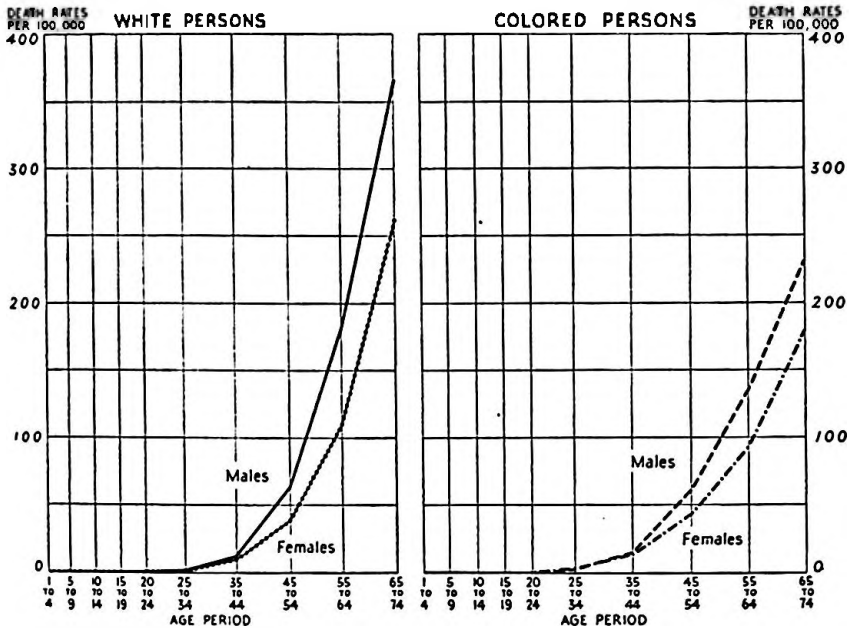
*Death rates standardized for age. †Excluding the pharynx.

CHART VI

CANCER OF THE STOMACH, LIVER*

Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935



*Does not include cancer of the pharynx.

Age In each color-sex group the rates increase progressively and irreversibly with advancing age to establish their maxima at the highest age group in this experience, 65 to 74 years. As Chart VI shows, the death rates among white persons rise more rapidly than those among the colored; in each race the rates among males show a steeper rise with advancing age than those among females.

Sex In the recent five-year period the mortality from cancers of the stomach and liver among white males was $1\frac{1}{2}$ times that among white females at ages 1 to 74 years. Among colored persons the death rate for males averaged one third higher than that for females. An excess male over female mortality was recorded at each age group after 35 years.

Cancers of the stomach and of the liver and gall bladder, when considered separately, show contrasting sex differences in mortality for the period 1931 to 1935. The recorded death rates from

cancer of the stomach alone have been higher among males than among females, not only at 1 to 74 years combined, but at virtually every age period. Moreover, the ratio male to female deaths increased considerably in the 19-year period.

The death rate from cancer of the liver and gall bladder, however, was 22 percent higher among white females than among white males, and 5 percent higher among colored females than among colored males in the recent quinquennium. For white persons higher mortality rates among females obtained at each age period. The excess female over male mortality diminished appreciably during the years under review.

Our data are to some extent illuminated by the findings of Ewing⁷. He reports that carcinoma of the gall bladder "affects women in the ratio of four or five to one man," and adds data showing that gallstones were found in 70 to 100 percent of these cases by various observers. He also remarks: "Mechanical irritation of the calculi, the relation to a peculiar form of lipoid metabolism (cholesterin), and the irritative and digestive action of bile seem to combine in producing the remarkable susceptibility of this mucous membrane to cancer."

Color In the period 1931 to 1935 the death rate from cancers of the stomach and liver among white persons exceeded that among colored by 30 percent among males and 16 percent among females, at ages 1 to 74 combined. For cancer of the stomach alone, the death rate for white males averaged about 20 percent higher than that for colored males; among females, on the other hand, the death rates were practically identical, namely 13.2 per 100,000 among the colored as against 13.1 among the white. Malignant tumors of the liver and gall bladder showed a definitely higher rate for the whites in each sex.

Trend of Mortality

The standardized death rates from cancers of the stomach and liver, among Metropolitan Industrial policyholders at ages 1 to 74, averaged 17 percent lower in the years 1931 to 1935 than in 1911 to 1915. The recorded decline, however, was not continuous for the entire 25-year period. In fact, the major part of the drop in the death rate took place in the decade 1926 to 1935, during which period the mortality declined almost without interruption.

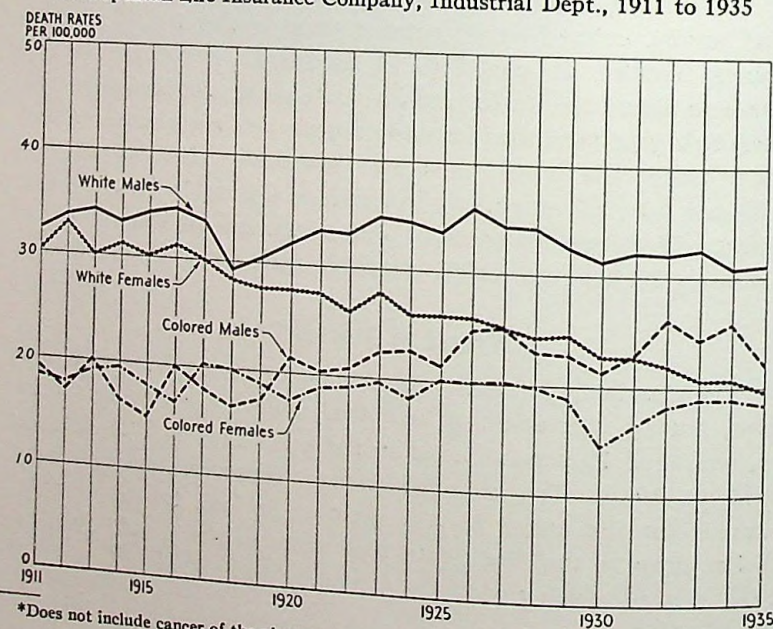
⁷Op. cit. Pages 736-737.

Moreover, for the 25-year period as a whole the mortality for ages 1 to 74 manifested a downward trend or practical stability in each color-sex group except colored males. The largest decrease in death rate was registered for white females, among whom the downward trend of the mortality was statistically significant not only at 1 to 74 years, but also at every age period. Among white males and colored females the declining tendency was slight at ages 1 to 74 combined; in each group the death rate fell in every age period except 65 to 74. Among colored males, however, an increase in death rate was registered for the group as a whole and at every important age period. Chart VII presents the time series graphically for each of the color-sex groups; the trend data by age appear in Table 10.

The trend picture for cancer of the stomach shows much the same characteristics as that for the group of organs as a whole in the period 1917 to 1935. This, of course, reflects the fact that deaths from gastric cancer constitute two thirds of those for the entire title. The mortality from cancer of the stomach decreased

CHART VII
CANCER OF THE STOMACH, LIVER*
Standardized Annual Death Rates per 100,000
By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



*Does not include cancer of the pharynx.

in each color-sex group except colored males, and significantly so among white females. Table 11 shows the trend figures of mortality by color, sex, and age.

TABLE 10
CANCER OF THE STOMACH, LIVER†
Averages of Annual Death Rates, and Trend of Mortality
By Color, Sex, and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	AVERAGE OF DEATH RATES PER 100,000				ANNUAL TREND AS PERCENT OF AVERAGE RATE			
	WHITE		COLORED		WHITE		COLORED	
	Males	Females	Males	Females	Males	Females	Males	Females
1 to 74*	33.0	26.4	21.1	18.6	-0.2	-1.8	+1.6	-0.1
45 to 74*	160.5	126.7	98.1	83.3	+ ‡	-1.7	+1.8	+0.3
1 to 24*	0.3	0.2	0.3	0.3	-1.5	-2.1	-0.7	-7.0
25 to 34	2.3	2.5	2.8	3.8	-1.7	-1.7	-2.8	-2.1
35 to 44	15.9	14.9	14.7	16.2	-2.2	-4.0	+0.8	-1.6
45 to 54	71.6	54.6	54.1	44.4	-1.2	-3.0	+1.3	-0.7
55 to 64	196.2	145.3	116.4	98.4	-0.3	-2.2	+1.1	-0.1
65 to 74	335.7	287.6	183.8	160.9	+1.0	-0.5	+3.0	+1.4

*Death rates standardized for age. †Excluding the pharynx. ‡Less than 0.05.
NOTE:—Figures in boldface indicate significant trends.

TABLE 11
CANCER OF THE STOMACH
Averages of Annual Death Rates, and Trend of Mortality
By Color, Sex and Age. Ages 25 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1917 to 1935

AGE PERIOD YEARS	AVERAGE OF DEATH RATES PER 100,000				ANNUAL TREND AS PERCENT OF AVERAGE RATE			
	WHITE		COLORED		WHITE		COLORED	
	Males	Females	Males	Females	Males	Females	Males	Females
1 to 74*	22.3	15.3	16.4	13.6	-0.1	-1.7	+1.9	-0.2
45 to 74*	109.2	74.3	76.9	61.7	+0.1	-1.5	+2.1	+0.3
25 to 34	1.5	1.6	1.8	2.4	-1.2	-2.5	-2.7	-1.3
35 to 44	10.5	7.6	10.7	10.9	-1.9	-3.0	+1.9	-3.2
45 to 54	46.5	29.7	40.4	31.3	-0.3	-3.0	+1.4	-0.8
55 to 64	131.3	82.8	88.6	70.8	-0.5	-2.1	+1.9	+0.5
65 to 74	238.2	179.2	154.4	127.2	+0.8	-0.4	+2.7	+0.8

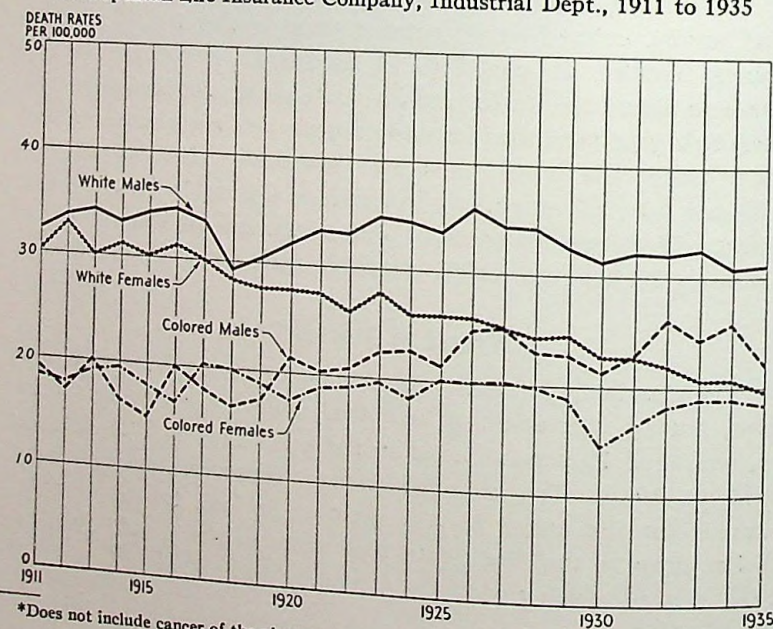
*Death rates standardized for age.
NOTE:—Figures in boldface indicate significant trends.

Moreover, for the 25-year period as a whole the mortality for ages 1 to 74 manifested a downward trend or practical stability in each color-sex group except colored males. The largest decrease in death rate was registered for white females, among whom the downward trend of the mortality was statistically significant not only at 1 to 74 years, but also at every age period. Among white males and colored females the declining tendency was slight at ages 1 to 74 combined; in each group the death rate fell in every age period except 65 to 74. Among colored males, however, an increase in death rate was registered for the group as a whole and at every important age period. Chart VII presents the time series graphically for each of the color-sex groups; the trend data by age appear in Table 10.

The trend picture for cancer of the stomach shows much the same characteristics as that for the group of organs as a whole in the period 1917 to 1935. This, of course, reflects the fact that deaths from gastric cancer constitute two thirds of those for the entire title. The mortality from cancer of the stomach decreased

CHART VII
CANCER OF THE STOMACH, LIVER*
Standardized Annual Death Rates per 100,000
By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



*Does not include cancer of the pharynx.

in each color-sex group except colored males, and significantly so among white females. Table 11 shows the trend figures of mortality by color, sex, and age.

TABLE 10
CANCER OF THE STOMACH, LIVER†
Averages of Annual Death Rates, and Trend of Mortality
By Color, Sex, and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	AVERAGE OF DEATH RATES PER 100,000				ANNUAL TREND AS PERCENT OF AVERAGE RATE			
	WHITE		COLORED		WHITE		COLORED	
	Males	Females	Males	Females	Males	Females	Males	Females
1 to 74*	33.0	26.4	21.1	18.6	-0.2	-1.8	+1.6	-0.1
45 to 74*	160.5	126.7	98.1	83.3	+ ‡	-1.7	+1.8	+0.3
1 to 24*	0.3	0.2	0.3	0.3	-1.5	-2.1	-0.7	-7.0
25 to 34	2.3	2.5	2.8	3.8	-1.7	-1.7	-2.8	-2.1
35 to 44	15.9	14.9	14.7	16.2	-2.2	-4.0	+0.8	-1.6
45 to 54	71.6	54.6	54.1	44.4	-1.2	-3.0	+1.3	-0.7
55 to 64	196.2	145.3	116.4	98.4	-0.3	-2.2	+1.1	-0.1
65 to 74	335.7	287.6	183.8	160.9	+1.0	-0.5	+3.0	+1.4

*Death rates standardized for age. †Excluding the pharynx. ‡Less than 0.05.
NOTE:—Figures in boldface indicate significant trends.

TABLE 11
CANCER OF THE STOMACH
Averages of Annual Death Rates, and Trend of Mortality
By Color, Sex and Age. Ages 25 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1917 to 1935

AGE PERIOD YEARS	AVERAGE OF DEATH RATES PER 100,000				ANNUAL TREND AS PERCENT OF AVERAGE RATE			
	WHITE		COLORED		WHITE		COLORED	
	Males	Females	Males	Females	Males	Females	Males	Females
1 to 74*	22.3	15.3	16.4	13.6	-0.1	-1.7	+1.9	-0.2
45 to 74*	109.2	74.3	76.9	61.7	+0.1	-1.5	+2.1	+0.3
25 to 34	1.5	1.6	1.8	2.4	-1.2	-2.5	-2.7	-1.3
35 to 44	10.5	7.6	10.7	10.9	-1.9	-3.0	+1.9	-3.2
45 to 54	46.5	29.7	40.4	31.3	-0.3	-3.0	+1.4	-0.8
55 to 64	131.3	82.8	88.6	70.8	-0.5	-2.1	+1.9	+0.5
65 to 74	238.2	179.2	154.4	127.2	+0.8	-0.4	+2.7	+0.8

*Death rates standardized for age.
NOTE:—Figures in boldface indicate significant trends.

For cancer of the liver and gall bladder the death rate among Industrial policyholders fell from 9.5 per 100,000 in 1917, to 6.0 in 1935. Over the 19-year period the mortality declined significantly at ages 1 to 74 in each color-sex group except among colored males. It is obvious from a comparison of Tables 11 and 12 that the mortality from cancer of the liver and gall bladder declined more rapidly than that from the stomach. Graphic verification of this fact is presented in Chart VIII.

The standardized annual death rates from cancer of the stomach, liver, and other organs of this group combined, for the period 1911 to 1935, and separately for (a) the stomach and (b) the liver, gall bladder, and biliary passages, for the years 1917 to 1935 among the entire group of weekly premium-paying policyholders and for the four color-sex subdivisions, are given in Appendix Table C.

It may well be that, to a large extent, the general decline in the death rate from cancers of the stomach and liver is spurious. During the period of this review, federal, State, and municipal Bureaus of Vital Statistics have conducted campaigns to have primary, rather than secondary or immediate, causes recorded on death certificates. As a result, it is likely that the stomach and liver, so often the sites of secondary cancer involvement, are

TABLE 12
CANCER OF THE LIVER AND GALL BLADDER
Averages of Annual Death Rates, and Trend of Mortality
By Color, Sex, and Age. Ages 25 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1917 to 1935

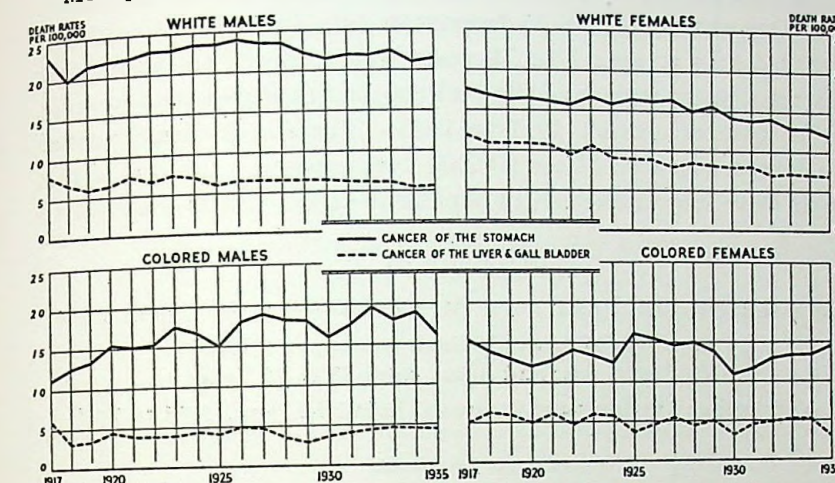
AGE PERIOD YEARS	AVERAGE OF DEATH RATES PER 100,000				ANNUAL TREND AS PERCENT OF AVERAGE RATE			
	WHITE		COLORED		WHITE		COLORED	
	Males	Females	Males	Females	Males	Females	Males	Females
1 to 74*	6.5	9.0	4.1	4.9	-1.1	-3.0	-1	-1.8
45 to 74*	31.2	43.3	19.2	21.7	-1.1	-2.9	+ 0.5	-1.7
25 to 34	0.5	0.8	0.6	1.0	-2.9	-3.9	-10.7	-4.0
35 to 44	3.0	4.7	2.5	4.6	-1.4	-4.4	-3.6	-1.4
45 to 54	12.9	18.1	10.8	11.4	-2.8	-3.6	-0.5	-1.0
55 to 64	37.4	49.5	22.1	25.4	-1.6	-3.4	+ 0.7	-2.2
65 to 74	69.3	99.9	36.6	42.8	+0.4	-2.1	+ 1.2	-1.7

*Death rates standardized for age. †Less than 0.05.
Note:—Figures in boldface indicate significant trends.

CHART VIII
CANCERS OF THE STOMACH, AND OF THE LIVER
AND GALL BLADDER

Standardized Annual Death Rates per 100,000
By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1917 to 1935



being reported less frequently, while primary conditions, such as cancer of the breast, are being reported more often. Moreover, more accurate diagnosis has made possible more precise certification. It is probable that many deaths which in previous years would have been attributed to cancer of the stomach and liver, are now being reported as due to cancer of the intestines.

For cancer of the liver and gall bladder the death rate among Industrial policyholders fell from 9.5 per 100,000 in 1917, to 6.0 in 1935. Over the 19-year period the mortality declined significantly at ages 1 to 74 in each color-sex group except among colored males. It is obvious from a comparison of Tables 11 and 12 that the mortality from cancer of the liver and gall bladder declined more rapidly than that from the stomach. Graphic verification of this fact is presented in Chart VIII.

The standardized annual death rates from cancer of the stomach, liver, and other organs of this group combined, for the period 1911 to 1935, and separately for (a) the stomach and (b) the liver, gall bladder, and biliary passages, for the years 1917 to 1935 among the entire group of weekly premium-paying policyholders and for the four color-sex subdivisions, are given in Appendix Table C.

It may well be that, to a large extent, the general decline in the death rate from cancers of the stomach and liver is spurious. During the period of this review, federal, State, and municipal Bureaus of Vital Statistics have conducted campaigns to have primary, rather than secondary or immediate, causes recorded on death certificates. As a result, it is likely that the stomach and liver, so often the sites of secondary cancer involvement, are

TABLE 12
CANCER OF THE LIVER AND GALL BLADDER
Averages of Annual Death Rates, and Trend of Mortality
By Color, Sex, and Age. Ages 25 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1917 to 1935

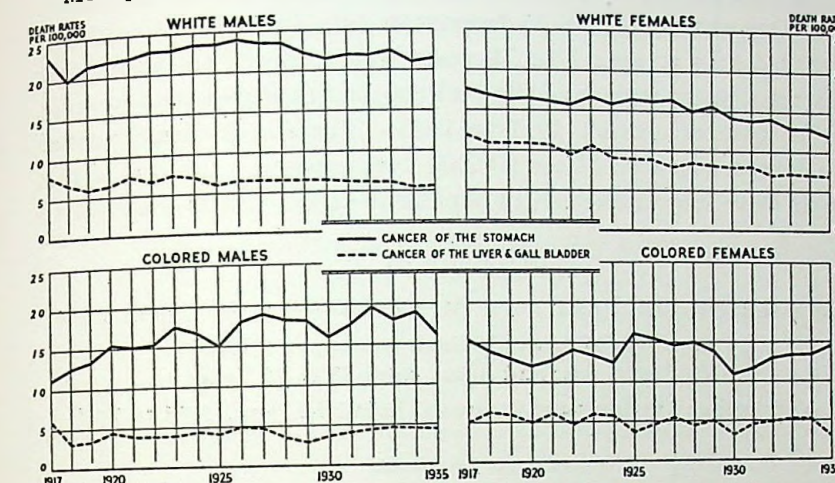
AGE PERIOD YEARS	AVERAGE OF DEATH RATES PER 100,000				ANNUAL TREND AS PERCENT OF AVERAGE RATE			
	WHITE		COLORED		WHITE		COLORED	
	Males	Females	Males	Females	Males	Females	Males	Females
1 to 74*	6.5	9.0	4.1	4.9	-1.1	-3.0	-1	-1.8
45 to 74*	31.2	43.3	19.2	21.7	-1.1	-2.9	+ 0.5	-1.7
25 to 34	0.5	0.8	0.6	1.0	-2.9	-3.9	-10.7	-4.0
35 to 44	3.0	4.7	2.5	4.6	-1.4	-4.4	-3.6	-1.4
45 to 54	12.9	18.1	10.8	11.4	-2.8	-3.6	-0.5	-1.0
55 to 64	37.4	49.5	22.1	25.4	-1.6	-3.4	+ 0.7	-2.2
65 to 74	69.3	99.9	36.6	42.8	+0.4	-2.1	+ 1.2	-1.7

*Death rates standardized for age. †Less than 0.05.
Note:—Figures in boldface indicate significant trends.

CHART VIII
CANCERS OF THE STOMACH, AND OF THE LIVER
AND GALL BLADDER

Standardized Annual Death Rates per 100,000
By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1917 to 1935



being reported less frequently, while primary conditions, such as cancer of the breast, are being reported more often. Moreover, more accurate diagnosis has made possible more precise certification. It is probable that many deaths which in previous years would have been attributed to cancer of the stomach and liver, are now being reported as due to cancer of the intestines.

CANCER OF THE PERITONEUM, INTESTINES, AND RECTUM

Among the weekly premium-paying policyholders in the Industrial Department of the Metropolitan Life Insurance Company, 35,632 deaths at ages 1 to 74 years were charged to cancer and other malignant tumors of the peritoneum, intestines, and rectum, in the quarter century 1911 to 1935. The standardized annual death rates averaged 11 per 100,000 lives exposed. Cancers of this group were responsible for 13.6 percent of the deaths charged to

TABLE 13
CANCER OF THE PERITONEUM, INTESTINES, AND RECTUM
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 25 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000						PERCENTAGE FEMALE OF MALE RATE		
	MALES			FEMALES					
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
WHITE									
1 to 74*.....	10.7	14.3	8.8	12.0	13.9	10.7	112	97	122
45 to 74*.....	48.4	65.6	39.2	53.9	62.3	47.7	111	95	122
25 to 34.....	2.2	2.7	1.9	2.8	3.4	2.2	127	126	116
35 to 44.....	7.3	9.4	6.3	9.7	10.8	9.1	133	115	144
45 to 54.....	21.3	26.6	19.3	26.9	29.6	26.8	126	111	139
55 to 64.....	56.0	72.5	46.8	59.9	68.4	51.9	107	94	111
65 to 74.....	107.5	158.0	79.1	115.9	139.5	96.4	108	88	122
COLORED									
1 to 74*.....	5.3	8.2	3.5	8.3	10.9	6.8	157	133	194
45 to 74*.....	22.7	37.6	13.9	31.1	42.5	23.3	137	113	168
25 to 34.....	1.7	1.8	1.8	4.0	4.3	3.7	235	239	206
35 to 44.....	4.7	5.5	3.7	12.1	14.4	12.0	257	262	324
45 to 54.....	11.1	18.7	8.8	21.6	26.3	19.9	195	141	226
55 to 64.....	28.6	42.6	14.2	34.7	51.7	19.7	121	121	139
65 to 74.....	43.4	79.5	26.9	50.3	69.4	38.8	116	87	144

*Death rates standardized for age.

cancer (all forms) and comprised 1.1 percent of the total deaths in this insured group during the 25 years.

Beginning with 1917, rates of mortality were calculated separately for cancers of the intestines and for cancers of the rectum and anus. In the 19 years for which the figures are available, intestinal cancers were charged with 19,420 deaths and cancers of the rectum and anus with 10,065 deaths among our Industrial policyholders. The standardized annual death rates for intestinal cancer at ages 1 to 74 averaged 7.1 per 100,000, and for cancer of the rectum and anus, 3.7 per 100,000.

Mortality by Age, Sex, and Color

The principal facts regarding the mortality from cancer of the peritoneum, intestines, and rectum, by age, sex, and color for the entire 25-year period as well as for the initial and the final quinquennium of the series, are presented in Table 13. The age distribution of the death rates for the five-year period 1931 to 1935 is shown graphically in Chart IX.

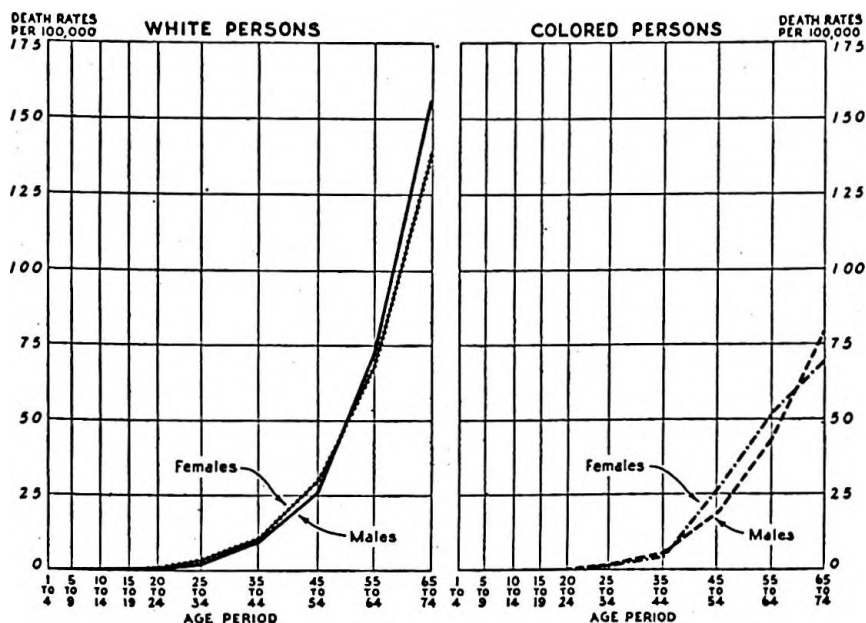
CHART IX

CANCER OF THE PERITONEUM, INTESTINES, AND RECTUM

Averages of Annual Death Rates per 100,000

By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935



Age Although a number of deaths occur in early and middle adult life, the greatest part of the mortality takes place at the older ages. In each color-sex group the death rate rises progressively with advancing age. The increase, however, is much more pronounced among white persons than among the colored.

Sex Among white persons the standardized death rate among males was slightly higher than that for females in the period 1931 to 1935, the rates at ages 1 to 74 years being 14.3 and 13.9 per 100,000, respectively. Analyzing the data by age we find that up to 55 years there is an excess female over male mortality; beyond this age the reverse is true. In the early years of this study, 1911 to 1915, white females registered a higher death rate than males not only at ages 1 to 74 combined, but also at every age period. As Table 13 shows, among the colored, females showed a considerably higher death rate than males throughout the quarter century under review, although the disparity between the sexes has been diminishing.

For the period 1931 to 1935 the death rates from intestinal cancers among females exceeded that for males by a little more than 10 percent among both white and colored persons. For cancers of the rectum and anus the sex ratio varied with color: among white persons the standardized death rate at 1 to 74 years was 38 percent greater for males than for females, whereas among the colored the rate for females averaged $1\frac{1}{2}$ times that for males.

Color The mortality for the group of organs as a whole is higher for white persons than for the colored at ages 1 to 74 combined. The excess amounted to 74 percent among males and 28 percent among females, in the recent five-year period. The color ratio of the mortality varies with the individual sites. Cancer of the intestines shows a higher death rate for white persons than for the colored in each sex and at every age period. For cancer of the rectum and anus, however, the rates for white females are considerably lower than those for colored females at ages under 65 years.

Trend of Mortality

The standardized annual death rates from cancer of the peritoneum, intestines, and rectum among Metropolitan Industrial policyholders, ages 1 to 74 years, rose from 9.4 per 100,000 in the period 1911 to 1915 to 13.7 in 1931 to 1935, an increase of 46

percent. The rise in mortality was negligible during the first decade of this experience, but became more obvious in the following 10 years and was most marked in the closing quinquennium of the period.

The death rates from cancer of this group of organs showed a significant upward trend in each color-sex group for the quarter century under review. The strongest upward tendency is evident for colored males, the group that had the lowest average death rate from this cause. Among them the average annual increase in the death rate was 4.2 percent of the mean rate for the period, 5.3 per 100,000. The next strongest upward tendency was exhibited by white males, among whom the rate increased 2.6 percent per annum. Similarly, among females the relative increase in death rate was greater for the colored than for the white, but the upward movement of the death rate in each group was less than that for the corresponding group of males. In each color-sex group a recorded increase in mortality was evident not only at ages 1 to 74 combined but at every age period. These facts appear in Table 14; Chart X exhibits the annual data graphically for ages 1 to 74. Appendix Table C shows the standardized annual death rates by color, sex, and broad age periods.

TABLE 14
CANCER OF THE PERITONEUM, INTESTINES, AND RECTUM
Averages of Annual Death Rates, and Trend of Mortality
By Color, Sex, and Age. Ages 25 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	AVERAGE OF DEATH RATES PER 100,000				ANNUAL TREND AS PERCENT OF AVERAGE RATE			
	WHITE		COLORED		WHITE		COLORED	
	Males	Females	Males	Females	Males	Females	Males	Females
1 to 74*.....	10.7	12.0	5.3	8.3	+2.6	+1.2	+4.2	+2.0
45 to 74*.....	48.4	53.9	22.7	31.1	+2.7	+1.3	+4.9	+2.6
25 to 34.....	2.2	2.8	1.7	4.0	+2.4	+1.8	+0.2	+0.4
35 to 44.....	7.3	9.7	4.7	12.1	+1.8	+0.6	+2.2	+0.4
45 to 54.....	21.3	26.9	11.1	21.6	+1.5	+0.4	+4.6	+1.0
55 to 64.....	56.0	59.9	28.6	34.7	+2.5	+1.4	+4.3	+4.1
65 to 74.....	107.5	115.9	43.4	50.3	+3.5	+1.9	+5.9	+2.6

*Death rates standardized for age.

NOTE:—Figures in boldface indicate significant trends.

CHART X
CANCER OF THE PERITONEUM, INTESTINES, AND RECTUM
Standardized Annual Death Rates per 100,000
By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

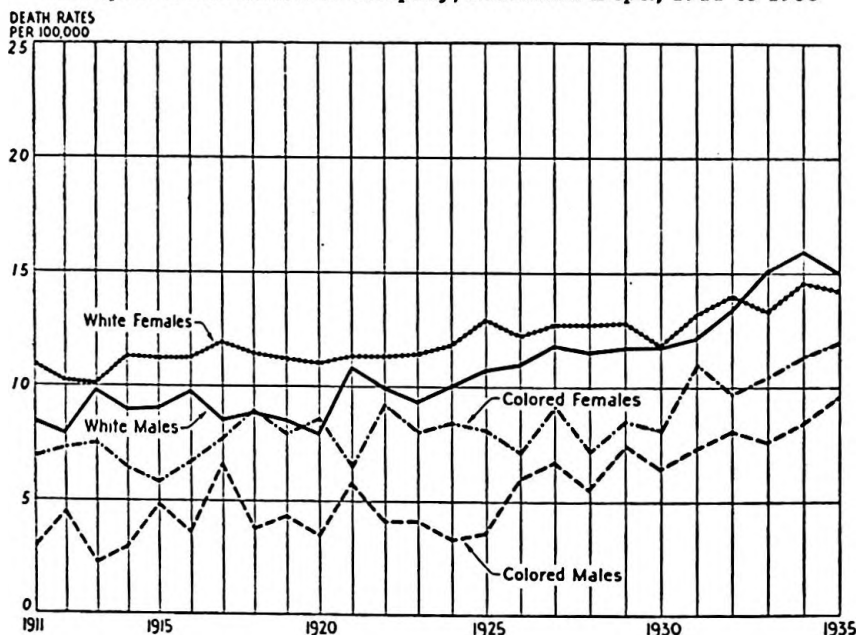


TABLE 15
CANCER OF THE INTESTINES

Averages of Annual Death Rates, and Trend of Mortality
 By Color, Sex, and Age. Ages 25 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1917 to 1935

AGE PERIOD YEARS	AVERAGE OF DEATH RATES PER 100,000				ANNUAL TREND AS PERCENT OF AVERAGE RATE			
	WHITE		COLORED		WHITE		COLORED	
	Males	Females	Males	Females	Males	Females	Males	Females
1 to 74*.....	6.5	8.3	3.3	4.1	+3.3	+1.5	+5.0	+3.1
45 to 74*.....	30.0	37.3	14.6	17.3	+3.4	+1.7	+6.1	+3.5
25 to 34.....	1.2	1.9	0.8	1.4	+3.6	+1.4	-4.1	+2.2
35 to 44.....	4.3	6.1	2.4	4.0	+3.4	+0.3	+3.2	+3.1
45 to 54.....	12.7	16.9	6.9	9.4	+2.7	+1.0	+4.9	+2.9
55 to 64.....	34.8	41.2	18.0	19.1	+2.7	+1.5	+5.7	+4.4
65 to 74.....	68.1	85.4	29.2	35.1	+4.4	+2.2	+7.4	+3.0

*Death rates standardized for age.

NOTE:—Figures in boldface indicate significant trends.

TABLE 16
CANCER OF THE RECTUM AND ANUS
Averages of Annual Death Rates, and Trend of Mortality
By Color, Sex, and Age. Ages 25 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1917 to 1935

AGE PERIOD YEARS	AVERAGE OF DEATH RATES PER 100,000				ANNUAL TREND AS PERCENT OF AVERAGE RATE			
	WHITE		COLORED		WHITE		COLORED	
	Males	Females	Males	Females	Males	Females	Males	Females
1 to 74*.....	4.1	3.4	2.2	4.2	+3.9	+1.6	+ 4.8	+0.6
45 to 74*.....	19.2	15.2	9.6	14.5	+4.2	+1.7	+ 5.0	+1.1
25 to 34.....	0.8	0.9	0.7	2.3	+0.3	+1.0	+ 7.9	-0.4
35 to 44.....	2.6	3.0	1.8	7.2	+2.5	+1.5	+ 1.6	-0.8
45 to 54.....	7.7	7.9	4.2	10.8	+2.5	+1.0	+ 9.4	+ †
55 to 64.....	22.4	17.4	13.9	17.9	+3.9	+1.9	- 0.2	+2.7
65 to 74.....	44.2	30.6	16.4	18.3	+5.2	+2.0	+10.1	+0.1

*Death rates standardized for age. †Less than 0.05.
 NOTE:—Figures in boldface indicate significant trends.

The trend of mortality from cancers of the intestines and of the rectum and anus, separately, for the 19-year period 1917 to 1935, are shown in Tables 15 and 16. These data show that the death rate manifested an upward movement in each color and sex group and virtually at every age period.

In searching for reasons to explain the increased mortality from cancer of the peritoneum, intestines, and rectum, it must be borne in mind that by far the largest number of these cancers are internal and therefore inaccessible to direct diagnosis. We have called attention in an earlier section of this chapter to the fact that even for cancer of the rectum the site is frequently inaccessible. In the light of these facts it is essential to recall that in the years covered by this study diagnostic technique has improved enormously. There has also been a great increase in hospitalization, with consequent rises in the percentage of cases treated by surgery and of those subjected to post-mortem examinations, both of which have affected the precision of diagnosis and have largely contributed to the increased reporting of deaths from such cancers.

CANCER OF THE FEMALE GENITAL ORGANS⁸

Among the weekly premium-paying policyholders of the Metropolitan Life Insurance Company, over the 25 years from 1911 to 1935, cancers of the female genital organs were responsible for 52,704 deaths at ages 1 to 74 years. This number constituted 20.1 percent of the mortality from all forms of cancer and comprised 1.7 percent of the deaths from all causes. Furthermore, cancers of the reproductive organs were responsible for almost one third of the total deaths from malignant tumors in this sex. The standardized annual death rates from cancer of the reproductive organs among white females averaged 25.1 per 100,000, and among colored females, 35.9.

Of the total deaths ascribed to this cause about 90 percent were due to uterine growths, and in view of this fact separate classification of deaths from cancer of the uterus was commenced in 1917. In the 19 years for which figures are available 40,043 deaths were

TABLE 17
CANCER OF THE FEMALE GENITAL ORGANS
Averages of Annual Death Rates per 100,000 Females
By Color and Age. Ages 20 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000						PERCENTAGE COLORED OF WHITE RATE		
	WHITE FEMALES			COLORED FEMALES					
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
1 to 74*.....	25.1	24.4	26.5	35.9	38.3	34.6	143	157	131
25 to 44*.....	22.1	19.1	25.3	38.2	39.0	40.3	173	204	159
45 to 74*.....	96.7	97.6	99.1	128.0	139.1	118.9	132	143	120
20 to 24.....	1.2	1.3	1.1	2.6	3.4	0.6	217	262	55
25 to 34.....	9.0	8.6	9.6	18.8	20.3	20.1	209	236	209
35 to 44.....	39.3	33.0	46.1	63.7	63.5	66.8	162	192	145
45 to 54.....	79.6	74.6	88.2	107.6	111.1	107.2	135	149	122
55 to 64.....	105.2	108.2	108.3	142.3	158.2	131.4	135	146	121
65 to 74.....	127.3	140.7	111.8	156.9	179.7	127.8	123	128	114

*Death rates standardized for age.

⁸Under this heading are classified cancer and other malignant tumors of the broad ligament, ovary, Fallopian tube, uterus (including the cervix), vagina, and vulva.

charged to this site among the females of our insured population. The average of the standardized annual death rates for white females and colored females were, respectively, 21.9 and 34.1 per 100,000.

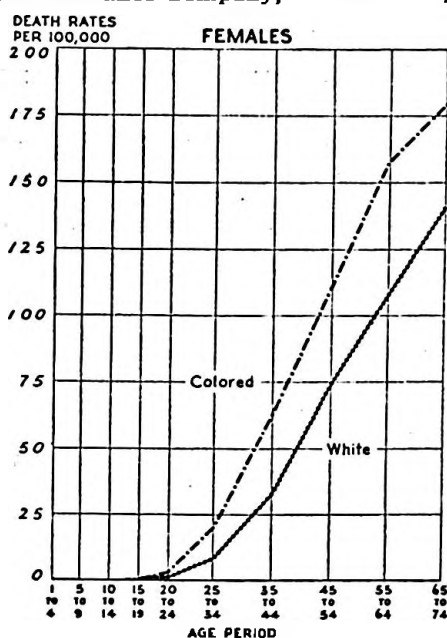
Mortality by Age and Color

The principal facts with regard to the average mortality from cancer of the female genital organs by age and color, over the 25 years of this experience and for the quinquennia at each end of that period, are presented in Table 17. Graphic presentation of the data for the recent quinquennium are found in Chart XI.

Age Below age 20, deaths from cancer of the female genital organs are comparatively rare. Beyond this age the rates rise rapidly with advancing age among both white and colored females.

Color Over the entire period covered by this review the mortality from cancer of the genital organs among colored females, ages 1 to 74 years, was 43 percent higher than that among

CHART XI
CANCER OF THE FEMALE GENITAL ORGANS
Averages of Annual Death Rates per 100,000 Females
By Color and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935



white females; during the five years 1931 to 1935 the excess mortality among colored females was 57 percent, and there is evidence of a tendency for the excess to become even greater as a result of divergent trends in the mortality among white and colored women.

Analyzing the recent rates by age we find that in the age range 20 to 44 years the death rates among colored females were about twice those for white females. This situation probably resulted, in a measure, from the higher birth rate among the colored at these ages. The excess colored mortality decreases, however, with advancing age.

Trend of Mortality

For the quarter century under investigation cancer of the genital organs exhibited divergent trends for white females and colored females. The trend of the death rates at ages 1 to 74 was downward among white women and upward among the colored. Although each of these trends is statistically significant, neither one is pronounced. Among white females the average annual decrease was 0.4 percent of the mean rate for the 25-year period; among colored women the average annual increment was 0.5.

Analysis of the trend by age discloses that the mortality among white females tended to decline, over the 25 years which our experience covers, at every age group except 65 to 74 years. Between 35 and 54 years the mortality from this cause decreased

TABLE 18
CANCER OF THE FEMALE GENITAL ORGANS
Averages of Annual Death Rates, and Trend of Mortality
By Color and Age. Ages 25 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	AVERAGE OF DEATH RATES PER 100,000		ANNUAL TREND AS PERCENT OF AVERAGE RATE	
	White Females	Colored Females	White Females	Colored Females
1 to 74*.....	25.1	35.9	-0.4	+0.5
45 to 74*.....	96.7	128.0	-0.1	+0.7
25 to 34.....	9.0	18.8	-0.4	+0.5
35 to 44.....	39.3	63.7	-1.6	-0.1
45 to 54.....	79.6	107.6	-0.9	+0.2
55 to 64.....	105.2	142.3	-†	+0.8
65 to 74.....	127.3	156.9	+1.1	+1.5

*Death rates standardized for age. †Less than 0.05.

NOTE:—Figures in boldface indicate significant trends.

significantly. Among colored women increasing trends were noted in the death rates at every age period except 35 to 44, where a slight decline was recorded. These facts are summarized in Table 18.

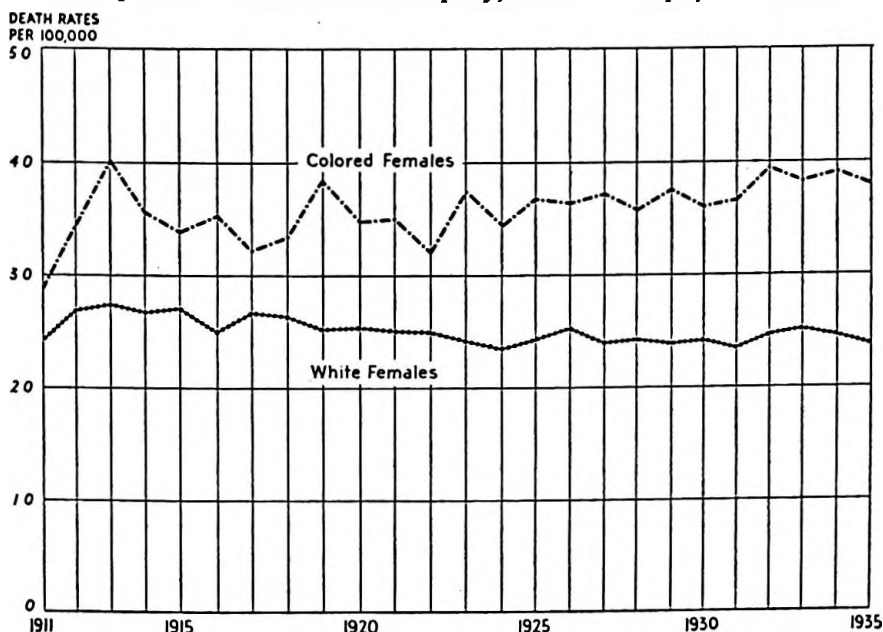
The standardized annual rates of mortality from cancer of the female genital organs, for both white and colored females for three age periods—1 to 74, 25 to 44, and 45 to 74 years—are given in Appendix Table C. In Chart XII the annual death rates are shown for each group of women at ages 1 to 74 years combined.

Discussion of Trend

A statistically significant decline in the mortality from cancers of the generative organs among white women is a finding of considerable importance, because these neoplasms constitute an important cause of death. Undoubtedly the factors that have contributed to this decline are both direct and indirect. Improvement in medical knowledge, in diagnostic technique, and in surgical skill share the credit for this result with the decline in

CHART XII
CANCER OF THE FEMALE GENITAL ORGANS
Standardized Annual Death Rates per 100,000 Females
By Color. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



the birth rate and the improvement in obstetrical and postpartum care. The close relation between cancer of the uterus, particularly of the cervix, and injuries to that organ during childbirth has been generally recognized. With the falling birth rates which have obtained in the United States and in Canada it is only natural that the death rates from cancer of the uterus should have declined. As indicated above, this expectation is borne out by our experience among white, but not among colored women. The differing tendencies suggest, and may be in part a measure of, the difference in the quality of medical care available to white and to colored persons.

The relative incidence of syphilis is another factor which may have a bearing on these divergent trends of mortality among white and colored females. It is rather hazardous to attempt to draw any definite conclusions from the mortality data for a disease which is so frequently concealed, but attention must be drawn to the fact that our records show that the death rates from syphilis increased among colored women and decreased among white women during the period of this review.

Mortality from Cancer of Uterus and of Ovary and Fallopian Tube

Of the deaths from malignant tumors among females, the uterus is charged with a greater number than any other organ or part of the body. As the site of fatal cancer among white women, it exceeds the stomach in our mortality statistics by about 45 percent, but it must be borne in mind that uterine cancers are, for the most part, accessible and thus readily diagnosed, whereas gastric cancers are inaccessible and, therefore, frequently escape detection. Among colored women deaths from uterine cancer are reported $2\frac{1}{2}$ times as frequently as those from gastric cancer.

Unfortunately, our data do not differentiate between growths in the cervix, where probably 90 percent of uterine cancers have originated in the past, and those affecting the body of the organ. This has marred, in a way, the discussion of cancer mortality on the basis of accessibility; the improvement shown in cervical cancer among white women is undoubtedly greater than indicated in the decline of the death rate from all cancers of the uterus.

The death rates from cancers of the ovary and Fallopian tube, although much lower than those of uterine cancers, increased significantly among both white women and colored women in the period under review. Whether this increase is real or only apparent

is problematical. It is possible that greater accuracy of diagnosis may account for much, if not the whole, of the increase. The ovaries and Fallopian tubes are classed among the inaccessible cancers, while the majority of cancers of the female genital organs—primarily cancers of the cervix of the uterus—are accessible for diagnosis and treatment. This difference in accessibility may account for the contrary trends. The facts are summarized in Table 19.

TABLE 19
CANCER OF OVARY AND FALLOPIAN TUBE AND OF UTERUS
Averages of Annual Death Rates*, and Trend of Mortality
By Color and Age. Ages 25 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1917 to 1935

AGE PERIOD YEARS	AVERAGE OF DEATH RATES* PER 100,000				ANNUAL TREND AS PERCENT OF AVERAGE RATE			
	OVARY AND FALLOPIAN TUBE		UTERUS		OVARY AND FALLOPIAN TUBE		UTERUS	
	White Females	Colored Females	White Females	Colored Females	White Females	Colored Females	White Females	Colored Females
1 to 74.....	2.1	1.6	21.9	34.1	+6.4	+ 8.3	—1.0	+0.4
25 to 44.....	1.9	1.6	18.9	35.5	+4.8	+ 4.0	—1.9	+0.5
45 to 74.....	7.4	5.3	85.6	122.9	+7.4	+10.7	—0.8	+0.3

*Standardized for age.

NOTE:—Figures in boldface indicate significant trends.

CANCER OF THE BREAST⁹

Cancer of the breast was responsible for 26,324 deaths, or one tenth of the total number of deaths ascribed to cancer among Metropolitan Industrial policyholders in the quarter century 1911 to 1935. The standardized death rates for the period averaged 6.7 per 100,000 insured persons at 1 to 74 years. Breast cancer is almost altogether a malady of women—less than 1 per cent of the deaths from this cause occur among men. For this reason the discussion which follows will be limited to the experience among females.

Mortality by Age and Color

The principal facts with regard to the distribution of the mortality from cancer of the breast among females, by age and color, are presented in Table 20. Chart XIII shows graphically the data for the period 1931 to 1935.

Age For both white and colored females the death rates from cancer of the breast are less than one per 100,000 below age 25. From this low point the rates rise rapidly and irreversibly

TABLE 20
CANCER OF THE BREAST
Averages of Annual Death Rates per 100,000 Females
By Color and Age. Ages 25 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	WHITE FEMALES			COLORED FEMALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
1 to 74*.....	12.8	14.8	11.9	13.7	14.4	14.4
25 to 44*.....	9.0	9.7	10.0	10.6	12.0	11.0
45 to 74*.....	53.3	62.9	47.4	55.3	57.5	58.6
25 to 34.....	2.9	3.4	3.2	3.8	3.7	4.4
35 to 44.....	17.0	18.1	19.0	19.6	22.9	19.6
45 to 54.....	40.5	45.8	36.5	41.8	47.6	44.2
55 to 64.....	57.4	70.6	48.2	58.5	59.3	63.3
65 to 74.....	80.6	95.0	75.6	85.8	80.6	89.3

*Standardized for age.

⁹Paget's disease of the nipple, previously classified in the International List of Causes of Death as one of the nonpuerperal diseases of the breast, has been included under cancer of the breast since 1921. It is believed, however, that the number of deaths charged to this cause has not been sufficient to affect the comparability of our death rates over the 25-year period.

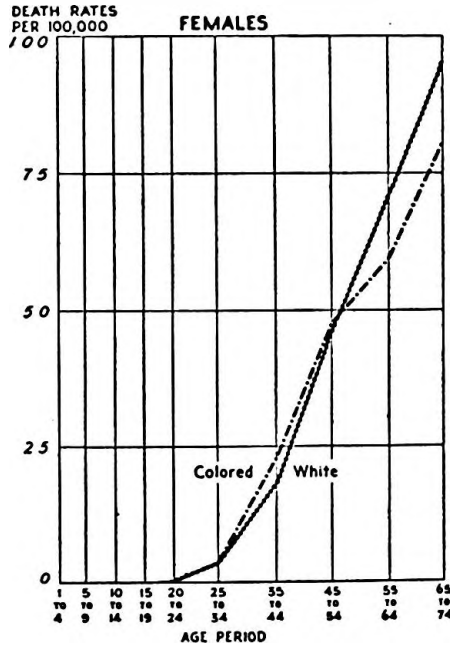
CHART XIII

CANCER OF THE BREAST

Averages of Annual Death Rates per 100,000 Females

By Color and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935



with advancing age to reach their maxima in the highest age period, 65 to 74 years, where the average rates in the recent quinquennium were 95.0 per 100,000 for white women and 80.6 per 100,000 for colored women.

Color For the five-year period 1931 to 1935 the average death rates at ages 1 to 74 were 14.8 per 100,000 for white females and 14.4 for colored females, indicating that in recent years there has been virtually no difference in the mortality from breast cancer for these two groups of women. Analyzing the death rates by age, we find that in the age groups under 55 years the mortality is higher among colored women, but past 55 the reverse is true. In the early years covered by this study the death rates for colored females were higher than for white females not only at ages 1 to 74 years combined but also at each age period.

Trend of Mortality

The death rates from cancer of the breast among white females at ages 1 to 74 years showed a significant upward trend in the

quarter century under review. Moreover, a rise in death rate is evident at every age period except 35 to 44 years, at which ages a slight decrease is shown. In the age range 45 to 74 a significant upward trend in the death rate was manifested at each 10-year age period. These facts are evident from Table 21.

In contrast with the experience for white females the death rate among colored females at ages beyond 55 declined slightly during the 25-year period. None of the specific age groups showed any upward or downward movement of significance.

Chart XIV displays graphically the standardized annual death rates for white females and colored females at ages 1 to 74 years; Appendix Table C presents the annual rates for these groups by broad age periods.

Discussion of Trend

As was indicated in the introductory section to this chapter, an accessible organ that shows an increasing cancer death rate is exceptional and, as such, calls for special attention. It is probable that much of the increase has been due to more accurate certification of cause of death. This point was brought out by Bigelow and Lombard and has been discussed on page 183.

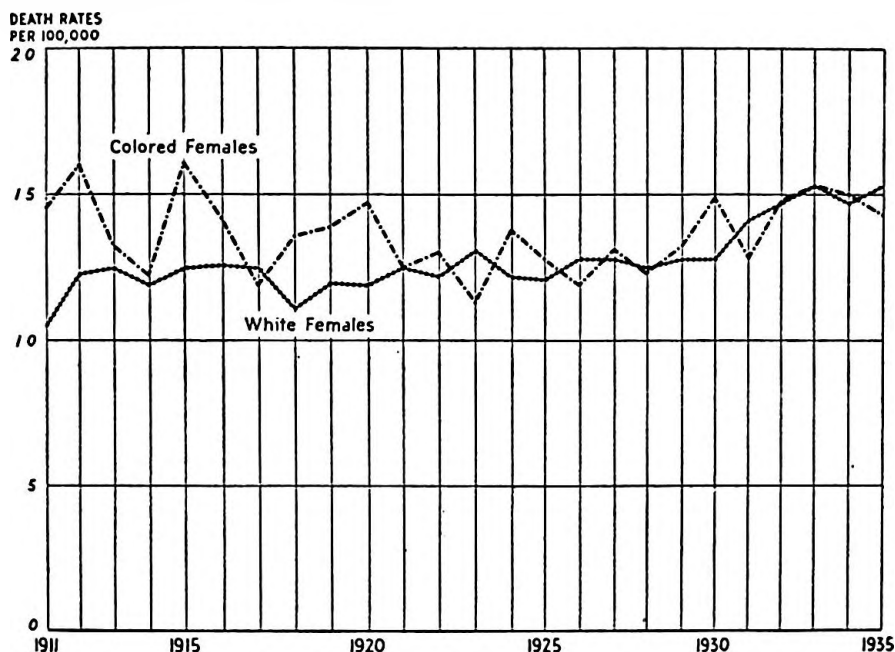
Then, too, there is another factor that merits consideration. The incidence of cancer of the breast is higher among unmarried than among married women, and among married women those

TABLE 21
CANCER OF THE BREAST
Averages of Annual Death Rates, and Trend of Mortality
Among Females by Color and Age. Ages 25 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	AVERAGE OF DEATH RATES PER 100,000		ANNUAL TREND AS PERCENT OF AVERAGE RATE	
	White Females	Colored Females	White Females	Colored Females
1 to 74*.....	12.8	13.7	+1.0	+ †
45 to 74*.....	53.3	55.3	+1.3	—0.1
25 to 34.....	2.9	3.8	+0.5	—0.3
35 to 44.....	17.0	19.6	—0.3	+0.5
45 to 54.....	40.5	41.8	+1.0	+0.3
55 to 64.....	57.4	58.5	+1.8	—0.2
65 to 74.....	80.6	85.8	+1.0	—0.5

*Death rates standardized for age. †Less than 0.05.
NOTE:—Figures in boldface indicate significant trends.

CHART XIV
CANCER OF THE BREAST
 Standardized Annual Death Rates per 100,000 Females
 By Color. Ages 1 to 74 Years
 Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



who have borne and suckled children are least affected by this disease. It would be of interest, therefore, in searching for the causes—apart from improvement in diagnosis, certification, and statistical practices—that might have contributed to an increase in the death rate from cancer of the breast among white women, to consider both the marital status of the decedents, their fertility, and the trend of the birth rate. Unfortunately, our mortality data have not been analyzed with reference to the marital status; furthermore, fertility is not recorded on death certificates. The relation between childbearing, suckling, and cancer of the breast must, therefore, be determined through other studies. One interesting fact, however, in this connection, is that while the death rate from cancer of the breast among white women has apparently been increasing, the birth rate has been declining. If we had incontrovertible evidence of an increase in the mortality from breast cancer, these observations might lend support to the thesis that an increase in breast cancer is associated with a declining birth rate; however, such evidence is lacking.

CANCER OF THE BUCCAL CAVITY¹⁰

In the quarter century under review a total of 8,095 deaths among Metropolitan Industrial policyholders, ages 1 to 74 years, was classified under this title. This number comprised 3.1 percent of the total deaths charged to cancer. The standardized annual death rates from buccal cancers averaged 3.2 per 100,000 in the period 1911 to 1935. The deaths were heavily concentrated among males.

TABLE 22
CANCER OF THE BUCCAL CAVITY
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 25 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
WHITE						
1 to 74*	6.0	5.6	6.3	0.8	0.8	0.9
45 to 74*	29.4	28.1	30.2	3.7	3.6	4.0
25 to 34	0.3	0.2	0.3	0.1	0.1	0.1
35 to 44	2.9	2.1	3.4	0.5	0.4	0.7
45 to 54	13.3	11.0	14.7	1.6	1.6	1.7
55 to 64	33.9	33.5	33.6	3.8	3.7	4.3
65 to 74	64.3	64.5	65.7	9.2	8.8	9.7
COLORED						
1 to 74*	2.7	2.8	2.5	1.1	0.9	1.4
45 to 74*	12.6	13.4	12.3	4.6	3.8	6.2
25 to 34	0.3	0.0	0.2	0.3	0.4	0.3
35 to 44	1.6	1.4	0.5	1.1	0.7	1.2
45 to 54	6.0	5.8	8.8	2.3	1.5	3.6
55 to 64	15.7	19.7	16.4	5.5	4.8	7.4
65 to 74	24.6	22.4	14.4	9.0	8.2	10.9

*Standardized for age.

¹⁰This title includes cancer and other malignant tumors of the cheek, gum, jaw, lip, maxilla, palate, soft palate, tongue, and tonsils, and, for the years 1911 to 1920, cancer of the sub-maxillary gland. It does not include cancer of the pharynx, which, in this study, is classified under the title "Cancer of other or unspecified organs."

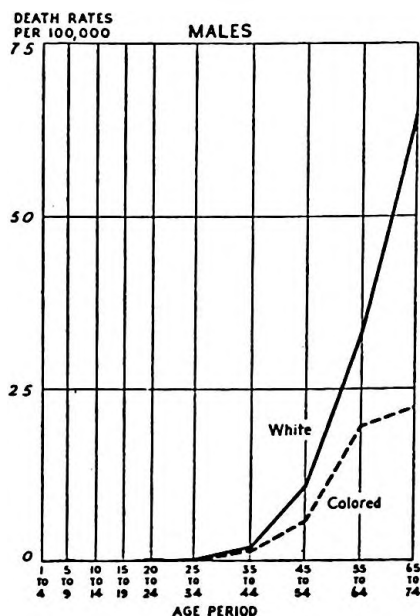
Mortality by Age, Sex, and Color

The principal facts regarding the mortality from cancer of the buccal cavity by age, sex, and color are presented in Table 22. Chart XV displays graphically the age distribution of the death rates for white males and for colored males.

Age Deaths from buccal cancers are rare below age 25. Analysis of the data for the five-year period 1931 to 1935 reveals that from a death rate of less than 0.5 per 100,000 at age period 25 to 34, the mortality rose progressively with advancing age, establishing maximum rates in the highest age group of our experience, 65 to 74 years. White males exhibited the most rapid rise; among women, both white and colored, the increase in rate with age was gradual as compared with the experience among men.

Sex Among white males the standardized death rate, at ages 1 to 74 years combined, was seven times that for white females in the recent quinquennium. Colored males registered a rate three times that for colored females.

CHART XV
CANCER OF THE BUCCAL CAVITY
Averages of Annual Death Rates per 100,000 Males
By Color and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935



Color The mortality from cancer of the buccal cavity among white males was twice that for colored males. In contrast with this experience among males, the average death rate among colored females slightly exceeded that for white females.

Trend of Mortality

For the 25-year period under survey the mortality in each color-sex group, except colored males, manifested a downward trend. Among white persons in each sex, the decline was statistically significant. Analysis of the trend data by age reveals that the death rate decreased at every age period among white males and among both white and colored females. The largest percent decline of the average death rates was recorded in middle adult life.

Table 23 presents the 25-year trend data by color, sex, and age periods. Chart XVI exhibits in graphic form the time series for white males and colored males. In Appendix Table C will be found standardized annual death rates for total persons and for each color-sex group by broad age periods.

Control of Buccal Cancer

The general decline in mortality from cancer of the buccal cavity indicates perhaps that the disease is being brought under control. This measure of success should encourage us to intensify

TABLE 23
CANCER OF THE BUCCAL CAVITY
Averages of Annual Death Rates, and Trend of Mortality
By Color, Sex, and Age. Ages 35 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

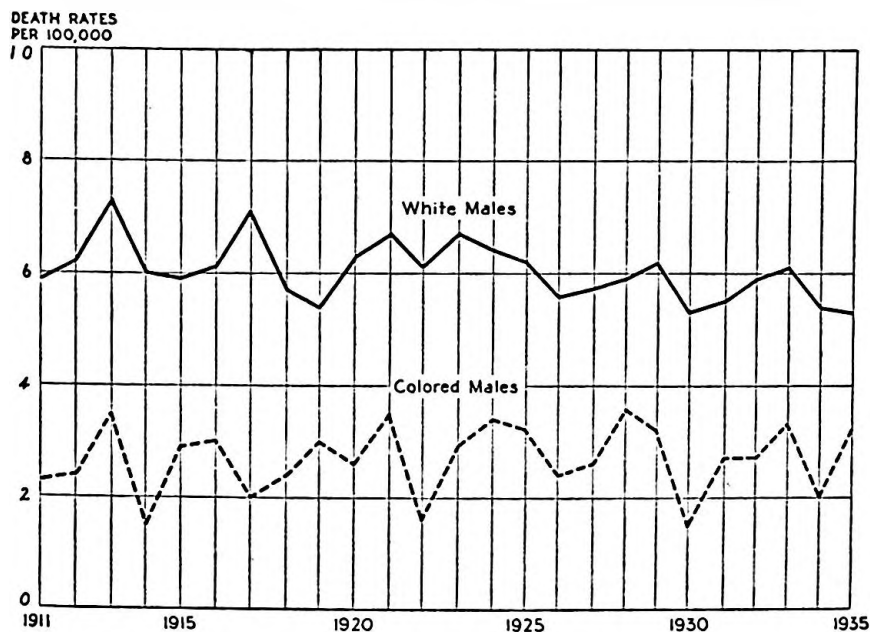
AGE PERIOD YEARS	AVERAGE OF DEATH RATES PER 100,000				ANNUAL TREND AS PERCENT OF AVERAGE RATE			
	WHITE		COLORED		WHITE		COLORED	
	Males	Females	Males	Females	Males	Females	Males	Females
1 to 74*.....	6.0	0.8	2.7	1.1	—0.6	—1.0	+0.4	—1.8
45 to 74*.....	29.4	3.7	12.6	4.6	—0.4	—0.7	+0.6	—1.7
35 to 44.....	2.9	0.5	1.6	1.1	—2.4	—2.8	—0.1	—1.6
45 to 54.....	13.3	1.6	6.0	2.3	—1.3	—1.2	—1.5	—3.5
55 to 64.....	33.9	3.8	15.7	5.5	—0.1	—1.0	+0.7	—1.8
65 to 74.....	64.3	9.2	24.6	9.0	—0.1	—0.2	+1.9	—0.5

*Death rates standardized for age.

NOTE:—Figures in boldface indicate significant trends.

CHART XVI
CANCER OF THE BUCCAL CAVITY
Standardized Annual Death Rates per 100,000 Males
By Color. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



and widen the educational campaign that has been carried on by public and private health agencies. The keynote of such program is the urging of early diagnosis and treatment for all persistent swellings and open sores in and about the mouth. Special effort should be made to enlist the attention of persons who have suffered from the mouth lesions of syphilis. Publicity should be given, too, to the importance of mouth hygiene and adequate dental care as prophylactic measures.

CANCER OF THE SKIN¹¹

Of the several cancer titles in the International List, cancer of the skin shows the lowest death rate. In the 25-year period 1911 to 1935, a total of 4,315 deaths among Metropolitan Industrial policyholders at ages 1 to 74 years was attributed to cancer of the skin; this number was 1.6 percent of the deaths charged to all forms of cancer. The average of the standardized annual death rates from skin cancer at these ages was 1.6 per 100,000 policyholders. Among white persons the death rates averaged 1.7 per 100,000; among the colored only 0.7.

TABLE 24
CANCER OF THE SKIN

Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 25 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
WHITE						
1 to 74*.....	2.3	1.7	2.7	1.2	0.9	1.4
45 to 74*.....	11.1	8.2	12.8	5.7	4.2	7.1
25 to 34.....	0.2	0.3	0.2	0.2	0.2	0.2
35 to 44.....	0.9	0.6	1.2	0.5	0.3	0.4
45 to 54.....	3.5	2.0	3.8	1.6	1.2	1.6
55 to 64.....	11.0	8.6	13.5	5.1	3.5	6.1
65 to 74.....	32.0	24.2	35.5	18.2	13.7	23.8
COLORED						
1 to 74*.....	0.7	0.6	0.9	0.7	0.7	0.8
45 to 74*.....	2.6	2.1	3.7	3.1	2.5	3.6
25 to 34.....	0.3	0.1	0.2	0.3	0.4	0.2
35 to 44.....	0.8	0.9	1.0	0.5	0.8	0.5
45 to 54.....	1.9	1.4	2.0	1.4	1.2	2.0
55 to 64.....	3.2	2.7	6.0	3.6	2.5	4.8
65 to 74.....	3.5	2.7	4.1	7.0	5.9	5.8

*Standardized for age.

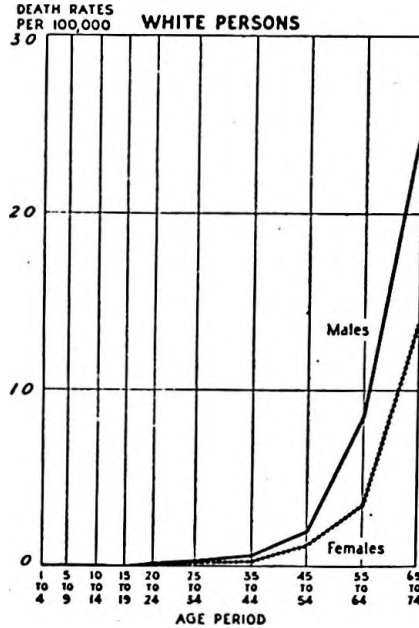
¹¹Not all deaths from cancer of the skin are included under this title. Malignant tumors of the external genital organs and of the cheek, for example, are allocated to other headings. Likewise, deaths reported as due to cancer of the arm, leg and other such organs are not classified under this title unless specified as skin cancer.

CHART XVII CANCER OF THE SKIN

Averages of Annual Death Rates per 100,000 White Persons

By Sex and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935



Mortality by Age, Sex, and Color

The principal facts regarding the mortality from cancer of the skin by age, sex, and color are set forth in Table 24. Chart XVII presents graphically the average death rates by age for white males and white females in the period 1931 to 1935.

Age Deaths from skin cancer are concentrated at the older ages. In the recent quinquennium the death rates at each age period under 45 were below 1 per 100,000 lives exposed. From this low point the death rates in each color-sex group increased progressively with advancing age, recording maximum rates in the highest age period of our experience, 65 to 74 years. Data for the general population of the United States disclose, moreover, that approximately 45 percent of the deaths from skin cancer occur at ages 75 and over.

Sex Among white persons, in the aggregate, the average death rate for males was almost twice that for females in the period 1931 to 1935. Moreover, the rate among males exceeded

that among females at every age period, the maximum excess being registered at ages 55 to 64. Among colored persons, on the other hand, the recorded mortality for females was slightly higher than that for males at ages 1 to 74 combined; this ratio reflects mainly the excess female mortality at ages beyond 65 years.

Color These data indicate that colored persons are relatively immune to cancers of the skin. The rate for white males was about three times that for colored males in the period 1931 to 1935. The excess white over colored mortality among males past 45 years increased steadily with advancing age until, at age group 65 to 74, there were nine deaths of white men for every one among colored men. Similarly, white females showed higher rates of mortality than colored females at the older ages, but the differences were much less than those for males. This differential mortality between the Negro and the Caucasian suggests a fertile field for investigation.

Trend of Mortality

For the quarter century under survey the trend of the death rate from skin cancer was significantly downward among white policyholders in each sex. Among white males, ages 1 to 74, the average annual fall in mortality was 2.3 percent of the mean rate for the 25-year period, which was 2.3 per 100,000; among white females, in the same age range, the average annual decrement was 2.8 percent of the mean death rate, 1.2 per 100,000. The number of deaths annually among colored persons was too small and the fluctuation in rate from year to year too wide, to merit the calculation of trends for these groups.

Analysis of the trend among white persons by age discloses that at every age period for which the data are sufficient to warrant calculation, the death rates revealed a downward tendency.

Among white males the downward trend was statistically significant at every age period between 35 and 74 years. The decline in the death rate was also significant among white females at ages 55 to 74 years. The data concerning the trend of the mortality at the various ages are summarized in Table 25.

In these declining death rates from cancer of the skin there is evidence that either the incidence of the disease is decreasing or that modern therapeutic methods, surgical or radiological, have markedly reduced its fatality. It is probable that both these factors have combined to bring about this result. There is also

TABLE 25
CANCER OF THE SKIN

Averages of Annual Death Rates, and Trend of Mortality
Among White Persons by Sex and Age. Ages 35 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	AVERAGE OF DEATH RATES PER 100,000		ANNUAL TREND AS PERCENT OF AVERAGE RATE	
	White Males	White Females	White Males	White Females
1 to 74*.....	2.3	1.2	—2.3	—2.8
45 to 74*.....	11.1	5.7	—2.2	—3.0
35 to 44.....	0.9	0.5	—4.0	—1.6
45 to 54.....	3.5	1.6	—2.6	—2.6
55 to 64.....	11.0	5.1	—2.2	—3.0
65 to 74.....	32.0	18.2	—2.1	—3.1

*Death rates standardized for age.

NOTE:—Figures in boldface indicate significant trends.

a suggestion that the elimination of industrial hazards, which in earlier years may have contributed to the incidence of skin cancer among males, has had a favorable influence on the death rates in these groups.

Chart XVIII exhibits in graphic form the 25-year series for white males and white females; in Appendix Table C are presented the standardized annual death rates by color, sex, and broad age periods.

Factors in the Decline of Mortality

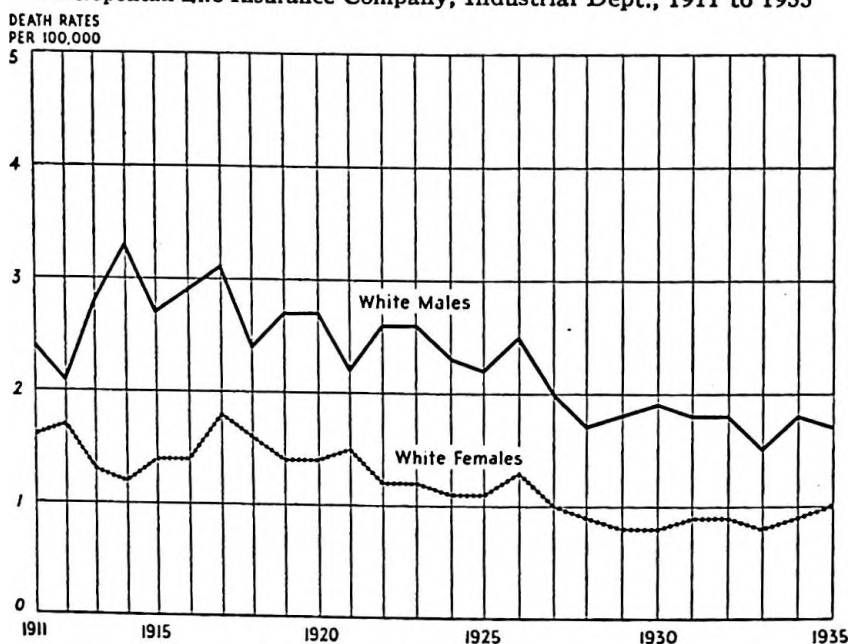
The downward trend in mortality from cancer of the skin is one of the bright spots in the cancer picture. In the period of this experience there have been no startling developments in the matter of diagnosis—skin cancers were as readily recognized and as accessible for treatment 25 years ago as they are today. Nevertheless, at least two potent factors have been at work to bring about this decrease: educational propaganda and improved methods of treatment.

It is to be noted that the first treatment by implantation of radium in a cancer occurred in 1911, and that since that time radiotherapy, both with radium emanations and the X-rays, has made remarkable progress. The campaign of education that has caused persons with suspicious sores and swellings to obtain competent medical advice while the cancer is still susceptible to com-

CHART XVIII CANCER OF THE SKIN

Standardized Annual Death Rates per 100,000 White Persons
By Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



plete removal or to local treatment, has doubtless had some effect in bringing about this observed decline. Such efforts and the more general recommendation for periodic physical examination must be continued so that these cancers may be diagnosed and brought under suitable medical care at the earliest possible moment.

CANCER OF OTHER ORGANS OR OF ORGANS NOT SPECIFIED¹²

Over the 25 years covered by this study, 50,925 deaths among the weekly premium-paying policyholders of the Metropolitan Life Insurance Company were charged to cancers comprising this group. This number is 19.5 percent of the total cancer deaths reported during the quarter century. The average of the standardized annual death rates for this residual title was 16.6 per 100,000 at ages 1 to 74 years.

It is unfortunate that almost one fifth of the entire cancer mortality (and virtually one third of that among males) is grouped under a title of miscellaneous character. With a view of obtaining more precise information, the Statistical Bureau of this Company, as long ago as 1917, adopted the procedure of the United States Census Office and tabulated separately certain of the inclusions under this title. Because of their importance as sites of fatal cancer, certain of these—bladder, lung and pleura, pancreas, and prostate—will receive special consideration in this section.

The Census Bureau subdivisions under this main title left a residual subtitle under which were classified deaths from malignant growths of such definite sites as, for example, (a) the eye and orbit, (b) the external genital organs of the male, and (c) the thyroid gland, together with deaths indefinitely diagnosed as "malignant disease" without further qualification, "general carcinomatosis," and the like. In retrospect, it appears that division of this residual subtitle would have been desirable. First, cases in which the site was specified should have been distinguished from those in which it was not specified. Then the specified sites should have been further subdivided and grouped on the basis of accessibility.

Analysis of our data for the year 1929 leads us to believe that more than one fifth of the deaths from accessible cancers among males are included in this subgroup. With information regarding accessibility lacking in such large proportion of male deaths, it

¹²Deaths from malignant tumors not classified under the various anatomical subdivisions already discussed are grouped under this residual heading. Included under it are deaths from cancers of organs not commonly attacked and those cases in which it has been impossible to obtain precise information regarding the part of the body affected. Among the inclusions in this miscellaneous group in the 1920 International List of Causes of Death are cancers and other malignant tumors of the following organs and sites: arteries, bones (except jaw), muscles and nerves, heart, brain, eye, bladder, male genital organs, lung and pleura, pancreas, kidneys and suprarenals, neck, chest, abdomen, arm, or leg. Deaths from cancer of the throat and, since 1917, cancer of the pharynx have been included in this group and not with Cancer of the Stomach, Liver as classified in the 1920 revision of the International List.

has not been possible to calculate trends of mortality for all accessible and for all inaccessible cancers as groups.

Mortality by Color, Sex, and Age

Age In each of the four color and sex classes the death rates from this miscellaneous group of cancers rose progressively and irreversibly with advancing age. The figures appear in Table 26.

TABLE 26
CANCER OF OTHER OR UNSPECIFIED ORGANS†

Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
WHITE						
1 to 74*	23.2	32.1	15.2	11.2	14.0	9.0
45 to 74*	102.5	143.4	65.0	45.0	56.8	34.7
1 to 4	2.8	3.3	2.5	2.6	3.1	2.9
5 to 9	1.5	2.1	0.9	1.3	1.7	1.1
10 to 14	1.3	2.1	1.1	1.2	1.7	0.7
15 to 19	2.7	3.5	2.3	1.7	1.9	1.7
20 to 24	3.1	4.2	2.6	1.6	2.1	1.4
25 to 34	4.7	6.2	4.1	3.4	4.3	2.9
35 to 44	14.3	18.7	10.1	10.1	11.2	9.0
45 to 54	47.3	66.4	31.7	26.4	30.7	20.3
55 to 64	117.9	163.6	74.1	51.4	68.6	38.2
65 to 74	223.7	314.7	138.4	83.3	106.2	67.3
COLORED						
1 to 74*	14.5	22.3	8.5	8.8	11.5	7.5
45 to 74*	60.7	96.9	34.3	32.6	44.1	28.4
1 to 4	2.2	1.8	2.3	2.3	4.0	0.8
5 to 9	1.3	2.5	0.4	0.9	0.8	0.4
10 to 14	1.4	2.0	0.0	0.9	0.7	0.8
15 to 19	1.9	2.8	1.2	2.1	2.5	2.1
20 to 24	2.2	3.6	0.4	1.9	2.0	2.3
25 to 34	3.6	5.1	2.1	3.5	4.6	3.3
35 to 44	11.2	14.2	9.6	9.4	10.5	7.0
45 to 54	29.9	44.5	21.9	21.5	26.1	18.1
55 to 64	69.2	111.6	38.9	39.5	51.6	38.1
65 to 74	128.7	211.7	59.3	50.1	79.0	38.8

*Standardized for age.

†Including cancer of the pharynx.

Sex In view of the fact that this heterogeneous group includes some forms of cancer peculiar to the male sex, a comparison of the death rates among men and among women, for this title as a unit, obviously is unwarranted. However, the sex ratio for certain of the subdivisions of this International List title have been computed. In each case males showed a higher rate. In the five-year period 1931 to 1935 the percentage male of female death rate among white persons at ages 1 to 74 was as follows: lung and pleura, 256; bladder, 247; and pancreas, 127. For each of these sites the excess male over female mortality increased in the 19-year period.

Color The recorded death rate from "cancer of other or unspecified organs" was higher among white policyholders than among the colored. The excess white over colored rate, at ages 1 to 74, averaged 44 percent for males and 22 percent for females in the recent quinquennium.

The color ratio of mortality for the various subdivisions of this title, except that for the prostate, are not discussed, because of the relatively small number of deaths among colored persons. The average of the standardized death rates from prostatic cancers among colored males (6.7 per 100,000) was 20 percent in excess of that among white males (5.6 per 100,000) in 1931 to 1935.

Trend of Mortality

Playing an important role in the upward trend of the total cancer mortality in this experience has been the rapid rise in the death rate from "cancer of other or unspecified organs." No other title under the cancer rubric, for the 25 years 1911 to 1935, manifested as marked an increase in mortality as this residual group. The death rate from cancers comprising this miscellaneous title rose significantly in each color and sex class for the quarter century under review. Table 27 gives the trend data for males and females by color and broad age periods; Chart XIX presents the time series graphically.

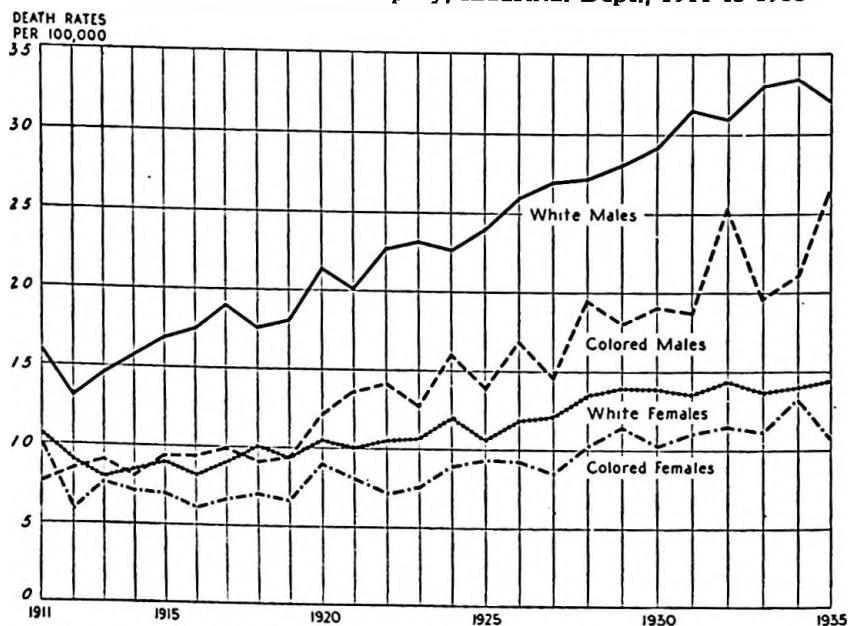
The trend of the death rates for the four important subdivisions of this title have been calculated for the years 1917 to 1935. The mortality from cancers of the lung and pleura, bladder, and pancreas increased significantly among both white males and white females. In each case the rise in death rate was more pronounced among men than among women. The number of deaths annually among colored policyholders from cancers involving these sites were too

TABLE 27
CANCER OF OTHER OR UNSPECIFIED ORGANS†
Averages of Annual Death Rates*, and Trend of Mortality
By Color and Sex. Ages 1 to 74 and 45 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

COLOR AND SEX	AVERAGE OF DEATH RATES* PER 100,000		ANNUAL TREND AS PERCENT OF AVERAGE RATE	
	Ages 1 to 74	Ages 45 to 74	Ages 1 to 74	Ages 45 to 74
White males.....	23.2	102.5	+3.6	+3.8
White females.....	11.2	45.0	+2.4	+2.7
Colored males.....	14.5	60.7	+4.8	+5.2
Colored females...	8.8	32.6	+2.5	+2.5

*Standardized for age. †Including the pharynx.
 NOTE:—Figures in boldface indicate significant trends.

CHART XIX
CANCER OF OTHER OR UNSPECIFIED ORGANS*
Standardized Annual Death Rates per 100,000
By Color and Sex. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



*Including cancer of the pharynx.

few to merit calculation of trends. For prostatic cancer the death rate rose sharply during the 19-year period, the increase being more rapid among colored males than among the white. The trend data appear in Tables 28, 29, 30, and 31. Appendix Table C presents the standardized annual death rates for these subdivisions and for the title as a whole, by color, sex, and broad age groups.

TABLE 28

CANCER OF THE LUNG AND PLEURA

Averages of Annual Death Rates, and Trend of Mortality
Among White Persons, by Sex and Age. Ages 25 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1917 to 1935

AGE PERIOD YEARS	AVERAGE OF DEATH RATES PER 100,000		ANNUAL TREND AS PERCENT OF AVERAGE RATE	
	White Males	White Females	White Males	White Females
1 to 74*.....	2.2	1.2	+ 9.5	+5.4
45 to 74*.....	9.2	4.6	+10.5	+5.8
25 to 34.....	0.6	0.4	+ 6.8	+2.9
35 to 44.....	2.2	1.3	+ 8.5	+3.9
45 to 54.....	6.5	3.2	+10.9	+3.9
55 to 64.....	11.8	5.5	+10.8	+6.8
65 to 74.....	12.0	6.5	+ 9.4	+6.9

*Death rates standardized for age.

NOTE:—Figures in boldface indicate significant trends.

TABLE 29

CANCER OF THE BLADDER

Averages of Annual Death Rates, and Trend of Mortality
Among White Persons, by Sex and Age. Ages 35 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1917 to 1935

AGE PERIOD YEARS	AVERAGE OF DEATH RATES PER 100,000		ANNUAL TREND AS PERCENT OF AVERAGE RATE	
	White Males	White Females	White Males	White Females
1 to 74*.....	3.7	1.5	+2.4	+1.2
45 to 74*.....	18.3	7.4	+2.4	+1.6
35 to 44.....	1.6	0.8	+1.7	—1.5
45 to 54.....	6.8	3.2	+3.1	—2.0
55 to 64.....	20.3	8.3	+1.9	+2.5
65 to 74.....	45.8	17.2	+2.6	+2.7

*Death rates standardized for age.

NOTE:—Figures in boldface indicate significant trends.

TABLE 30
CANCER OF THE PANCREAS
 Averages of Annual Death Rates, and Trend of Mortality
 Among White Persons, by Sex and Age. Ages 35 to 74 Years
 Metropolitan Life Insurance Company, Industrial Dept., 1917 to 1935

AGE PERIOD YEARS	AVERAGE OF DEATH RATES PER 100,000		ANNUAL TREND AS PERCENT OF AVERAGE RATE	
	White Males	White Females	White Males	White Females
1 to 74*.....	1.9	1.6	+6.3	+5.6
45 to 74*.....	8.8	7.6	+6.3	+6.1
35 to 44.....	1.3	0.9	+7.3	+1.6
45 to 54.....	4.3	3.6	+5.8	+4.6
55 to 64.....	11.1	9.2	+6.9	+6.3
65 to 74.....	17.1	15.4	+6.1	+6.8

*Death rates standardized for age.

NOTE:—Figures in boldface indicate significant trends.

TABLE 31
CANCER OF THE PROSTATE
 Averages of Annual Death Rates, and Trend of Mortality
 Among Males, by Color and Age. Ages 45 to 74 Years
 Metropolitan Life Insurance Company, Industrial Dept., 1917 to 1935

AGE PERIOD YEARS	AVERAGE OF DEATH RATES PER 100,000		ANNUAL TREND AS PERCENT OF AVERAGE RATE	
	White Males	Colored Males	White Males	Colored Males
1 to 74*.....	4.1	4.0	+5.2	+ 7.7
45 to 74*.....	21.3	20.7	+5.4	+ 7.9
45 to 54.....	3.5	5.3	+3.1	+10.0
55 to 64.....	21.6	22.6	+4.9	+ 7.3
65 to 74.....	68.7	59.2	+5.9	+ 7.7

*Death rates standardized for age.

NOTE:—Figures in boldface indicate significant trends.

In interpreting these trends two facts should be kept in mind. First, although the annual increment, expressed as a percent of the mean rate for the period, appears relatively large, the *absolute* rise in death rate per year has been small. Among white males the annual increase in the death rate from cancers of the lung and pleura, for example, averaged only two per million lives exposed; among white females the rise in death rate per year was even

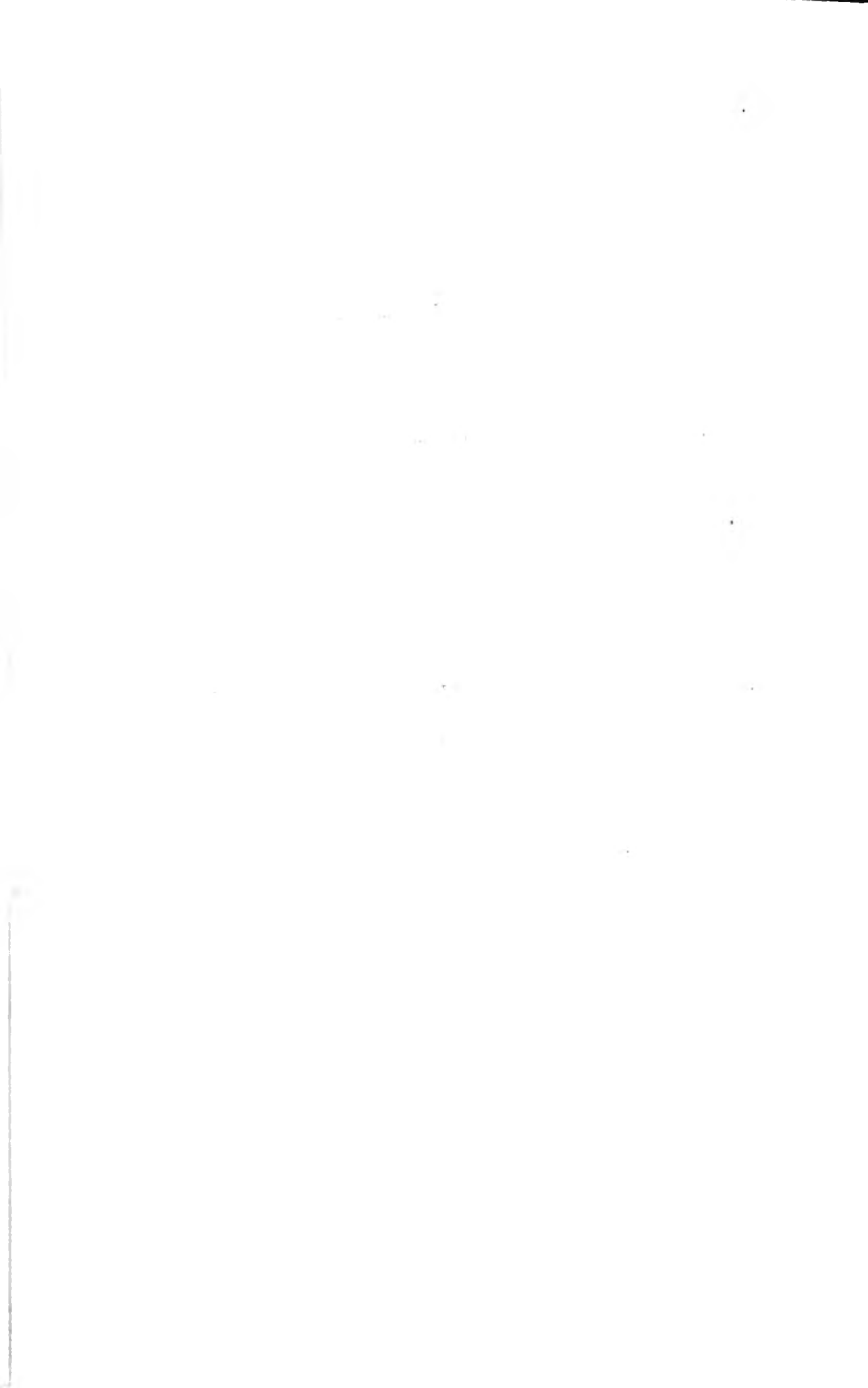
smaller. A second consideration in interpreting these data is that these organs and, in fact, most of the organs included under this title of the International List, fall in the inaccessible group, and, as such, these death rates have been particularly susceptible of increase as diagnostic methods have improved and as hospitalization, operation, and autopsy have become more frequent. In view of these facts the upward trend in the recorded mortality must be interpreted with caution.



CHAPTER VIII

THE PRINCIPAL CARDIOVASCULAR- RENAL DISEASES

THE DISEASES AS A GROUP	229
ORGANIC DISEASES OF THE HEART	248
DISEASES OF THE CORONARY ARTERIES AND ANGINA PECTORIS	267
CHRONIC NEPHRITIS	285
CEREBRAL HEMORRHAGE AND PARALYSIS	300
DISEASES OF THE ARTERIES	312



THE PRINCIPAL CARDIOVASCULAR-RENAL DISEASES AS A GROUP

This chapter deals with a group of chronic diseases and conditions—heart disease, coronary artery disease, chronic nephritis, cerebral hemorrhage, and arteriosclerosis—commonly known as the principal “degenerative diseases,” but more correctly described as the principal cardiovascular-renal diseases. These pathological conditions year after year occupy a most prominent place in the mortality picture. In the United States this group of causes is now responsible annually for more than one third of the total number of deaths. At ages 45 and over, where the mortality from them is concentrated, almost half the deaths are reported as due to cardiovascular-renal conditions. Viewing the facts from another angle, the situation is even more striking. If present conditions of mortality continue to prevail, out of every 1,000 white males born, 458 will eventually die from one or another of these diseases; and for white females the figure is 482 per 1,000. The death toll of no other group of related diseases even approaches this magnitude.

The question may be raised as to the soundness or validity of considering the cardiovascular-renal diseases as a group. It is true that none of the standard classifications of disease or of causes of death groups them under a single heading. In the latest revision of the International List of Causes of Death, for example, deaths from heart disease, diseases of the coronary arteries, and arteriosclerosis are allocated to “Diseases of the circulatory system”; deaths from chronic nephritis are assigned to “Diseases of the genitourinary system,” and those from cerebral hemorrhage, to “Diseases of the nervous system.” In the recent Standard Classified Nomenclature of Disease, as well as in the earlier nomenclatures issued by Bellevue Hospital, by the Massachusetts General Hospital, and by the Royal College of Physicians, the individual cardiovascular-renal diseases appear under various headings more or less similar to those in the International List. It must be remembered, however, that the present mortality and morbidity classification systems had their origins about the middle of the past century, when these diseases and their etiology

received far less attention than at present and much less was known about them.

There are a number of good reasons for the statistical treatment of the cardiovascular-renal diseases as a whole. In the first place, a large number of the deaths from these causes are fairly definitely associated with the physiological and pathological processes of aging. There is no question that a considerable proportion of the deaths from the breakdown of the cardiovascular system and the kidneys results primarily from infection, which is, indeed, the primary etiological factor in almost all of these deaths under age 35. After this age the proportion of deaths due primarily to infection diminishes, although as late as age 50 these deaths comprise a significant percentage of the total in this group. Even at the older ages infection must not be considered as without influence, especially with regard to chronic conditions based on preceding acute disease of the heart and kidneys. It would be a mistake to minimize the importance of the role that infection plays in the mortality from cardiovascular-renal diseases. Nevertheless, if it were possible to tabulate the deaths from these diseases according to etiological type, it would undoubtedly be found that deaths initiated by infection are far outnumbered by those due primarily to the degeneration of the vascular system, particularly at the older ages. In this second group death results from a breakdown of the internal economy of the body itself, with no known extrinsic factor operating. The thickening and hardening of the arteries impede the circulation of blood and diminish nutrition to the vital organs. The diminished quantity of blood may damage the heart muscle or cause a host of other affections. In the kidneys, the arteriosclerotic processes may cause atrophy of tissue. In the cerebrum the arteries weakened by degeneration may rupture at the weakest point. In general, the heart, blood vessels, and kidneys gradually lose their structural elasticity and their ability to adapt themselves to the changing needs of the body. Progressive diminution of this functional capacity inevitably results in physical breakdown and death.

Furthermore, the functions of the heart, kidneys, and blood vessels are so interrelated that the premature breakdown of one of these vital systems places added strain upon the others and hastens their disintegration. As a result, diseases of these organs often coexist in the same individual. Statistical confirmation of this fact is available from a study of contributory causes of death made by the Federal Bureau of the Census from the mortality

records of 1925. In that year, of the total number of deaths from the principal cardiovascular-renal diseases almost one third were reported to be complicated by at least one of the other diseases of the group. Although the figures for the contributory causes probably include a number of purely terminal conditions, the high figure recorded for the several diseases of this group as contributory causes is undoubtedly significant, especially as there are many cases in which such contributory cause existed but was not mentioned in the death certificate.

Analysis of the records for the individual diseases shows equally striking results. Of the cases in which cerebral hemorrhage was certified as the primary cause of death, more than 30 percent recorded arterial disease as a contributory cause. About one out of every six deaths charged to heart disease was complicated by disease of the arteries or disease of the kidneys. On the other hand, heart disease was reported as a complication of more than one third of the deaths allocated to chronic nephritis; cerebral hemorrhage and arteriosclerosis were reported as present in an additional 15 percent of the cases.

It is likely that these complications are much more frequent than the death certificates show. If these reports contained complete case histories they would unquestionably show, for example, that arterial disease is a contributory factor in an overwhelming majority of the deaths certified as due to cerebral hemorrhage, and that at least half the deaths attributed to heart disease are complicated by arterial or renal disease. The cardiovascular-renal diseases usually develop insidiously and over a considerable period of time, so that it is often difficult to determine in which one of the group was initiated the chain of pathologic changes which finally led to death. In considering the group of causes as a whole, this difficulty is largely overcome.

There are other good reasons for studying the cardiovascular-renal diseases together. With the advance of medical knowledge during the 25 years under review, concepts regarding the role of certain diseases in causing death have been modified, and these changing views have been reflected in the certification of causes of death by physicians. Thus, the decline of the idea that hypertension was invariably a symptom of nephritis, and the emergence of the concept of essential hypertension in which the cardiac and arterial damage dominate the picture, are undoubtedly reflected in the rise in the relative importance of heart disease and in the simultaneous fall in chronic nephritis. Coronary artery diseases

also are appearing in the death registers with such increased frequency that it is certain that the rise in their death rate reflects almost entirely more frequent recognition and greater stress on their clinical significance. Cerebral hemorrhage, on the other hand, is being reported less frequently as a primary cause of death, but the conditions which superinduce it are reported more frequently in its stead on death certificates.

In like manner, procedures of classifying deaths have changed during this 25-year period to conform with advances in medical knowledge. These changes are embodied in the official *Manual of Joint Causes of Death*, published by the Bureau of the Census. The first edition of this Manual was issued in 1914, and revised editions appeared in 1925 and 1933. Only minor changes affecting the cardiovascular-renal diseases were made in 1933, but the 1925 revision reversed the earlier procedure for certain combinations of causes of death. Some of these changes materially affect the comparability at different calendar epochs of the death rate for individual diseases in the cardiovascular-renal group. Prior to 1925, when "valvular heart disease" or "chronic heart disease" was certified jointly with "chronic nephritis," the death was classified under cardiac disease; beginning with 1925 the assignment was reversed. These combinations are frequently reported on death certificates, and the reversal of statistical practice thus raised the reputed mortality from chronic nephritis and depressed that from heart disease. The changes in joint cause procedure have actually destroyed the comparability of the death rates from cerebral hemorrhage. In the second edition of the Joint Cause Manual, nephritis, endocarditis, myocarditis, angina pectoris, and lobar pneumonia are preferred over cerebral hemorrhage, reversing the allocation in the earlier edition of the volume. The changes in joint cause assignment made in 1925 are too numerous to list here, but it is significant that so many of the changes affected the cardiovascular-renal diseases.

Fortunately, however, such changed allocations have remained almost entirely within this group of diseases, and hence they do not seriously affect the comparability of the time series for cardiovascular-renal diseases taken as a whole. Thus, while it is not possible to give wholly comparable mortality rates for each one of these closely related diseases over a 25-year period, the statistical picture for the group as a whole is clear. These are some of the reasons which justify the statistical consideration of the cardiovascular-renal diseases as a group.

Attention should here be called especially to the fact that deaths from acute diseases of the heart and kidneys are excluded from the group here discussed. The number of these deaths is quite large, and certain types of them are important and properly belong in a study of cardiac and renal disease. But these acute conditions are for the most part different in character from the chronic diseases of these organs, so that from a clinical standpoint it would not be desirable to include them in one group with the chronic conditions. Furthermore, in deaths reported as due to an acute condition of heart or kidney, these are very often terminal complications of some disease falling entirely outside this group. There is no way of separating cases properly attributed primarily to acute conditions of heart and kidney, from those in which such conditions may have been secondary. Furthermore, whereas the chronic diseases of this group are closely interrelated, the acute conditions of kidney or heart may in the majority of cases be entirely independent entities.

Importance as a Cause of Death

In the period 1911 to 1935 the principal cardiovascular-renal diseases¹ were responsible for a total of 978,777 deaths among the Industrial policyholders of the Metropolitan Life Insurance Company; this number constituted 30.6 percent of the deaths from all causes. This experience relates to policyholders in the age range 1 to 74 years and hence does not include the most advanced ages, at which the death rates from these diseases are highest. From the public health viewpoint, however, this limitation is not very serious, for interest in these causes as a problem in that field is concentrated in the ages under 75.

During the 25-year period the mortality from the principal cardiovascular-renal diseases increased in *relative* importance. The percentage of deaths from these diseases rose from 27.0 percent of all deaths in 1911 to 1915, to 37.5 percent in 1931 to 1935. This was due, in large part, however, to the decline in the mor-

¹This group does not include deaths reported as due to the following: Pericarditis, acute endocarditis, acute myocarditis, hemorrhage without specified cause, functional diseases of the heart, congenital heart disease, gangrene, and acute nephritis. Their exclusion results from a variety of reasons, but chiefly because this chapter is concerned mainly with the chronic cardiovascular-renal diseases, and because of the unsatisfactory nature of the data on the acute diseases, as stated in the text. Some of the titles listed above were excluded, however, because of the difficulties in obtaining comparable data over the 25-year period. Deaths reported as due to senility were omitted in conformity with the stipulations of the International List of Causes of Death, in which senility appears under a class heading entirely apart from those in which the cardiovascular-renal diseases are included. However, the exclusion of these conditions in no way modifies the conclusions drawn in this chapter.

In order to have comparable figures for heart disease over the 25 years, the classification in use at the beginning has been kept throughout. The use of the classification adopted in 1920 would add somewhat to the figures and increase slightly both the proportion of deaths from cardiovascular-renal diseases as a group, and the relative importance of heart disease.

tality from all other causes combined. Indeed, the mortality from the cardiovascular-renal diseases also fell, but at a lower rate than that from all causes. Thus, the death rate from cardiovascular-renal diseases at ages 1 to 74 averaged 371.7 per 100,000 in 1911 to 1915, but was only 296.6 in 1931 to 1935. This drop of 20.2 percent in the death rate from these conditions is considerably less than that of 37.3 percent in the total death rate.

At ages 1 to 74 combined, there is practically no difference between the sexes in regard to the relative importance of the cardiovascular-renal diseases. The ratio of these deaths to the total was 37.0 percent for white males and 37.3 for white females.

The relative importance of these diseases varies decidedly with age. In general, the proportion of these deaths increases strikingly with advancing age. This is shown in Table 1 which gives, for detailed age groups among white persons, the percentage of deaths in the total mortality during the last five years of this experience. The percentages are not by any means negligible even between ages 10 and 20, and in early adult and middle life these diseases

TABLE 1
PRINCIPAL CARDIOVASCULAR-RENAL DISEASES†

Proportion of All Causes of Death, by Age
White Males and White Females. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000				PERCENTAGE CARDIOVASCULAR- RENAL OF ALL CAUSES	
	WHITE MALES		WHITE FEMALES		White Males	White Females
	All Causes	Cardio- vascular- Renal Diseases	All Causes	Cardio- vascular- Renal Diseases		
1 to 74*.....	878.0	325.0	652.0	242.9	37.0	37.3
1 to 4.....	405.9	6.8	354.8	6.7	1.7	1.9
5 to 9.....	178.2	10.3	142.3	9.3	5.8	6.5
10 to 14.....	139.9	16.2	105.4	18.8	11.6	17.8
15 to 19.....	208.0	21.4	166.6	21.8	10.3	13.1
20 to 24.....	291.4	29.0	268.2	30.6	10.0	11.4
25 to 34.....	417.1	59.5	346.5	50.2	14.3	14.5
35 to 44.....	774.7	179.9	519.3	124.5	23.2	24.0
45 to 54.....	1,600.7	559.5	1,025.8	366.0	35.0	35.7
55 to 64.....	3,299.3	1,546.7	2,302.5	1,077.0	46.9	46.8
65 to 74.....	6,750.9	3,938.0	5,378.3	3,161.7	58.3	58.8

*Death rates standardized for age.

†Heart diseases (1909 classification, International List of Causes of Death), chronic nephritis, cerebral hemorrhage and paralysis without specified cause, diseases of the arteries, angina pectoris, diseases of the coronary arteries, and embolism and thrombosis.

as a group contribute materially to the death toll. At ages 20 to 24 they account for one in every 10 deaths among men and more than one in every nine, among women. At ages 25 to 34 the proportion is about one in every seven in both sexes, and at 35 to 44, about one in every four. This group of causes continues to increase in importance with advancing age so that at ages 65 to 74 it constitutes almost three fifths of the total mortality. The singularly high proportion of deaths from these diseases reported at ages 10 to 19 is partly explained by the inclusion of deaths which were actually due to rheumatic fever, glomerulonephritis, or other acute infections, but because of inexact reporting were, according to the usual classification procedure, allocated to chronic heart or kidney diseases.

In general, the situation in regard to the relative importance of these diseases among colored persons is essentially the same as that for the whites.

Mortality by Age, Sex, and Color

The average death rates from the principal cardiovascular-renal diseases as a group among the Industrial policyholders of the Metropolitan Life Insurance Company are given by age, sex, and color in Table 2. The data are shown separately for the whole 25-year period and for the first and last five years of this period. The discussion of these details, however, will here be limited to the data of the five years 1931 to 1935.

Age The chief feature of the age curves, shown in Chart I, is the steady rise with advancing age, at first gradual, but accelerating rapidly during adult life to a towering maximum at the oldest ages. Among white persons this increase with age is approximately the same among males and females up to the age of 25. Past that age the curve for males increases at an appreciably greater rate than that for females. Among colored persons the rate of increase is the same for both sexes until age 45 approximately, but after that age the progression in the male rate is the faster.

The rates of increase with age are extremely large and the death toll mounts rapidly. Among white males the death rate triples from the age group 25-34 to the age group 35-44, triples again between this and the next decade, and between 45-54 and 55-64; it then more than doubles between 55-64 and 65-74. The death rate in this last age group (the highest shown in this experience)

TABLE 2
PRINCIPAL CARDIOVASCULAR-RENAL DISEASES†

Averages of Annual Death Rates per 100,000

By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000						PERCENT CHANGE 1931-1935 SINCE 1911-1915	
	MALES			FEMALES				
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915	Males	Females
WHITE								
1 to 74*.....	346.5	325.0	403.5	278.8	242.9	322.3	—19.5	—24.6
1 to 24*.....	23.9	16.7	30.5	25.9	17.4	34.1	—45.2	—49.0
25 to 44*.....	135.8	111.5	193.4	109.3	82.3	147.0	—42.3	—44.0
45 to 74*.....	1,553.0	1,497.4	1,745.9	1,231.5	1,107.3	1,379.9	—14.2	—19.8
1 to 4.....	11.2	6.8	16.5	10.0	6.7	13.7	—58.8	—51.1
5 to 9.....	15.0	10.3	20.2	16.5	9.3	24.0	—49.0	—61.3
10 to 14.....	22.6	16.2	28.5	28.9	18.8	38.7	—43.2	—51.4
15 to 19.....	32.4	21.4	38.5	33.1	21.8	42.3	—44.4	—48.5
20 to 24.....	38.5	29.0	49.2	40.4	30.6	51.1	—41.1	—40.1
25 to 34.....	76.2	59.5	111.7	67.0	50.2	92.0	—46.7	—45.4
35 to 44.....	214.2	179.9	300.7	164.8	124.5	219.4	—40.2	—43.3
45 to 54.....	587.7	559.5	713.8	437.4	366.0	535.5	—21.6	—31.7
55 to 64.....	1,582.2	1,546.7	1,782.4	1,210.6	1,077.0	1,385.7	—13.2	—22.3
65 to 74.....	4,104.0	3,938.0	4,463.9	3,411.3	3,161.7	3,646.9	—11.8	—13.3
COLORED								
1 to 74*.....	472.7	471.3	507.0	448.1	430.5	458.6	— 7.0	— 6.1
1 to 24*.....	30.9	21.8	40.5	36.1	25.8	45.1	—46.2	—42.8
25 to 44*.....	247.1	223.8	288.7	250.1	222.0	279.4	—22.5	—20.5
45 to 74*.....	2,026.9	2,081.3	2,116.6	1,878.1	1,857.3	1,863.0	— 1.7	— 0.3
1 to 4.....	22.2	10.5	44.0	20.6	9.9	33.6	—76.1	—70.5
5 to 9.....	18.1	14.9	20.4	20.1	17.2	20.4	—27.0	—15.7
10 to 14.....	28.3	19.8	32.8	33.5	23.9	38.1	—39.6	—37.3
15 to 19.....	37.7	28.0	42.9	45.5	32.4	57.8	—34.7	—43.9
20 to 24.....	49.1	35.7	65.6	61.6	45.7	77.6	—45.6	—41.1
25 to 34.....	133.3	111.5	170.5	132.7	115.0	150.5	—34.6	—23.6
35 to 44.....	396.7	371.6	444.3	404.4	362.8	448.8	—16.4	—19.2
45 to 54.....	945.8	961.3	1,027.9	950.7	890.9	1,040.4	— 6.5	—14.4
55 to 64.....	2,178.7	2,216.5	2,298.1	1,993.2	1,936.0	2,003.9	— 3.6	— 3.4
65 to 74.....	4,668.8	4,858.0	4,725.2	4,171.7	4,321.9	3,827.2	+ 2.8	+12.9

*Death rates standardized for age.

†Heart diseases (1909 classification, International List of Causes of Death), chronic nephritis, cerebral hemorrhage and paralysis without specified cause, diseases of the arteries, angina pectoris, diseases of the coronary arteries, and embolism and thrombosis.

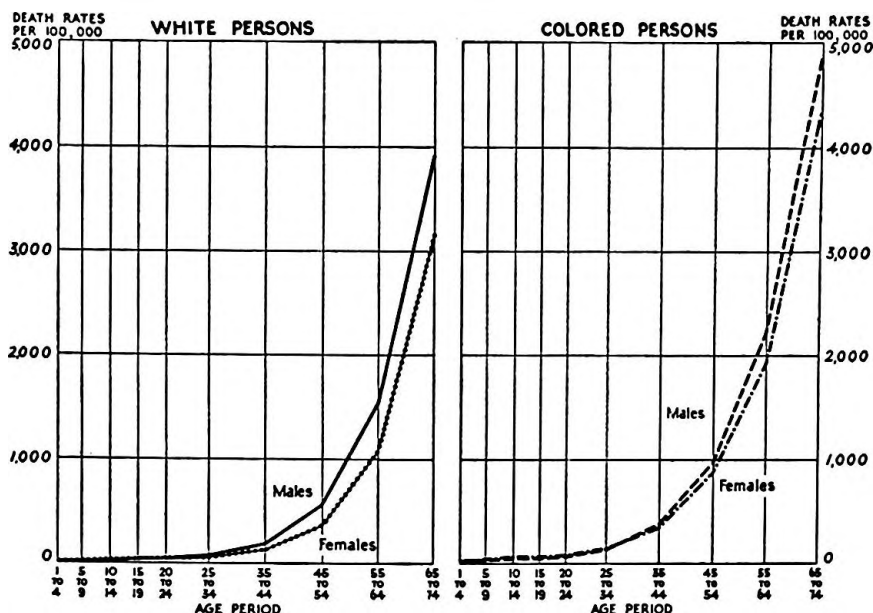
CHART I

PRINCIPAL CARDIOVASCULAR-RENAL DISEASES†

Averages of Annual Death Rates per 100,000

By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935



†Heart diseases (1909 classification, International List of Causes of Death), chronic nephritis, cerebral hemorrhage and paralysis without specified cause, diseases of the arteries, angina pectoris, diseases of the coronary arteries, and embolism and thrombosis.

is more than 60 times that in the age group 25-34. These rates of increase with advancing age are characteristic of the mortality from the cardiovascular-renal diseases. Except for differences in the precise ratios, the picture is essentially the same in the three other color-sex groups.

The extent to which the mortality at the older ages overshadows that in early adult and middle life should not make us lose sight of the fact that these diseases are extremely important in these earlier age periods also. Not only do they account for a relatively large part of the mortality at these ages, but they actually rank ahead of most other causes. Thus, even between ages 35 and 44 more white persons die of these conditions than of tuberculosis, violence of all types, pneumonia and influenza, or cancer, which last, among females, is prominent at a relatively young age. It is important that these facts be stressed because it is at the younger ages that most can be done to prevent premature deaths from cardiovascular-renal diseases.

Sex The death rate from the principal cardiovascular-renal diseases is higher for males than for females. At ages 1 to 74 combined, the excess male mortality amounted, in the period 1931 to 1935, to 34 percent among white policyholders and 9 percent among the colored. The sex ratio of the death rates varies, however, with age. Between ages 10 and 25 white females actually registered higher death rates than males. There are several reasons for the difference at these ages, but since they vary according to the particular disease, they will be discussed later. It will be sufficient to indicate that they reflect the sex differences in maturation and in the incidence of certain types of infection, and also the sequelae of childbearing in young women, chiefly those with previously damaged hearts or kidneys.

At about age 25 the curves for the two sexes cross, and thereafter white males have the higher mortality. Between ages 25 and 34 the excess is 19 percent; in the next decade of life, 44 percent; reaches its peak of 53 percent at 45 to 54; and then declines to 44 percent at 55 to 64, and 25 percent at 65 to 74. The relatively moderate differences at ages 25 to 34 may be traced more definitely to specific etiology of the separate diseases than to the group as a whole. But after 40, when this group of diseases becomes more definitely homogeneous, it is difficult to establish the causes of the differential mortality of men and women from these diseases. Specific physiological differences between the two sexes are apparently unimportant as a cause. The nature of the arteriosclerotic and degenerative changes is the same in both sexes. Little is known regarding their causes apart from the natural changes due to age. Investigation of the relation of infection to these changes has been inconclusive for the most part. Essential hypertension is the underlying cause in an appreciable portion, but the cause of the hypertension is itself largely unknown. It is likely that the causes of the higher mortality of men, compared with women, from these diseases are largely environmental and that the higher rates among males are due to the cumulative effect of small but more or less continuous "insults" to the cardiovascular-renal system than to any specific and tangible cause. Among the environmental influences which have been most prominently mentioned in this connection are hard manual work, exposure to cold and damp, the infections (not necessarily sufficient to cause disability or absence from work), nervous tension, and the use of tobacco and alcohol.

Among the colored the differences in cardiovascular-renal mortality between the two sexes is much less marked than among

whites. At all ages combined, the rate for males is only 9 percent higher than the female rate, and at ages 45 to 74, in which the joint occurrence of these diseases is most frequent, the excess is only 12 percent. It is not at all clear why there should be this difference between the two races in the sex ratio of these diseases. It is possible that in this urban Negro group, which has fluctuated a great deal in its composition, environmental factors such as work, exposure, and infection are much more alike for the two sexes than in the case of the white population.

Color Deaths from the cardiovascular-renal diseases are much more frequent among colored than among white persons. This condition holds without exception as to age or sex. The difference is more marked among females than in males and in early and middle adult life, when at some ages the death rates of the colored are double those for whites. While there is justification for accepting the data as evidence of real differences between the two races in the mortality from these conditions, there is some likelihood that inadequate certification of causes of death for Negroes is responsible for a large part of the difference recorded. This is evident from a review of the detailed causes within the cardiovascular group, which shows greater excesses for the diseases in which diagnosis appears to be the least discriminating. In so far as these differences are real, they are due partly to the greater incidence of syphilitic sequelae among Negroes and also to environmental influences, such as working, living, and housing conditions, which are, on the average, poorer than those of whites.

Trend of Mortality

The mortality from the principal cardiovascular-renal diseases has, in general, exhibited a downward trend over the quarter century 1911 to 1935. As Chart II shows, however, the decline has not been continuous. In the early years between 1911 and 1917, the death rate among Metropolitan Industrial policyholders fluctuated around 370 per 100,000 and showed a slight but not statistically significant downward tendency. In the period of the influenza pandemic of 1918 and its minor recrudescences of 1919 and 1920, the mortality from the cardiovascular-renal diseases fell sharply from 373.2 per 100,000 in 1917, to 284.0 in 1921, a drop of about 25 percent within four years. The greater part of this fall took place between 1918 and 1919. There was established at this time a new level about which the death rates have since

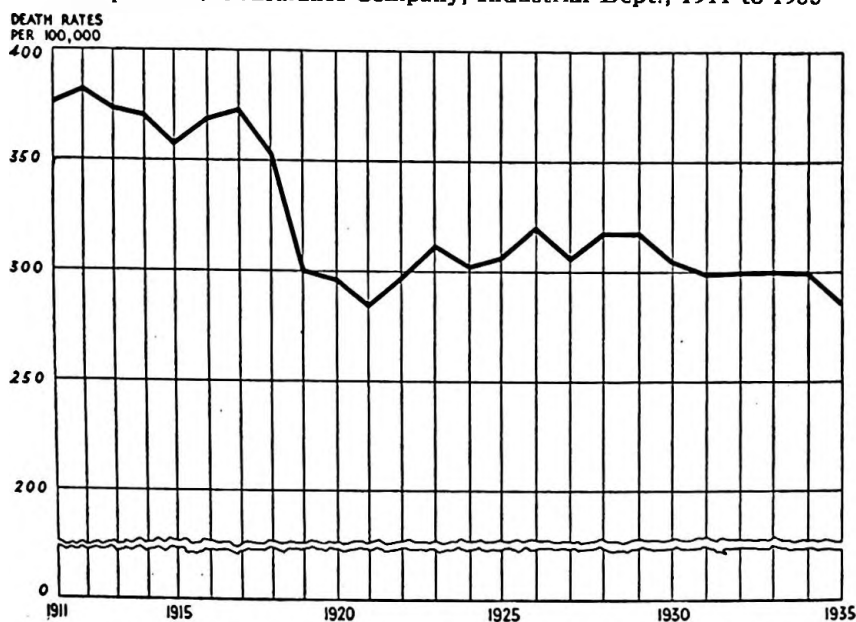
CHART II

PRINCIPAL CARDIOVASCULAR-RENAL DISEASES†

Standardized Annual Death Rates per 100,000

Total Persons. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



†Heart diseases (1909 classification, International List of Causes of Death), chronic nephritis, cerebral hemorrhage and paralysis without specified cause, diseases of the arteries, angina pectoris, diseases of the coronary arteries, and embolism and thrombosis.

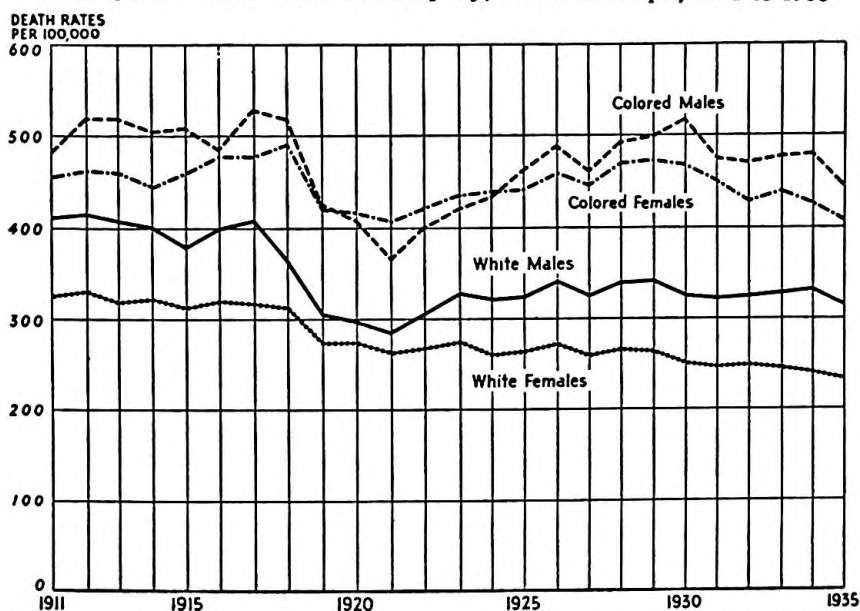
fluctuated. The significance of this post-pandemic fall is discussed in the chapter on influenza and pneumonia. From the minimum point of the series in 1921, the death rate from the cardiovascular-renal diseases rose moderately for two years. In the subsequent period, 1923 to 1935, the curve showed no decisive trend, but it may be noted that the rates have been particularly stable and low during the last five years. The rate in 1935 was the lowest since 1921 and, with the exception of that year, the lowest recorded over the whole 25 years. Comparison of the first and last five-year periods of this experience shows that the death rate of recent years was 20.2 percent below that of 1911 to 1915.

The trend of mortality has varied considerably with sex and color, as can be seen from Chart III. That for white males showed, in general, the same characteristics as that for the aggregate described in the previous paragraph, but the improvement in recent years has not been as great as in the experience as a whole. Their death rate in the last five years has been nearly 10 percent

CHART III PRINCIPAL CARDIOVASCULAR-RENAL DISEASES†

Standardized Annual Death Rates per 100,000
By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



†Heart diseases (1909 classification, International List of Causes of Death), chronic nephritis, cerebral hemorrhage and paralysis without specified cause, diseases of the arteries, angina pectoris, diseases of the coronary arteries, and embolism and thrombosis.

above the low level of 1919-1922. The course of mortality among white females shows much the same year-to-year fluctuation as that for males, so far as direction is concerned, but not as to degree. The fall of their mortality during and after the pandemic was much less sharp, the rebound was brief and limited, and the subsequent trend was quite definitely downward, almost continuously so since 1928. The rates in recent years were the lowest on record. In 1931 to 1935 the white female death rate from cardiovascular-renal diseases was 24.6 percent less than in 1911 to 1915; among white males the drop was only 19.5.

The trend of cardiovascular-renal mortality among colored policyholders has been less favorable than that for whites. In each sex, the mortality trend was moderately upward in the pre-influenza period, fell rapidly during 1919 to 1921, and then rose decisively for almost a decade. The decline in mortality following the influenza epidemic was so great among colored males that in the years 1920 to 1924 their death rate fell below that for the

females. Since 1930 the death rate of colored persons has been declining markedly, and despite the large increase in mortality from these conditions during the 1920's their death rate in recent years has been below the prepandemic level. Among colored males the rate in 1931 to 1935 was 7.0 percent lower than in 1911 to 1915; and among colored females the decrease was 6.1 percent. Comparison based on the changes since 1919-1922 is less favorable to males, however, for their mortality in 1931 to 1935 has been nearly 20 percent higher, compared to a rise of less than 5 percent for colored females. Indeed, the 1935 rate for the latter, 406.8, was practically identical with the 1921 minimum of 406.6.

The trends of cardiovascular-renal mortality, when analyzed further by color, sex, and age, show important variations. Among white persons in every age group there was a distinct drop in the death rate immediately following the influenza pandemic, and at ages under 25 the decline has continued in both sexes practically down to the end of this experience. Among white females this phenomenon is noted also in the age group 25 to 44. In males, at these ages, there was a moderate rebound from the low levels of 1919-1922 and the death rate was practically stationary at a new level for several years, 1923 to 1929, and then again at a slightly lower level between 1930 and 1935. Among males at ages 25 to 44 the death rate from cardiovascular-renal diseases has never returned to the low levels attained in 1919-1922. At ages 45 to 74, the trends among white persons are similar to those previously described for all ages combined, except in regard to the degree of change. Among white males, at ages 45 to 74, the rise since 1921 is somewhat larger than that at all ages, and the improvement in recent years is smaller than that at all ages. In like manner, the improvement in the female rate since 1928 has been relatively smaller than at all ages. In fact, it is characteristic of the cardiovascular-renal trends that the younger the age, the earlier and the greater has been the decline in mortality; the older the age, the smaller and more belated the improvement. Such permanent *increases* as have been recorded in mortality have been limited to the older ages.

Among colored persons there has likewise been improvement at the younger ages in cardiovascular-renal mortality, but most of the improvement has taken place in very recent years. To a slightly less degree, this holds for young colored females. At ages 25 to 44 the sharp postinfluenza drop that characterizes these trends was followed, in the case of colored males, by a steady rise

for several years, which brought the rate nearly to the pre-pandemic levels. But recent years have seen a large improvement, although insufficient to bring the rate back to the low point of 1921-1922. Colored females in this age group fared somewhat worse for a time. Their death rate did not drop as fast during 1919-1922 as did that of colored males, and the subsequent upward turn was almost as distinct. Consequently, for several years the death rate from cardiovascular-renal diseases among colored females at these ages exceeded that for males. In recent years, however, there has been distinct improvement among colored women in this age group.

At ages 45 to 74 the picture for colored persons is not a very cheerful one, especially among the men. Their death rate from cardiovascular-renal diseases rose very sharply following the post-influenza drop, and was stabilized at a very high level for several years up to and including 1934. While a sharp decrease was recorded in 1935, that gives no assurance of continued improvement. Despite this decrease of the rate in 1935, the mortality in that year was over 25 percent higher than in 1921. The situation is slightly better among colored females at ages 45 to 74. Their rate has declined since 1933. It may be that these differences in the trends of cardiovascular-renal mortality between the white and colored races represent, in some degree at least, increasing accuracy of diagnosis, but, on the other hand, it may reflect the disadvantages under which the Negro labors in his new urban environment, particularly the older men whose lot has been most difficult in recent years.

As compared with a quarter of a century ago, however, the situation in recent years is pretty generally one of improvement. This is borne out by Table 2, which shows the percentage changes between the first and last five-year periods of this experience. Among whites, the declines are greater among females than males, 24.6 percent and 19.5 percent, respectively. Among the colored, on the other hand, the opposite is true, the male rate showing a fall of 7.0 percent, compared with 6.1 percent for females. In both races the declines have been greatest at the younger ages. Among whites under 45 they are uniformly greater than 40 percent. After 45, among whites and also among colored females, the proportionate improvement drops abruptly and steadily diminishes up to the end of life. Among colored males this occurs at an age 10 years younger. At 65 to 74, the oldest ages included in this experience, the declines in cardiovascular-renal mortality in the 25-year period are relatively modest among whites, 11.8

percent for men and 13.3 percent for women, while among the colored actual increases are recorded, 2.8 percent for men and 12.9 percent for women.

The differences between the white and the colored races in cardiovascular-renal mortality have widened. The ratio of the colored male rate to that of white males has increased from 126 percent in 1911 to 1915, to 145 percent in 1931 to 1935, while among females an even larger change occurred, the ratio rising from 142 percent to 177 percent.

These differential changes according to sex, color, and age in the mortality from cardiovascular-renal diseases have much significance. They indicate, at one and the same time, the broad approach to what may further be accomplished in these diseases and also to the limitations which must be placed on expectation of improvement. The very real betterment of the situation at the younger ages is gratifying, and, as it is due largely to declining incidence of infectious diseases which often have chronic heart and kidney sequelae, it lends hope for continued improvement. For, despite the large decline in the cardiovascular-renal diseases under 40, they still loom large in the mortality picture at these ages. The approach to this problem will be touched on later in relation to specific diseases in the cardiovascular-renal group. Between 40 and 60, too, there is room for real improvement, especially in the case of males. Certain factors in relation to specific diseases, such as the role of syphilis in heart disease in men of this age group, point the way to a definite program which may be expected to yield significant results. Other factors in the development of cardiovascular-renal disease at these ages remain to be elucidated before we can expect any considerable change for the better. Most important of these factors probably is hypertension. It may be that in this etiological group little may be expected, and that little primarily as a result of better therapeutic measures. For, the underlying basis of cardiovascular-renal disease of this origin is individual variation in the hereditary substratum, which is little subject to change. This element is even more to be stressed in connection with the trend of mortality past 60 where increasingly, as we approach the limit of the life span, we are concerned not with specific factors relating to the breakdown in one organ or the other in the cardiovascular system, but with the nature of living matter itself. Constitutional differences, probably of hereditary origin, play the important role here, and while these are subject to some modification by other factors, such as work, rest, infection,

exposure, diet, etc., the effect of these factors is of slight and diminishing importance as we approach the natural term of life.

The effect on the mortality from cardiovascular-renal diseases of the declining death rate from other causes must also be considered. This effect is probably twofold. In the first place it is likely that the control of other diseases has preserved past midlife an increasing proportion of persons of relatively inferior constitution, some of whom then prematurely become victims of cardiovascular-renal diseases. Secondly, the mere fact that deaths from other causes have been reduced, inevitably raises the proportion of deaths from cardiovascular-renal disease.

Cardiovascular-Renal Diseases Considered Separately

Although good reasons have been given for the statistical treatment of the principal cardiovascular-renal diseases as a group, the individual causes of the group must also be considered. To disregard them would be to overlook valuable information regarding very important disease entities. In spite of the difficulties of clear separation discussed in the opening pages of this chapter,

TABLE 3
PRINCIPAL CARDIOVASCULAR-RENAL DISEASES
Number of Deaths and Death Rates per 100,000
Total Persons. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

CAUSE OF DEATH	Number of Deaths	PERCENT OF TOTAL DEATHS		DEATH RATES PER 100,000	
		All Causes	Cardio-vascular-Renal Diseases	Standardized*	Crude
PRINCIPAL CARDIOVASCULAR-RENAL DISEASES.....	978,777	30.6	100.0	324.0	282.6
Organic diseases of the heart.....	445,833	13.9	45.6	144.1	128.7
Chronic nephritis.....	246,217	7.7	25.2	83.9	71.1
Cerebral hemorrhage and paralysis without specified cause.....	200,217	6.3	20.5	67.3	57.8
Diseases of the arteries†....	36,584	1.1	3.7	13.9	10.6
Angina pectoris.....	24,265	0.8	2.5	7.8	7.0
Other cardiovascular-renal diseases.....	25,661	0.8	2.5	7.0	7.4

*Standardized for color, sex, and age.

†For the years 1930 to 1935 the rates for diseases of the arteries, comprising titles 96 and 97 of the International List, were not strictly comparable with those of prior years. The resulting difference, however, is negligible.

TABLE 4
PRINCIPAL CARDIOVASCULAR-RENAL DISEASES
 Percent Each "Degenerative Disease" of All Causes of Death
 and of the "Degenerative Group." Total Persons. Ages 1 to 74 Years
 Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH	PERCENT OF DEATHS										DEATH RATES* PER 100,000				
	ALL CAUSES					CARDIOVASCULAR-RENAL DISEASES									
	1931 to 1935	1926 to 1930	1921 to 1925	1916 to 1920	1911 to 1915	1931 to 1935	1926 to 1930	1921 to 1925	1916 to 1920	1911 to 1915	1931 to 1935	1926 to 1930	1921 to 1925	1916 to 1920	1911 to 1915
PRINCIPAL CARDIOVASCULAR-RENAL DISEASES.	37.5	32.8	30.1	24.1	27.0	100.0	100.0	100.0	100.0	100.0	296.6	312.9	300.2	338.3	371.7
Organic diseases of the heart.....	18.0	15.3	13.5	10.5	11.4	47.9	46.7	44.8	43.4	42.4	143.3	146.3	132.8	143.8	154.1
Chronic nephritis.....	7.8	8.1	7.8	6.8	8.0	20.9	24.7	25.8	28.4	29.4	60.4	75.9	76.6	96.7	109.9
Cerebral hemorrhage and paralysis without specified cause.....	6.9	6.5	6.7	5.3	5.8	18.4	19.6	22.3	21.9	21.6	52.3	60.6	67.8	74.4	81.6
Diseases of the arteries†.....	1.2	1.2	1.1	1.0	1.2	3.2	3.6	3.7	4.1	4.6	10.0	12.2	12.6	15.6	19.0
Angina pectoris.....	1.2	1.0	0.7	0.3	0.4	3.3	3.2	2.2	1.4	1.3	10.7	11.0	7.1	5.1	4.9
Other cardiovascular-renal diseases.....	2.4	0.7	0.3	0.2	0.2	6.3	2.2	1.2	0.8	0.7	19.9	6.9	3.3	2.7	2.2
Diseases of the coronary arteries.....	1.7	†	†	†	†	4.6	†	†	†	†	15.1	†	†	†	†

*Standardized for color, sex, and age.

†For the years 1930 to 1935 the rates for diseases of the arteries, comprising titles 96 and 97 of the 1930 International List, were not strictly comparable with those of prior years. The resulting difference, however, is negligible.

‡Not available.

the figures for each of these diseases are of sufficient validity to justify and demand analysis. Before we turn to a detailed treatment of the various causes, however, we shall review the numerical relations between these conditions.

For the quarter century as a whole, heart disease was by far the most important item in the mortality from the cardiovascular-renal diseases, accounting for 45.6 percent of the deaths in this group. Chronic nephritis, next in order, comprised 25.2 percent of the deaths, and cerebral hemorrhage 20.5 percent of the total. Of much lesser importance were the diseases of the arteries and angina pectoris, which constituted 3.7 and 2.5 percent of the deaths, respectively. The figures appear in Table 3.

The relative importance of the individual diseases in the cardiovascular-renal group changed somewhat in the period under survey. As Table 4 shows, chronic nephritis, cerebral hemorrhage, and diseases of the arteries contributed a smaller proportion of the deaths from cardiovascular-renal diseases in the closing years than in the earlier ones. On the other hand, heart disease, angina pectoris, and the "other cardiovascular-renal diseases" increased in relative importance. The abrupt increase in the last-mentioned residual group in recent years resulted mainly from the rapid rise in the mortality from coronary disease, which did not receive separate recognition in the International List until 1930.

ORGANIC DISEASES OF THE HEART²

Chronic diseases of the heart exact today a greater toll of human life than any other cause of death. In fact, the probability of eventually dying from cardiac impairments of these types is almost $1\frac{1}{2}$ times that from tuberculosis and cancer combined. If present conditions of mortality continue to prevail, one out of every five white males born and one out of every four white females born will die eventually from heart disease.

Even this death toll does not fully indicate the magnitude of the problem. Heart disease in the United States ranks among the leading causes of chronic illness and disability. The survey of chronic illness in Massachusetts³ several years ago disclosed that there were probably 84,000 persons ill with heart disease in that State alone. In New York State, DePorte⁴ estimated on the basis of an inquiry among physicians that there were 300,000 cases of heart disease. An investigation in New York City⁵ showed that at least one out of every eight of the chronically ill suffer from heart disease, and this figure was exclusive of a large number of old people in institutions, many of whom undoubtedly had some form of cardiovascular disease. The most recent large-scale survey⁶ covering illnesses in 18 States among 9,000 families visited periodically for 12 months showed an annual case rate⁷ from heart disease of 12.6 per 1,000 persons. Among nearly

²"Organic diseases of the heart," as used in this investigation, refers to the group of diseases included under Title 79 in the 1909 Revision of the International List of Causes of Death. This title includes all chronic valvular diseases, fatty degeneration, chronic myocarditis, chronic dilatation, chronic heart disease of rheumatic origin, "heart disease" with no further qualification, and endocarditis and myocarditis, unqualified as to chronicity, for decedents 60 years of age or over. Excluded from this group are pericarditis, acute endocarditis, acute myocarditis, diseases of the coronary arteries, angina pectoris, and "functional heart disease."

Changes in the assignment of deaths reported as due jointly to heart disease and other conditions, effective in 1925, probably affected the heart disease death rate. On the one hand the registered cardiac mortality was lowered by preference being given to angina pectoris, gastric ulcer, and bronchopneumonia over certain heart conditions, reversing the procedure prior to 1925. On the other hand, certain changes in coding practice have tended to swell the mortality figures for heart disease. Most prominent among these changes were those giving preference to "chronic endocarditis," "chronic myocarditis," "cardiac asthma," and "cardiac degeneration" over "cerebral hemorrhage." It is impossible to estimate, even approximately, the number of times these various combinations of terms are actually encountered and whether the net effect of the changes has been to raise or to lower the reputed heart disease death rate.

³BIGELOW, GEORGE H., and LOMBARD, HERBERT L. *Cancer and Other Chronic Diseases in Massachusetts*. Boston. Houghton Mifflin Co. 1933. Page 18.

⁴DEPORTE, J. V. "Heart Disease in the State of New York." *The American Heart Journal*. Vol. 5. 1930. Page 658.

⁵JARRETT, MARY C. *Chronic Illness in New York City*. New York. Columbia University Press. 1933. Vol. 1. Page 148.

⁶COLLINS, SELWYN D. "Age Incidence of Specific Causes of Illness." *U. S. Public Health Reports*. Vol. 50. 1935. Page 1407.

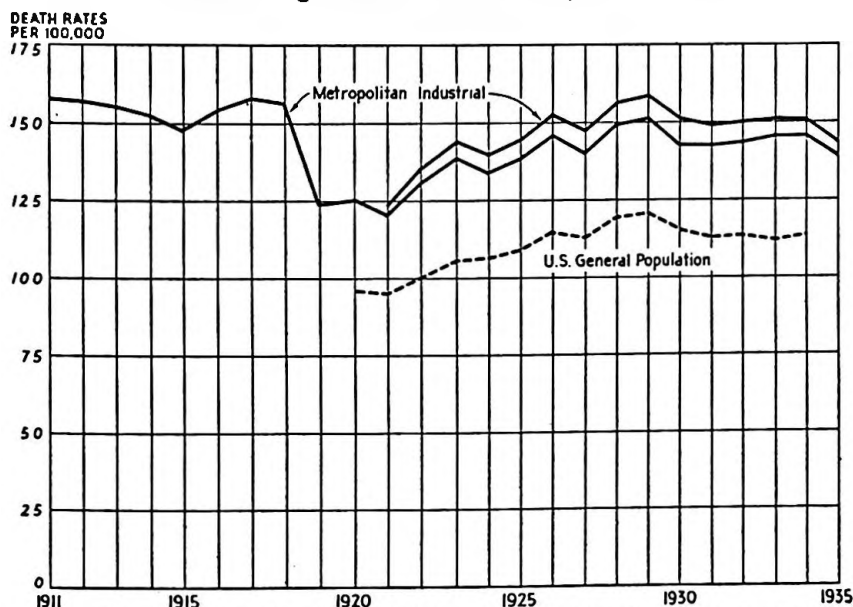
⁷Adjusted to correspond to the age distribution of the white population of the Registration States, 1929-1930.

110,000 children,⁸ most of them between 14 and 17 years of age, 5.7 per 1,000 were found to have organic heart disease. On the basis of the available data, which are far from satisfactory, we estimate that there are at least 2,000,000 persons in this country suffering from diseases of the heart. Moreover, many deaths from cardiac conditions are preceded by long periods of incapacitating illness, during which wage-earners and their families suffer loss of income. In addition, the patient usually requires medical and nursing care, and in many cases hospitalization. The economic and social loss from heart disease, therefore, reaches an enormous total.

The mortality from heart disease among urban wage-earners and their families, of whom the Industrial policyholders are representative, is higher than that in the general population. Chart IV shows clearly the disparity in death rates for the two groups. Comparison of the trends for the two experiences are made only for the years 1920 to 1934, because accurate population estimates

CHART IV
ORGANIC DISEASES OF THE HEART†
Standardized Annual Death Rates per 100,000
Total Persons. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935
and U. S. Registration States of 1920, 1920 to 1934



†Title 79 of the 1909 Revision of the International List for the 25-year Metropolitan series, and title 90 of the 1920 List for the two shorter series.

⁸GOODMAN, MORRIS, and PRESCOTT, JOSEPHINE W. "Heart Disease Among Adolescent School Children of New York City." *Journal of the American Medical Association*. Vol. 103. 1934. Page 137.

by color, sex, and age are not available for the expanding United States Registration Area for the period 1911 to 1919. Among Metropolitan policyholders, ages 1 to 74, the cardiac death rate in recent years was more than $1\frac{1}{4}$ times that for the same age group of the population at large. This excess mortality gives a rough measure of the tax imposed by industrial work and attending conditions on wage-earners and their families. Excessive fatigue, crowded workrooms, poor living quarters, and inadequate medical care are factors which may well be reflected in these figures. The higher rate among the insured may also result in part from the mode of life in urban areas, as contrasted with that in rural parts. In any case, the fact that this insurance experience deals with that group of the population in which heart disease mortality is much above the average, gives added significance to this investigation.

In the 25 years from 1911 to 1935 a total of 445,833 deaths from organic heart disease was reported among Metropolitan Industrial policyholders at ages 1 to 74. The standardized annual death rates for the period averaged 144.1 per 100,000. In this insurance experience heart disease accounted for one death out of every seven.

Heart disease as a cause of death has gained in relative importance during the period under review. For the years 1911 to 1915 the cardiac deaths were 11.4 percent of those from all causes; in 1931 to 1935 the proportion was 18.0 percent. In the earlier quinquennium heart disease ranked a somewhat distant second to tuberculosis; in the recent five-year period heart disease was the leading cause of death, and registered a death rate more than twice that for tuberculosis.

The large number of deaths from heart disease at the older ages overshadows the fact that it is a leading cause of death at almost every period of life. In recent years the disease was out-ranked only by accidents and appendicitis among white males at ages 10 to 14. In the broad age range 15 to 44 heart disease was in fourth place, being exceeded by accidents, tuberculosis, and influenza and pneumonia combined. Beyond age 45 heart disease was the leading cause of death. The experience for white males is fairly typical of the other three color-sex groups.

Mortality by Age, Sex, and Color

The death rates from organic heart disease by age, sex, and color for the 25-year period as a whole, and for the initial and final quinquennia of that period, are presented in Table 5. Again the discussion will be limited to the recent period 1931 to 1935.

TABLE 5
ORGANIC DISEASES OF THE HEART†
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

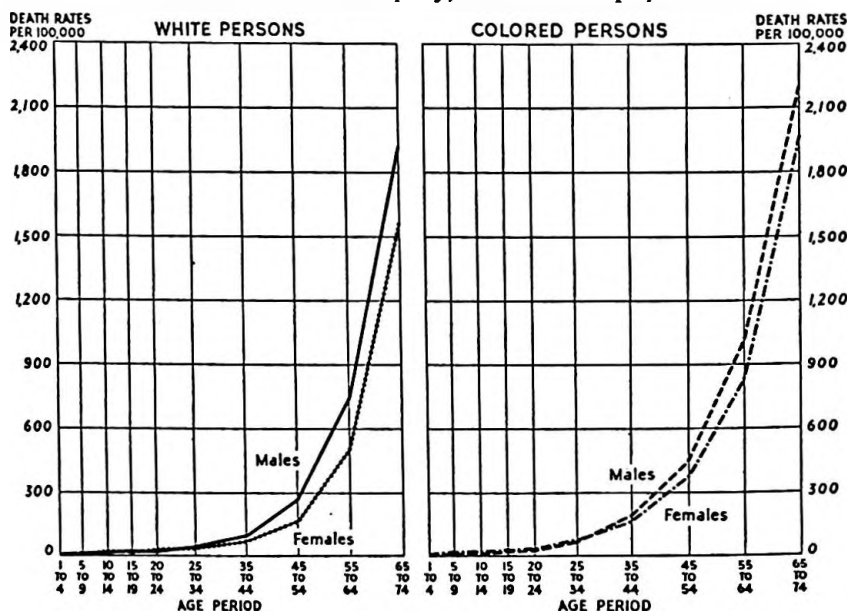
AGE PERIOD YEARS	MALES			FEMALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
WHITE						
1 to 74*.....	152.3	157.7	160.8	126.2	118.7	138.9
1 to 24*.....	17.0	11.8	20.6	18.6	12.4	24.3
25 to 44*.....	65.7	58.2	85.4	54.5	44.0	69.2
45 to 74*.....	655.7	710.3	659.7	530.7	524.4	559.4
1 to 4.....	5.9	3.7	7.4	5.7	4.1	6.1
5 to 9.....	11.3	7.6	14.9	13.1	7.4	18.9
10 to 14.....	18.3	12.6	22.9	23.4	14.1	32.1
15 to 19.....	24.5	16.0	28.5	24.2	15.3	30.7
20 to 24.....	24.2	18.9	28.5	25.9	20.7	32.3
25 to 34.....	41.5	36.3	55.8	37.8	30.8	48.2
35 to 44.....	97.5	87.1	124.4	76.5	61.4	96.8
45 to 54.....	244.3	254.1	268.4	177.9	158.6	210.6
55 to 64.....	669.7	724.8	663.0	513.7	499.0	563.4
65 to 74.....	1,739.5	1,914.4	1,709.0	1,513.7	1,556.6	1,493.2
COLORED						
1 to 74*.....	207.9	218.7	211.4	195.7	195.1	199.8
1 to 24*.....	19.3	14.4	21.2	23.9	18.3	27.5
25 to 44*.....	125.5	112.2	142.6	123.3	107.3	140.0
45 to 74*.....	849.2	940.8	836.3	776.3	813.0	761.7
1 to 4.....	10.3	5.8	15.4	11.6	6.3	15.2
5 to 9.....	12.9	11.9	10.6	15.9	14.4	13.5
10 to 14.....	20.5	14.5	19.8	25.1	17.9	28.7
15 to 19.....	25.3	18.7	27.4	30.5	24.0	36.0
20 to 24.....	27.5	20.6	33.3	36.1	28.3	44.2
25 to 34.....	73.2	57.4	92.6	70.6	60.6	76.6
35 to 44.....	194.3	184.3	208.4	192.5	168.8	223.4
45 to 54.....	414.0	432.7	431.4	399.2	374.4	447.4
55 to 64.....	919.0	1,002.9	917.6	813.3	823.6	809.2
65 to 74.....	1,896.9	2,199.1	1,781.4	1,725.9	1,976.8	1,523.4

*Standardized for age.
†1909 classification.

Age Deaths from heart disease are found in sizable numbers at every period of life, but by far the greatest mortality occurs in middle adult life and at the older ages. Minimal rates are recorded among children under 5. During the next 20 years of life the rates rise gradually. Thereafter the mortality increases sharply with each succeeding age period. In recent years the death rates have increased from two to three times between successive decades of life after age 25, so that among white men, for example, the rates at 65 to 74 are over 50 times as high as at 25 to 34. In general, the rise in the death rate with age is least among white women and greatest in colored men. These facts are illustrated in Chart V.

There are certain significant variations in the curves by color and sex. At ages 10 to 14 the rise in the white female death rate is somewhat greater than in males, reflecting perhaps the strain of the earlier puberty of girls and possibly also a differential incidence of rheumatic fever. In the next five years of life the female death rate goes up very slightly, but there is a sharper increase in that for white boys. This situation reflects the difference in the

CHART V
ORGANIC DISEASES OF THE HEART†
 Averages of Annual Death Rates per 100,000
 By Color, Sex, and Age. Ages 1 to 74 Years
 Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935



age of puberty in the two sexes with its effect on those children with poor hearts, damaged by rheumatic fever or other infections, or with congenital heart disease. In the next five years of life, between 20 and 24, the situation is again reversed, a small rise in the mortality of males but a sharper one in females. Here, it is believed, one cause is the high mortality following pregnancy among young women with previous heart disease, and while this factor is not limited to this age group, it stands out more strikingly than at later ages. Beyond 25 the rates rise rapidly in both sexes, but more so among men.

The age curves for colored persons show essentially the same characteristics as those for whites. Attention must be called, however, to the abrupt rise in the death rate of colored persons at ages 25 to 34.

Sex More males than females succumb to heart disease, though among white persons the female mortality is at some periods slightly in excess of that for males, for reasons which have already been suggested. Among the colored, on the other hand, the heart disease death rate of females in recent years has been distinctly higher than that of males throughout the first three decades of life. At the very youngest ages, this is probably without statistical significance because of the small number of deaths, many of which are probably not accurately certified as to cause. But in the succeeding ages, the differences are too large and too consistent to be without significance. Between ages 5 and 25 it is difficult to assign any cause for this disparity. It hardly seems likely that the conditions of life for the two sexes among the colored are so different at these younger ages. Physiological changes may, in part, be involved and, after age 15, the effect of pregnancy on colored women with heart disease. This must be a far more important factor in Negroes than in whites, for even at ages 25 to 34 the colored female rate exceeds that for males, whereas among whites the reverse is true.

After age 25 among the white and after 35 among the colored, the death rates from heart disease among men are consistently higher than in women. Among whites the difference is at first relatively slight, the excess of the male rate being only 18 percent at ages 25 to 34, but the gap widens appreciably during the next two decades, so that at ages 45 to 54 the excess is 60 percent, the maximum. The excess falls off subsequently so that by ages 65 to 74 it is only 23 percent. Among the colored the changes are much

more gradual and never very large. The excess of the male death rate from heart disease over the female rate, in recent years, rises slowly from 9 percent at ages 35 to 44, to its maximum of 22 percent at ages 55 to 64, and then falls to 11 percent at 65 to 74.

Color The death rate among colored persons from chronic heart disease exceeds that for the white by 39 percent among males and no less than 64 percent among females. The difference is marked in both sexes in the preschool ages. Among males the differences between the rates of the white and colored are relatively small between ages 10 and 25, but from there on the picture changes abruptly. For the next 20 years of life there is a large and growing difference between men of the two races, which reaches its maximum of 112 percent at ages 35 to 44. The relative excess then falls off until at 65 to 74 it is only 15 percent. Among females the situation is very different. The smallest excess of the colored rate over that for white females is 27 percent, recorded at 10 to 14 and again at the oldest ages in this experience, 65 to 74. At 15 to 19 the colored rate is more than $1\frac{1}{2}$ times that of the white, falls off slightly during the next five years, but then mounts sharply, reaching a maximum at ages 35 to 44, when it is no less than $2\frac{3}{4}$ times the white rate. The excess is somewhat smaller in the next 10 years and declines thereafter very sharply. To a certain extent these large differences may be discounted as due to relatively poor certification of the causes of death among Negroes, for these differences between the two races in cardiac mortality at ages past 35 are much larger relatively than is found in the death rate from all causes combined. It is likely that, in a large proportion of cases in which the deceased had no regular medical attendant, the diagnosis of heart disease was frequently put down even without good evidence of its presence. On the other hand, the differences are too large to be dismissed altogether in this manner. Part certainly may be explained by the incidence of syphilitic heart disease in Negroes. Part also may be due to the effect of arduous manual work and of exposure, particularly if there existed any damage to the heart from other causes. By and large the proportion of persons doing work of this type is greater among Negroes than among whites, even in this Industrial insurance experience.

Trend of Mortality

Chart IV on page 249 shows the course of the mortality among the Industrial policyholders of the Metropolitan Life Insurance Company. For the years 1911 to 1918 the death rate from heart

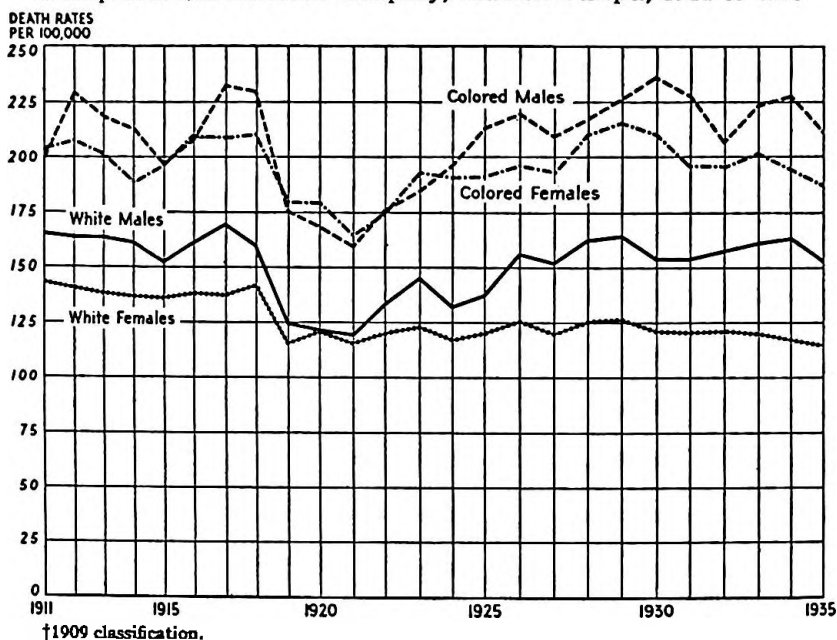
disease was fairly stable. In 1919, however, the year following the influenza pandemic, the heart disease death rate dropped sharply and continued to decline to the minimum point of the series in 1921. From that point the rate increased fairly steadily and rapidly until 1929. It may be noted, at this point, that this sharp fall and subsequent recovery is to be found in every age group in both sexes and in both white and colored races. There are differences from group to group as regards duration and extent, both of the fall and the subsequent rise, which, in some cases, are small and of short duration. In 1930 the death rate from heart disease fell again and the new level was maintained with little variation until 1935, when another slight fall was recorded. The recent levels of the heart disease rate are at the approximate stage of a decade ago. They are still appreciably above the low point of 1919-1921, but are below the level of the preinfluenza years. Too much stress should not be laid on the recent improvement of the mortality from organic heart diseases because, to a significant extent, it may be due to the reporting of many deaths as due to coronary disease, which is not included with the organic heart diseases. This should be kept in mind in the detailed comparisons, by color, sex, and age of the cardiac death rates in the last few years with those of past years.

Chart VI shows, for this group of policyholders, the trends of the heart disease rate by color and sex. For white males the time series has most of the characteristics of the insured population as a whole: A level trend from 1911 to 1918, a sharp decline between 1918 and 1921, and an upward trend between 1921 and 1929. No definite upward or downward movement of the death rate is discernible in the closing years of the series. The rate has fluctuated quite widely, nearly duplicating the 1929 peak in 1933 and 1934, but dropping sharply in 1935. The rise in the rate during the 20's, most of which has been maintained, was so large that the rates in several recent years have reached the level prevailing before the pandemic. The average rate for 1931 to 1935 was 2 percent lower than that of 1911 to 1915, but nearly 30 percent above the low levels of 1919 to 1921.

Among white females the course of the heart disease rate shows somewhat similar tendencies, but there are important differences. First, heart disease rates among women began to fall in 1919, a year later than among men; the decline was by no means so sharp, and the subsequent rebound was very slight. The trend was gently upward between 1921 and 1929, but since that year the

CHART VI
ORGANIC DISEASES OF THE HEART†
 Standardized Annual Death Rates per 100,000
 By Color and Sex. Ages 1 to 74 Years

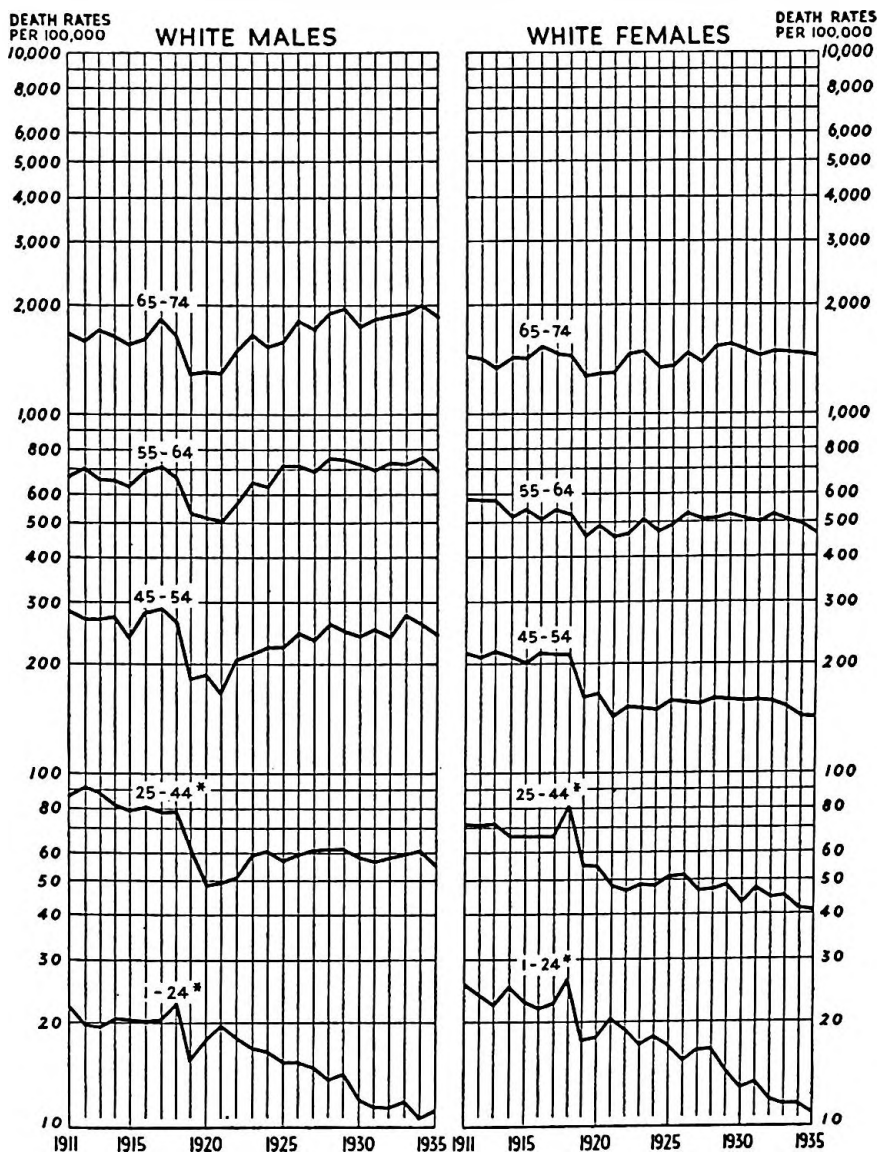
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



mortality has shown a definite downward trend. In fact, the rate in 1935 was the lowest recorded during the 25 years, and the average rate for the period from 1931 to 1935 was but 1 percent higher than the three-year minimum 1919–1921, and 15 percent below that of 1911–1915. Among colored persons the trends have been more or less parallel to that for white males.

Even more significant departures from the general trend are found at the various ages of life. Charts VII and VIII show the trends for each color and sex group by age. The curves for the age range 1 to 24 are distinctly different from the picture shown at all ages combined. Among these young people, irrespective of color or sex, heart disease rates have definitely declined. Among white persons the rate in 1931 to 1935 was about half that in 1911 to 1915. The record among the colored is not so good as among the whites, but in recent years it has exhibited such appreciable improvement that the level of the last five years is nearly one fourth lower than that of the preceding five years among young colored males, and one sixth lower among colored females. Thus, a very favorable situation prevails at the younger ages.

CHART VII
ORGANIC DISEASES OF THE HEART†
Annual Death Rates per 100,000 White Persons
By Sex and Age. Ages 1 to 74 Years
 Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



*Standardized for age.
 †1909 classification.

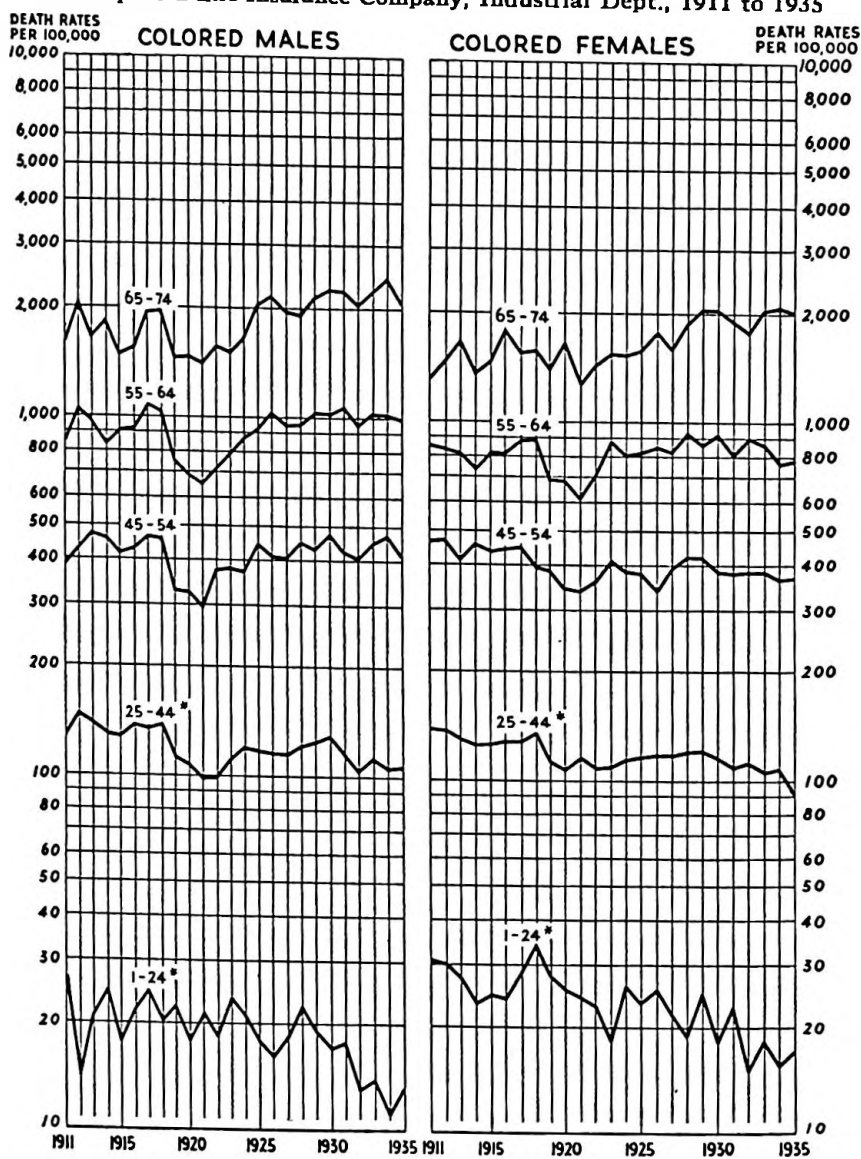
CHART VIII

ORGANIC DISEASES OF THE HEART†

Annual Death Rates per 100,000 Colored Persons

By Sex and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



*Standardized for age.

†1909 classification.

A generally favorable picture is evident also at ages 25 to 44. Among white males at these ages there was a rather steady decline in heart disease mortality up to and including 1918, a precipitate fall the next two years, then a rebound to the 1919 level. This level has been maintained with but minor fluctuations for 12 years. At this level, however, the heart disease rates at these ages are approximately 30 percent below the preinfluenza level. Among white females the death rate prior to the pandemic also showed a downward tendency. The havoc which the epidemic played with pregnant women afflicted with heart disease, is shown by an abrupt increase in heart disease rates in 1918. The next year, however, showed a fall in the rate to a lower level than in any previous year, and since that time the heart disease rate among women aged 25 to 44 has shown a downward tendency.

Among the colored the situation is now also encouraging. But this is a relatively recent development. Colored males in this important period of life experienced a downward trend until 1922, but thereafter they suffered a sharp increase in mortality, so that the rates as recently as 1930 approached the levels obtaining during the period prior to 1918. A distinct change for the better has occurred since 1930, and the rate for the last five years of the experience has averaged nearly 20 percent less than the 1930 rate. Among young colored women the trend has been somewhat more favorable than among colored men. On the whole, the situation as regards heart disease in the important productive years is far better today than 25 years ago and, as in childhood and adolescence, contrasts sharply with the less favorable condition at all ages combined. Possibly here too we see the favorable effects of the decline in the infectious diseases.

It is obvious from the foregoing that such increases as have occurred in the death rate from heart disease are limited to middle life and old age. Sharp declines in the rates, which have been recorded in the two or three closing years of the experience, should be viewed with suspicion because they may simply reflect the recent drift towards more frequent recognition and registration of cardiac deaths as due to coronary disease. Among white men at ages 45 to 54 the current rates are still below those prevailing prior to 1918, despite a large and persistent rise since 1921. At all ages past 55, however, the rates have not only been increasing, but have attained a level appreciably in excess of those prevailing in the earlier years. Among white women at ages 45 to 54, the rate remained remarkably stable between 1922 and 1933 and has since

fallen sharply. The 1931 to 1935 average was about 25 percent below that for 1911 to 1915. At ages 55 to 64, despite a slight upward trend from 1919 to 1926 and the maintenance of the high level reached in that period almost down to the present, the mortality in no recent year has reached the preinfluenza level. Only at ages past 65 have current death rates among white women exceeded those of earlier years. Among older Negroes the upward trend of the death rate since 1921 has been sharper than among whites.

Summarized briefly, then, the heart disease mortality situation is a mixed one. Certain aspects are decidedly favorable. In childhood and in early adult life, heart disease mortality has been falling and the rates are now at minimal levels. In white women this improvement extends well into middle life. Only in old age is the upward course of heart disease mortality really important.

Types of Heart Disease

What do these varying and contrasting trends mean? Why should death rates from heart disease in early life decline and the rates in later life increase? The reasons for this diversity in trend must be sought in a consideration of the causes and types of heart disease which prevail in the broad age periods of life. Heart disease is not a single entity; it is a complex of many factors, etiological and pathological. Moreover, in the same diseased heart there may coexist two or more types of structural change which may or may not be of the same etiological origin. It will clarify our discussion considerably if we consider two broad structural groups: chronic valvular heart disease and chronic myocardial disease.

Endocarditis, or inflammation of the internal serous membrane of the heart, is caused chiefly by diseases of the infectious type: rheumatic, streptococcic, or syphilitic. Disease of the heart valves is frequently caused by these infections, but often it is also the result of atheromatous or sclerotic changes. Mitral valve disease, which is the most important of the valvular lesions, is chiefly but not exclusively of rheumatic origin. This type of heart disease is most common in youth and middle age, and particularly affects females, among whom the incidence is probably 50 percent greater than in males. Aortic valve disease also is generally of infectious origin, but the offending organism is more often the spirochete of syphilis. Aortic disease is most common in middle life and affects males more frequently than females, the ratio being roughly three

to one. Diseases of the tricuspid and pulmonic valves also enter into the picture, but are much less frequently encountered than are mitral or aortic lesions.

Myocardial disease is by far the most important type of heart trouble. Its common manifestation is an increase in the size of the heart. The cause of this cardiac enlargement, whether by hypertrophy or dilatation or both, is heart strain, the chief factors of which are ascribed, on the one hand, to hypertension, and on the other, to valvular disease. The latter is, as we have seen, chiefly of rheumatic origin. But hypertensive cases greatly outnumber those with a valvular background. Degeneration and fibrosis, comprising important types of myocardial change, result chiefly from coronary disease. Cases of this kind are practically limited to middle life and old age, more especially to the latter.

Annual data on the mortality from chronic heart disease, according to the structures involved, are available for the Industrial policyholders of the Metropolitan Life Insurance Company since 1921. The figures for the quinquennium 1931 to 1935, by color, sex, and age, are presented in Table 6.

Trends of Mortality for Structural Types

Distinctly different trends are evident in the mortality from chronic valvular heart disease and chronic myocardial disease. Graphic presentation of these facts appears in Chart IX. During the period for which data are available, the mortality from valvular disease has fallen steadily. Moreover, the decline in death rates from these conditions has affected every age, both males and females, and Negroes as well as white persons. The rate of fall has been greatest among young persons. Current death rates at ages under 25 are barely half what they were in 1921-1922. Between ages 25 and 44 there has also been substantial improvement, although less than at the younger ages. Even past 45 years of age the improvement in the recorded mortality from valvular disease has been substantial, and in white persons, curiously enough, it was even greater than at ages 25 to 44.

In marked contrast with these trends are the changes in mortality from disease of the heart muscle. Between 1921 and 1929 large and statistically significant increases in death rates were recorded at every age period for each of the four color and sex groups. Males registered a greater percent increase than females; colored persons in each sex showed a more rapid rise in mortality than the white. Among white males past age 45, beyond which

TABLE 6
CHRONIC VALVULAR HEART DISEASE AND CHRONIC MYOCARDIAL DISEASE
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Department, 1931 to 1935

AGE PERIOD YEARS	WHITE						COLORED			
	MALES			FEMALES			MALES		FEMALES	
	Chronic Valvular Disease	Chronic Myocardial Disease		Chronic Valvular Disease	Chronic Myocardial Disease		Chronic Valvular Disease	Chronic Myocardial Disease	Chronic Valvular Disease	Chronic Myocardial Disease
1 to 74*	38.7	91.8		33.2	66.7		71.0	94.5	65.9	84.2
1 to 24*	7.8	1.2		8.3	1.2		7.3	1.4	10.3	2.3
25 to 44*	25.9	18.8		22.9	11.7		42.9	31.7	42.8	30.7
45 to 74*	142.9	452.4		117.2	330.9		288.1	446.2	253.2	390.3
1 to 4	1.7	0.4		2.1	0.4		1.7	0.5	2.3	0.9
5 to 9	5.1	0.6		4.8	0.6		6.1	1.0	7.7	1.2
10 to 14	8.8	1.2		9.8	0.7		8.5	0.2	9.5	2.2
15 to 19	11.0	1.6		10.3	1.9		10.3	2.1	15.4	2.8
20 to 24	12.1	2.3		14.6	2.6		9.7	3.1	16.3	4.6
25 to 34	20.3	7.6		19.4	5.3		23.5	14.5	26.6	14.4
35 to 44	33.3	33.6		27.4	20.1		68.4	54.3	64.2	52.2
45 to 54	69.1	156.1		50.1	93.4		148.4	208.9	134.9	172.7
55 to 64	141.8	466.8		112.4	319.0		320.6	468.2	259.8	397.1
65 to 74	343.7	1,225.4		306.7	992.9		606.0	1,046.3	560.4	965.0

*Standardized for age.

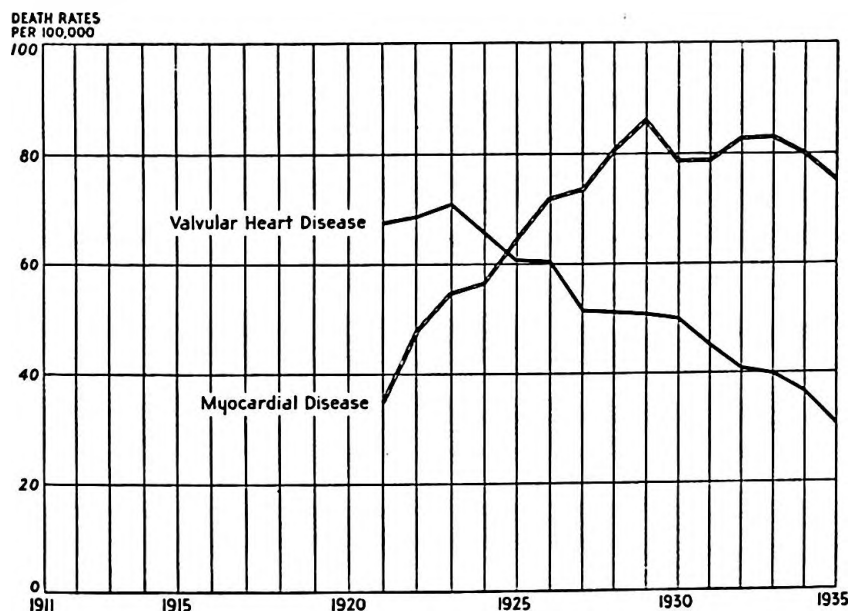
CHART IX

CHRONIC VALVULAR HEART DISEASE AND CHRONIC MYOCARDIAL DISEASE

Standardized Annual Death Rates per 100,000

Total Persons. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1921 to 1935



the deaths from these conditions are concentrated, the mortality from myocardial disease doubled, and among white women it rose 75 percent. Among Negroes at these ages the increases are even more striking.

These diverse trends of valvular and myocardial disease are so sharply defined that we must be cautious in interpreting them. Both White⁹ and Halsey¹⁰ point out that changes in medical opinion constitute a major factor in the situation. A generation ago attention was focused on valve changes in heart disease. But largely as a result of the teachings of the late Sir James Mackenzie, the efficiency of the heart muscle of cardiac patients was more and more stressed. Concurrently, medical ideas on hypertension were changing. Its effects upon the myocardium were receiving greater attention. Into this situation a new element entered which has further modified the picture, namely the increasing emphasis on the coronary artery changes which are frequently the

⁹WHITE, PAUL D. *Heart Disease*. New York. Macmillan Company. 1931. Page 300.

¹⁰HALSEY, ROBERT H. "Etiology of Heart Disease." *Journal of the American Medical Association*. Vol. 98, February 20, 1932. Pages 593-598.

cause of myocardial degeneration. Consequently, the disease of the coronary artery has come to be more frequently reported on death certificates, often to the exclusion of the myocardial damage. This is clearly reflected in the recent rather sudden halt in the previously rapid rise of the mortality from myocardial disease. Unfortunately, we cannot measure exactly the effect of these shifts in medical opinion upon the heart disease picture. We are convinced, however, that the trends of the death rates indicate the direction, if not the magnitude, of the change in the prevalence of the various types of heart disease.

These contrasting trends, in so far as they are indicative of real changes in the heart disease situation, assume importance in the light of the etiology of heart disease and its relation to structural changes in the organ. Cardiac disease of young persons is, as we have seen, chiefly due to morbid changes in the heart valves, usually of infectious origin. The decline in heart disease mortality in early life, therefore, is not surprising, for these germ enemies of mankind have been the objects of successful attack. The incidence of rheumatic fever, the communicable diseases of childhood, and of certain other infections, has long been decreasing. The result apparently has been a reduction in the frequency of heart disease at the ages where this background is the usual one. This change in the heart disease picture is greatest in early life, but continues well up to age 50.

Among men in the broad working ages, when syphilis is so often the cause of aortic damage, better control of this disease has also played a part in reducing heart mortality of the valvular type. The decline in syphilis mortality among white men has been real and substantial. Moreover, late manifestations of syphilis have probably been reduced by better and more intensive treatment resulting in a greater proportion of cured cases. The recorded death rate from syphilis among colored men has actually increased, but this phenomenon may be a statistical artifact, because syphilis is probably more frequently diagnosed in colored men than formerly.

Many causes have been suggested for the rise in the recorded death rate from heart disease at the older ages. Much has been said regarding the pace of modern life in this connection. But the picture is not very clear. It is true, of course, that the crowding of immense populations into cities, their intense activity, and the excitements which increased earnings have enabled people to enjoy, are not conducive to orderly and reposeful living. The

many strains of modern life on the nervous system and indirectly upon the heart are by no means negligible, but the extent to which they add to the incidence of heart disease is not easy to determine. In contrast with these possibly harmful effects of modern life, no one can deny that very considerable benefits to the health and well-being of the masses accrue from the advances in modern science and technology. On the whole, men today, whether on the farm or in industry, work less hard than they formerly did. Machinery carries most of the burden of the work and, consequently, the heart strain from hard manual labor, in which a very large proportion of our population had to engage in times past, is much less common today than formerly. Under conditions of present-day life the masses are, in general, better fed, better clothed, better housed, and receive more frequent and better medical attention. In the face of all these advantages of modern life, one must proceed slowly in ascribing the rise in heart disease to the more rapid tempo of our day.

Part of the *recorded* increase we are considering has resulted from the better knowledge and treatment of heart disease. The many improvements in medical technique and facilities, and the greater familiarity of physicians with these improvements would have the effect of disclosing many cases which previously would have gone undetected. The use of the electrocardiograph, the X-ray, and other laboratory procedures, which have been developed for testing heart function and determining heart size, have certainly added to the number of recorded cases of heart disease. But the recorded increase in heart disease due to this factor is a matter of congratulation rather than of concern. The same may be said of better medical treatment that prolongs life and often enables useful members of the community afflicted with heart disease to carry on their activities.

Future of Cardiac Mortality

The heart picture, therefore, on the whole, is an encouraging one, in spite of the increasing death rate from cardiac disease at the older ages. This does not mean that we should look upon the problem of heart disease with indifference. There is every reason to look forward to a continued improvement in mortality from heart disease in children and young adults, particularly from the valvular conditions. But further accomplishment along these lines will result largely from continued efforts in combating the infections such as acute rheumatic fever, scarlet fever, and syphilis,

and in adding to present facilities for their prevention. Current projects for the better housing of the poor will probably bear fruit in reducing still further the incidence of rheumatic infections. For the unfortunates who may still acquire heart disease in early life, we must see that adequate care is available, particularly for convalescents.

Little may be expected, however, in the way of reducing the mortality from heart disease in late life. We need not be concerned about deaths of this type, which are the result of the inevitable breakdown of the organism with advancing age. But even if we cannot check the upward course of "degenerative" heart disease, we should not neglect that part which is premature and responsible for much unnecessary suffering and disability among persons still in the prime of life. Very material benefit may be expected to accrue from education in better health habits, especially in the value of a moderate amount of exercise and of sufficient rest. Of especial importance is the promotion of the periodic health examination of persons in middle life. Many cases of heart lesions in their early stages may thus be detected, so that the affected individuals are enabled to derive the benefits of prompt treatment and suitable alteration in their mode of life.

DISEASES OF THE CORONARY ARTERIES AND ANGINA PECTORIS

It is fitting that consideration of these conditions be closely joined to the discussion of the mortality from heart disease. Segregation of the deaths due to coronary artery disease, from the heart disease group, is really rather artificial because, as has been indicated, myocardial degeneration is frequently the result of disease in the coronary arteries, which are the sources of the blood supply to the heart muscle. Unfortunately, it is not possible to trace along strictly comparable lines the sequence of the death rates from these causes throughout the whole 25-year period. For deaths specifically ascribed to coronary artery disease no separate data exist prior to 1930, and our knowledge of the true incidence of conditions of this type is severely limited on that account. On the other hand, the data for angina pectoris, which is so often merely symptomatic of coronary disease, are available since the beginning of this experience. Its trend for most of the period prior to 1930 is undoubtedly indicative of the increasing appreciation of the role of coronary artery disease in the mortality picture.

It must seem surprising that it has taken so long for coronary artery disease to become widely recognized. Angina pectoris, the most frequent cause of which is coronary disease, was originally named in 1768 by Heberden, who applied this term to the symptom-complex the outstanding features of which were excruciating pain in the chest and fear of impending death. He did not suspect changes in the coronary arteries as the basis of the anginal pain; that cause was suggested a few years later, although the idea was not published until the end of the 18th century. Among the first to recognize the significance of coronary artery disease was Edward Jenner, the famous discoverer of vaccination for smallpox, who found changes at autopsy in the coronary arteries of two individuals who had had violent attacks of angina pectoris. But for many reasons the correct view of the causes of typical anginal attacks was overlooked or disputed for more than a century. The view generally accepted today of the coronary origin of angina is largely the result of the work of James B. Herrick, an American physician, who, in 1912,¹¹ reported the effect of obstruction of the

¹¹HERRICK, JAMES B. "Clinical Features of Sudden Obstruction of the Coronary Arteries." *Journal of the American Medical Association*. Vol. 59. 1912. Page 2015.

coronary arteries. This paper did not receive much attention at the time, but greater attention was given to his second paper on the subject, published in 1919.¹² Possibly, as Dr. Herrick has said, "practitioners and laboratory workers were (then) in a receptive mood for new facts about the heart,"¹³ largely because of the revival of interest in heart disease due to the work of Mackenzie, and to the new electrocardiographic and X-ray methods for the study of the heart which were then being developed. In the last 10 years few medical problems have been the subject of such intensive and searching study as diseases of the coronary arteries.

It should be remarked that diseases of the coronary arteries and angina pectoris do not constitute an absolutely pure grouping. The term angina pectoris has been, in varying degree, applied to severe pain or sense of oppression in the heart region. Physicians have come to use the term with greater discrimination as the symptoms associated with the cardiac pain have become more fully understood. By and large, however, angina pectoris has been considered as a sign that the heart is unable to meet the demands made upon it, and that, for the most part, the underlying cause is a deficiency in the quantity of blood supplied by the coronary arteries to the heart muscle. The deficiency may vary markedly in degree with corresponding variations in the severity of the attack.

Several pathologic conditions may give rise to angina pectoris. Of these conditions, by far the most common is a narrowing of the channel in some branch of the coronary arteries, or the actual occlusion of such a branch. Occasionally, however, no changes in the heart or its arteries are demonstrable in cases of angina pectoris. Various theories have been proposed to account for this phenomenon, most favored of which is that the condition is due to a spasm of the arteries, arising from impulses passing along the nerves controlling these vessels.

Although the term angina has thus been somewhat loosely employed to denote a condition or set of symptoms of variable origin, there is good justification for considering angina pectoris jointly with diseases of the coronary arteries. The great majority of deaths from angina pectoris are, in the judgment of most authorities, definitely of coronary origin. Indeed, coronary disease and angina pectoris are frequently specified together on the same death certificate, and it is one of the anomalies of classification procedure

¹²HERRICK, JAMES B. "Thrombosis of the Coronary Arteries." *Journal of the American Medical Association*. Vol. 72. 1919. Page 387.

¹³HERRICK, JAMES B. Chapter "Historical Note" in *Diseases of the Coronary Arteries and Cardiac Pain*, edited by ROBERT L. LEVY, New York. Macmillan Company. 1936. Page 25.

that such cases are still assigned to the symptom, angina, rather than to the causative coronary artery disease.

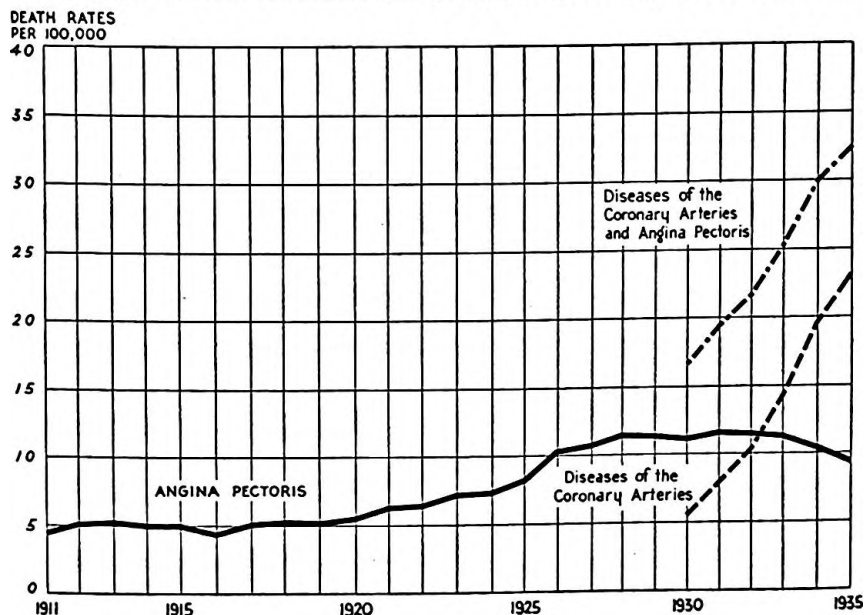
Trend of Mortality

The chief feature of the mortality from this group of diseases is its extremely rapid rise, especially in recent years. Chart X shows the standardized death rates, at ages 1 to 74 years, for diseases of the coronary arteries and angina pectoris, both separately and combined for the years 1930 to 1935, and also the death rates for angina pectoris prior to 1930. Most striking is the almost perpendicular rise in coronary disease from 5.6 per 100,000 in 1930, to 23.1 in 1935, an increase of more than 300 percent in this very short interval. During most of this period, the death rate from angina pectoris has, in contrast, been relatively constant, and has fallen nearly 20 percent in the last two years. Consequently, the rate of increase for coronary disease and angina pectoris combined for the five years is large although considerably less than that from coronary disease alone, for the death rates for the two cate-

CHART X DISEASES OF THE CORONARY ARTERIES AND ANGINA PECTORIS

Standardized Annual Death Rates per 100,000
Total Persons. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



gories together rose from 16.7 in 1930 to 32.4 in 1935, or nearly 100 percent. It should be noted also that in 1930 the recorded rate for coronary disease was considerably lower than the angina rate, but since 1933 the order has been reversed.

Prior to 1930 the mortality from angina pectoris alone showed a considerable rise. Between 1911 and 1919 there was no significant change in the death rate from angina, but from 1920 to 1926 there was a rapid and practically uninterrupted rise which carried the death rate from this condition from 5.5 per 100,000 to 10.3. Thus, in six years the death rate nearly doubled. From 1926 to 1930 it increased further, but by no means at the pace recorded in the earlier period. It is fairly certain, however, that this interruption in the rise of the death rate from angina pectoris did not reflect an objective clinical reality, but was merely a result of the certification, in increasing numbers, of deaths characterized by angina pectoris, as due to the causative coronary disease. Evidence of this is also found in the statistics for "Embolism and thrombosis" under which deaths from coronary thrombosis were classified prior to 1930. There was a distinct rise in the recorded death rate under that title, from 3.1 per 100,000 in 1924 to 7.8 in 1929, whereas prior to 1925 there had been but little fluctuation in the death rate for this group of conditions. Moreover, the trends according to sex and age in the mortality from "Embolism and thrombosis" were similar in character to those recorded since 1930 in the death rate from diseases of the coronary arteries.

So rapid has been the rise in the mortality from diseases of the coronary arteries (including angina pectoris) that these conditions now rank high in the list of causes of death. In 1935, in this Industrial insurance experience, this group was the eighth leading cause of death and accounted for 4.0 percent of the total deaths. In the United States, in 1934, the latest year for which the figures are available, deaths from these conditions numbered nearly 55,000, of which more than 34,000 were recorded specifically as due to coronary artery disease and 20,000 as due to angina pectoris. Their total exceeded the number from diabetes, for example, by 93.2 percent and was only 24.5 percent less than the number of deaths from tuberculosis. They constituted 3.9 percent of the deaths from all causes.

No matter from what source mortality data are taken, a similar situation is found to prevail. Among policyholders insured in the Ordinary Department of the Metropolitan Life Insurance Company, consisting for the most part of men who are, on the

average, on a higher economic level than those in the Industrial Department, the death rate from coronary diseases alone has increased from 8.5 per 100,000 in 1930 to 28.8 in 1935 (adjusted rates, ages 10 to 74). If angina pectoris is included, the increase is from 24.5 in 1930 to 43.0 in 1935.

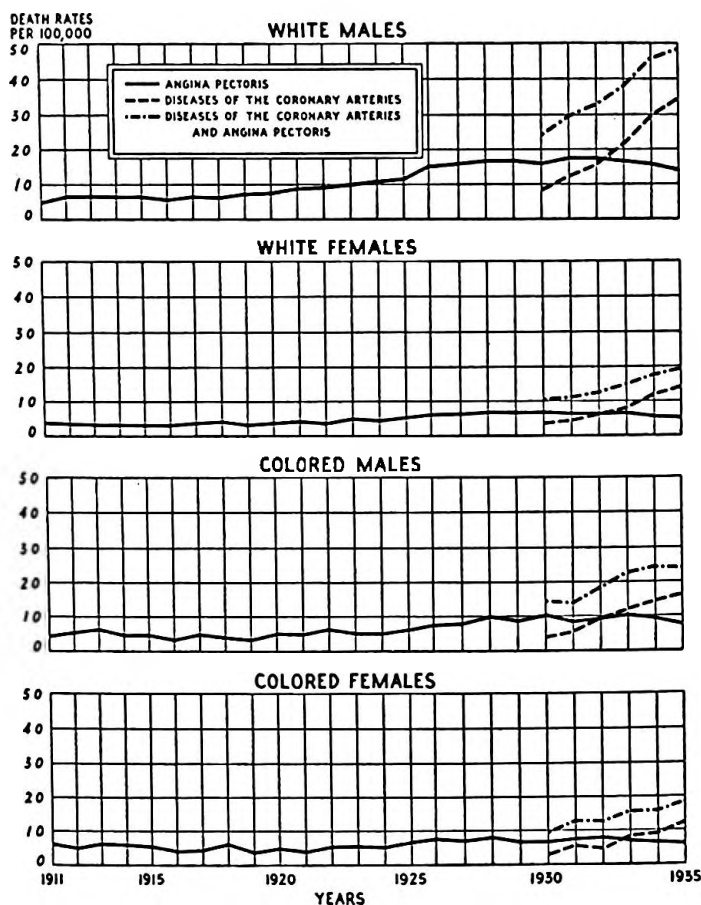
Likewise, the death rate from diseases of the coronary arteries for the country as a whole (excluding Texas) has risen from 7.9 per 100,000 in 1930 to 27.4 in 1934, or an increase of nearly $2\frac{1}{2}$ times in the short space of four years. The combined figures for diseases of the coronary arteries and angina pectoris show an increase from 24.1 per 100,000 in 1930 to 43.2 in 1934.

Of very great interest is the only long-term series of statistics on coronary diseases. It relates to Brookline, Mass., whose health officer, Dr. Francis P. Denny,¹⁴ has studied and reclassified the records of all heart deaths in his community since 1900. The data for that city, a well-known suburb of Boston, are of particular value because the per capita wealth of its inhabitants is among the highest in the country and in consequence of this, and of the close proximity to one of the country's great medical centers, the general level of medical service available to its population is excellent. Dr. Denny found that from 1900 to 1904 no deaths were reported from coronary diseases. Between 1905 and 1909 the death rate was 3.9 per 100,000. In the next five years the rate rose slightly. After 1915 it went up with considerable rapidity, so that in the five-year period 1930 to 1934 a rate of 94.6 per 100,000 was recorded and in 1935 a rate of 156.6. The deaths recorded from diseases of the coronary arteries in 1935 were slightly less than half of all the deaths from heart disease in that year. The death rate from angina pectoris rose from 16.7 in 1900 to 1904, to a peak of 36.4 during 1925 to 1929 and has since fallen to 21.8 in 1935. The deaths from coronary diseases and angina pectoris combined in Brookline, in 1935, outnumbered those from all other forms of heart disease.

The increased mortality from coronary artery disease and angina pectoris, as Chart XI shows, has affected both males and females, of both the white and colored races. The rise has been greatest among white males, whose death rate rose from 24.2 per 100,000 in 1930, to 48.7 in 1935. For coronary artery disease alone the rise was from 8.2 per 100,000 to 34.6. The rate of increase has been nearly as large for white females and but little less for colored persons.

¹⁴DENNY, FRANCIS P., "The Increase in Coronary Disease and Its Cause." *New England Journal of Medicine*, Vol. 214. April 16, 1936. Pages 769-773.

CHART XI
DISEASES OF THE CORONARY ARTERIES
AND ANGINA PECTORIS
Standardized Annual Death Rates per 100,000
By Color and Sex. Ages 1 to 74 Years
 Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



In like manner the rise in the death rate from these conditions extends to every age group in adult life, and it would be merely a repetition of sets of figures on different levels of mortality to detail them at length. In practically every color-sex-age group, the rates for coronary disease and angina combined increased approximately 100 percent between 1930 and 1935.

A drastic upward movement in the recorded mortality from any chronic disease at a time when the general death rate, and that for chronic diseases as a whole, show relatively small change,

must reflect a revolution in medical thought. Indeed, the increase in the mortality from coronary artery disease has been so large and uniform that it has not only confused the trends for other chronic cardiovascular conditions, as was noted particularly in the case of myocardial disease, but it has also raised serious doubts as to whether the change is entirely an artifact, or whether there has been a real increase in diseases of the coronary arteries. It will be well to review the characteristics of this mortality and their significance before considering this aspect of the situation.

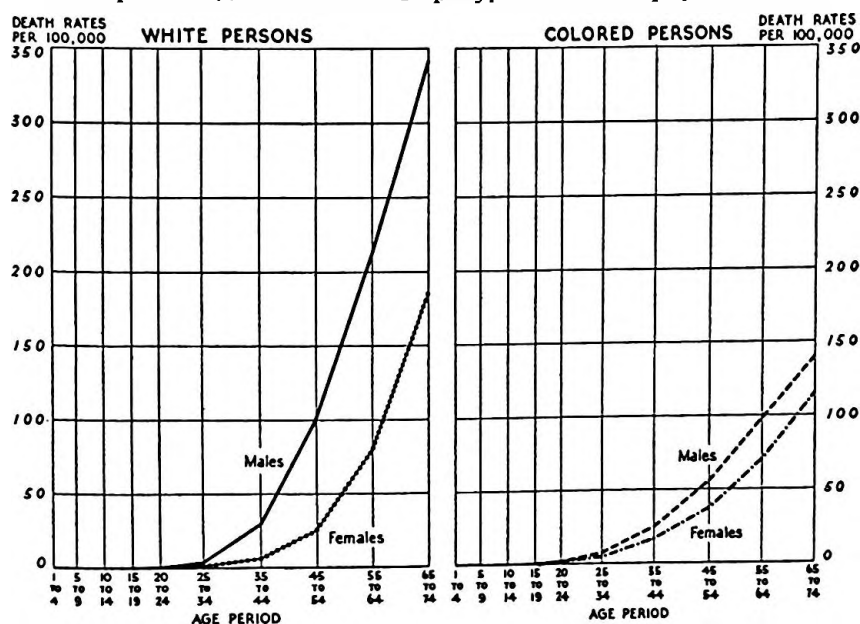
Mortality by Age, Sex, and Color

Age Diseases of the coronary arteries are distinctly conditions of middle and later life. Occasional cases are recorded among young people, but except in isolated instances at these ages, the diagnosis is open to question, or the cause of the anginal symptoms is extracardial. At ages 25 to 34, deaths from these conditions begin to appear in appreciable numbers, the death rate among white men being 4.1 per 100,000 in this age group during 1931 to 1935. As Chart XII shows, their death rate rises precipi-

CHART XII
DISEASES OF THE CORONARY ARTERIES AND
ANGINA PECTORIS COMBINED

Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935



tately with age thereafter. At ages 35 to 44 the rate is seven times that in the preceding decade of life, triples again in the next, doubles in the following one, and increases 60 percent more between ages 55 to 64 and 65 to 74. The rate at 65 to 74 is more than 80 times that at 25 to 34 and 11 times that at 35 to 44. In general, this is the shape of the age curve in each color and sex group, although there are variations in the rate of increase from age to age, and also in the levels of the death rate. Generally, also, the shapes of the curves for coronary disease and angina pectoris separately past age 35 are very similar in their characteristic rapid rise with age. This may be accepted as further evidence of their essential identity.

Sex Males are the chief sufferers from coronary artery diseases.

In this regard, the mortality data are in agreement with practically every clinical experience reported. At all ages combined, the white male rate from coronary artery diseases and angina pectoris, in 1931 to 1935, was 39.0 per 100,000, or more than $2\frac{1}{2}$ times the white female rate of 15.0, as Table 7 shows. This ratio holds also for coronary artery disease and angina pectoris separately. The ratio for the two causes combined varies considerably, however, according to age. Between 25 and 34 the white male rate is about three times the female, and at 35 to 44 it is five times the female rate, the maximum difference recorded. It then drops

TABLE 7
DISEASES OF THE CORONARY ARTERIES AND
ANGINA PECTORIS COMBINED

Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 20 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935

AGE PERIOD YEARS	WHITE		COLORED	
	Males	Females	Males	Females
1 to 74*.....	39.0	15.0	20.6	14.9
45 to 74*.....	181.1	73.0	84.6	62.5
20 to 24.....	0.7	0.4	1.8	1.8
25 to 34.....	4.1	1.4	6.8	4.6
35 to 44.....	30.3	6.3	24.6	16.6
45 to 54.....	100.5	26.0	55.0	37.4
55 to 64.....	212.6	80.5	97.6	70.6
65 to 74.....	342.1	186.4	140.7	115.3

*Standardized for age.

to four times the female rate at 45 to 54, slightly more than $2\frac{1}{2}$ times at 55 to 64, and slightly less than twice past 65. These ratios by sex for angina and coronary disease combined are more or less duplicated when they are considered separately. At every age the white male death rates are distinctly higher than those for white females. At ages under 45 the difference is somewhat more marked in angina pectoris.

Among the colored, males are likewise more frequent victims of coronary artery diseases than females. But, as is characteristic in all the chronic diseases of the cardiovascular system, the difference between the two sexes is much less marked among the colored than among the white. The death rate from angina and coronary disease combined among colored males was 20.6 per 100,000, or nearly 40 percent higher than the female rate of 14.9. The difference was slightly more marked for coronary artery disease, so designated, than for angina pectoris. Considered by age, the ratio of male to female death rates among the colored showed little variation.

Color A very large difference, according to sex, occurs in the relative mortality from coronary artery disease and angina pectoris in the white and colored races. White men have a death rate from these conditions nearly twice that of the colored, whereas among females the death rates of the two races are practically identical. When coronary artery disease and angina pectoris are considered separately, it is seen that the death rate of white males from coronary artery disease is almost exactly twice that among colored males, while that from angina pectoris is about 1.8 times as high as among colored males. Among females, the death rate from coronary artery disease is higher among whites than among the colored, but for angina pectoris the reverse is true. This difference reflects, in part, better discrimination in the diagnosis of coronary artery disease among whites and, probably in part also, variations in the incidence of different etiological types of coronary artery disease in the two races.

Data for Diseases of the Coronary Arteries and Angina Pectoris Considered Separately

Separate consideration of the mortality from coronary artery disease, so certified, and from angina pectoris is necessary or advisable for several reasons. First of all, the separate data throw some light on differences in diagnostic precision in these conditions

as between various groups within the insured population. Secondly, the data for angina up to 1930, and the combined data for coronary artery disease and angina pectoris since that year do not form a consistent historical series. Moreover, a certain proportion of the angina group is not primarily coronary in origin, and the figures for angina alone yield facts of importance and interest.

DISEASES OF THE CORONARY ARTERIES

As we have seen, it is only since 1930 that separate data are available for these conditions. Under the subtitle now provided for this group in the International List of Causes of Death are deaths certified as due either to sclerosis, thrombosis, embolism, occlusion, or obstruction of the coronary arteries, or as disease of the coronary arteries without further qualification. Prior to 1930 these deaths were classified either under "Diseases of the arteries" or under "Embolism and thrombosis," depending upon the terminology used by the physician in certifying the cause of death.

The extraordinarily rapid rise in coronary artery disease mortality in this insured population extends to both men and women in the two races. These trends have already been shown in Chart XI. The figures are given in Table 8.

Without exception sharp upward trends are found in the death rates from diseases of the coronary arteries in every detailed age group, by sex and color, in which the numbers were sufficient to yield reliable annual death rates. In practically all cases the rapidity of the advance was the same, so that there is no point

TABLE 8
DISEASES OF THE CORONARY ARTERIES
Standardized Annual Death Rates* per 100,000
By Color and Sex. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1930 to 1935

YEARS	TOTAL PERSONS	WHITE		COLORED	
		Males	Females	Males	Females
1935	23.1	34.6	14.0	16.2	12.1
1934	19.7	29.7	11.7	14.4	9.1
1933	14.2	21.4	8.1	12.1	8.2
1932	10.3	15.5	6.1	9.0	4.5
1931	8.0	12.2	4.5	5.2	5.3
1930	5.6	8.2	3.5	3.9	2.8

*Standardized for age, and in the case of Total Persons, also for color and sex.

in discussing these trends in detail. From the nature of the pathology of coronary artery disease, this uniformity in the trends indicates that the basis of the rise is common to all these color-sex-age groups, and that it is probably highly artificial. The explanation of the major portion of the increase is the more frequent recognition of coronary disease in deaths showing its characteristic symptom-complex, as well as the changing viewpoint as to the originating cause of the condition.

Apart from the level of the death rates, the mortality data of coronary artery disease do not differ sufficiently in respect to their characteristics by color, sex, and age from the data for coronary artery disease and angina pectoris combined, to warrant separate discussion. The data themselves are useful and are given in Table 9. Because of the drastic and general rise in the mortality

TABLE 9
DISEASES OF THE CORONARY ARTERIES
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 20 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1931 to 1935	1935	1930	1931 to 1935	1935	1930
WHITE						
1 to 74*.....	22.7	34.6	8.2	8.9	14.0	3.5
45 to 74*.....	104.8	161.4	38.0	43.1	67.7	16.9
20 to 24.....	0.5	0.5	0.3	0.2	0.4	0.1
25 to 34.....	2.7	3.1	1.3	1.0	1.9	0.1
35 to 44.....	18.2	26.7	5.9	3.9	5.6	2.2
45 to 54.....	58.6	86.2	20.3	15.6	23.4	6.9
55 to 64.....	120.3	189.2	48.1	48.0	79.0	20.2
65 to 74.....	201.7	314.2	67.6	108.3	166.9	37.7
COLORED						
1 to 74*.....	11.4	16.2	3.9	7.8	12.1	2.8
45 to 74*.....	47.6	71.9	12.3	32.8	50.8	11.0
20 to 24.....	1.2	0.0	0.0	1.1	2.3	0.9
25 to 34.....	3.5	4.7	3.7	2.3	3.9	0.8
35 to 44.....	12.5	13.9	7.2	9.0	12.8	2.8
45 to 54.....	29.6	46.2	7.8	19.5	25.7	7.5
55 to 64.....	55.7	84.4	7.4	37.8	60.5	10.4
65 to 74.....	81.2	118.5	33.2	59.5	100.8	21.6

*Standardized for age.

from coronary artery disease the death rates by color, sex, and age are given for the years 1930 and 1935, as well as the averages for 1931 to 1935.

ANGINA PECTORIS

Trend of Mortality

For the 25-year period as a whole, angina pectoris has shown a definite but sporadic rise in mortality. Among Metropolitan policyholders at ages 1 to 74 the death rate in the last five years, 1931 to 1935, was 10.7 per 100,000, or more than twice the rate of 4.9 per 100,000 recorded in 1911 to 1915, the first quinquennium of this experience. The death rate from angina pectoris has increased considerably among males and females of both the white and the colored races. The increase was, however, distinctly more pronounced among whites than among Negroes, and among males than among females. As Table 10 shows, the rise in the death rate between the first and last quinquennia was 158.7 percent for white males, 69.4 percent for white females, 80.4 percent for colored males, and 22.4 percent for colored females. The standardized annual death rates by color, sex, and broad age groups are shown in Appendix Table C.

With but few exceptions there were no increases in angina pectoris mortality at the younger adult ages where the death rate from this cause is low and diagnosis least accurate, but throughout

TABLE 10
ANGINA PECTORIS
Five-year Averages of Annual Death Rates* per 100,000
By Color and Sex. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

YEARS	TOTAL PERSONS	WHITE		COLORED	
		MALES	FEMALES	MALES	FEMALES
1911 to 1935.....	7.8	11.1	4.9	6.7	6.0
1931 to 1935.....	10.7	16.3	6.1	9.2	7.1
1926 to 1930.....	11.0	16.1	6.6	9.0	7.0
1921 to 1925.....	7.1	10.0	4.6	5.7	5.4
1916 to 1920.....	5.1	6.7	3.7	4.3	4.7
1911 to 1915.....	4.9	6.3	3.6	5.1	5.8
PERCENT INCREASE 1931-1935 SINCE 1911-1915.....	118.4	158.7	69.4	80.4	22.4

*Standardized for age, and in the case of Total Persons, also for color and sex.

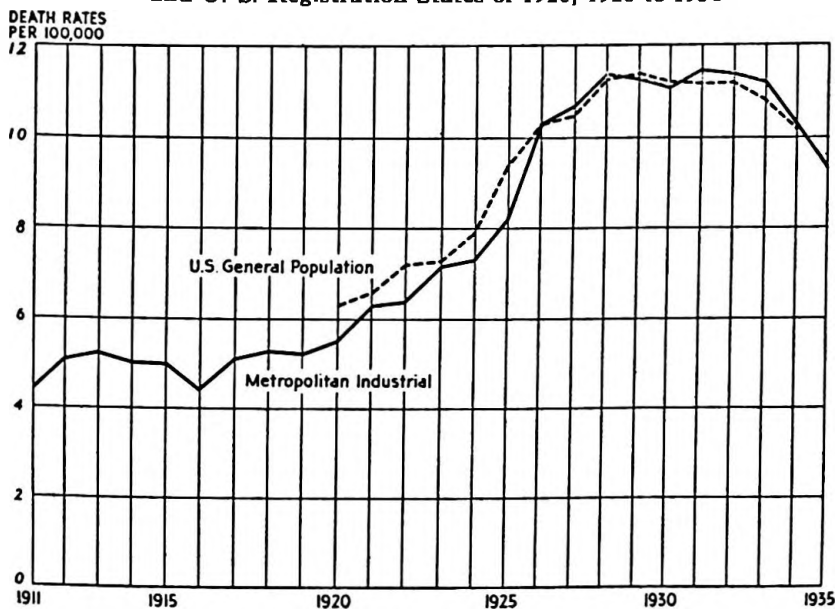
later adult life there has been a decided increase among men and women, both white and colored. Table 11 shows that this rise has been greatest among white men between 35 and 65. There the increases between 1911 to 1915 and 1931 to 1935 are uniformly more than 200 percent, and even at 65 to 74 the increase is close to 100 percent. Among white women the increases are limited to ages past 45 and are uniformly in the neighborhood of 100 percent. Colored men, on the other hand, showed somewhat the same situation as white men, the increases being relatively larger at the younger ages. Among colored women the situation is different from that in the other three groups in that the largest increases are recorded at the oldest ages.

As the main features of the trend in the death rate from angina pectoris have already been indicated in discussing the general trend for the group of coronary artery diseases, it is quite unnecessary at this point to elaborate the matter further. It may be noted in passing that the experience on angina pectoris for the general population as shown in Chart XIII parallels that for the insured group.

CHART XIII ANGINA PECTORIS

Standardized Annual Death Rates per 100,000
Total Persons. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935
and U. S. Registration States of 1920, 1920 to 1934



Age The age curves are not particularly different, except for the level of the rates, from those for coronary artery disease and angina pectoris combined. The actual death rates by age in each color-sex group are given in Table 11.

Sex As we have already noted, many more men than women die from angina pectoris, particularly at the younger adult ages. These sex differences are more marked than those in coronary artery disease.

It may be noted also that the disparity in the death rates between the two sexes widened in the period under review. With the death rates at much lower levels in 1911 to 1915, the white male rate was 75 percent higher than that of white females, as

TABLE 11
ANGINA PECTORIS
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 20 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
WHITE						
1 to 74*.....	11.1	16.3	6.3	4.9	6.1	3.6
45 to 74*.....	51.4	76.3	29.1	23.4	29.9	15.7
20 to 24.....	0.3	0.2	0.4	0.3	0.2	0.5
25 to 34.....	1.4	1.4	1.4	0.7	0.4	1.1
35 to 44.....	8.2	12.1	3.7	2.4	2.4	2.3
45 to 54.....	26.5	41.9	12.4	8.2	10.4	5.0
55 to 64.....	59.1	92.3	30.1	25.2	32.5	17.9
65 to 74.....	104.5	140.4	72.5	61.3	78.1	40.9
COLORLED						
1 to 74*.....	6.7	9.2	5.1	6.0	7.1	5.8
45 to 74*.....	25.5	37.0	19.3	23.2	29.7	22.2
20 to 24.....	0.8	0.6	1.6	0.7	0.7	0.6
25 to 34.....	2.7	3.3	2.1	2.9	2.3	3.1
35 to 44.....	9.6	12.1	6.9	7.7	7.6	7.5
45 to 54.....	17.5	25.4	9.5	15.0	17.9	17.0
55 to 64.....	27.4	41.9	23.9	24.4	32.8	23.0
65 to 74.....	43.5	59.5	37.3	43.0	55.8	34.6

*Standardized for age.

compared with the 167 percent excess recorded at the higher level in 1931 to 1935, and the colored male rate, formerly below that of colored females, has recently averaged 30 percent above it.

Color The death rate from angina pectoris among white males has been nearly twice that for the colored in recent years. Among females, on the other hand, the rate for the colored is the higher. As Table 11 shows, however, there are distinct differences according to age. Among males the death rates for the colored from 1931 to 1935 are higher than those for the white at ages under 35, and between 35 and 45 they are identical. Only after 45 are the death rates for white men higher than those for the colored, and increasingly so with advancing age. In like manner, the death rates for colored females are higher than those for white women only up to age 55. Between 55 and 64 the rates are practically the same, but at 65 to 74, when the mortality from the disease is highest (within the age range included in this experience) the death rate of white women is considerably in excess of that for colored women.

An Interpretation of the Trends in Diseases of the Coronary Arteries and Angina Pectoris

It is apparent from the foregoing that the data on coronary artery disease and angina pectoris show very much the same characteristics. Such differences as exist are pretty much accounted for by the more precise diagnosis of these conditions in white persons, as compared with the colored. Because of the essential unity of these conditions, separate discussion of the factors underlying the trends and the incidence of the deaths in the two groups, by sex, age, and color would be purely artificial and we shall, therefore, consider them as a unit in interpreting the variations.

The differences between men and women and between the white and colored races in their mortality from coronary artery disease and angina pectoris reflect, in large part, the varying etiology of these conditions. Variations in the adequacy of medical service and accuracy of diagnosis, however, also have a bearing on the subject. Interference with the blood supply to the heart through the coronary arteries, which is usually the basis of the symptoms displayed in angina pectoris and coronary artery disease, has not one but several causes. The chief one is progressive obstruction resulting from degenerative changes in the coronary arteries or their branches. The process is essentially that in-

volved in arteriosclerosis; first the formation of areas of softening in the coronary artery (atheroma) followed by thickening and calcification of the arteries. As a result the arterial opening is narrowed. This narrowing itself hinders the proper nutrition of the heart muscle and may cause anginal pain. Greater interference is effected by the formation of a fixed clot or thrombus in the narrowed arteries which may be partially or wholly occluded. This is often the result of the flaking off of a tiny part of the arterial wall on which the thrombus may form. This whole development is associated with or is a part of the aging process, and since it is the most usual type involved in coronary artery disease it explains why the death rates are highest at the oldest ages. It may be noted that the occlusion by a thrombus of one of the coronary arteries, or one of its larger branches, usually results in such profound and prolonged distress and shock, that these are vital points in differentiating coronary thrombosis from the lesser or more transitory symptoms of angina.

Angina pectoris appears also as a result of secondary syphilitic changes in the heart. In these cases the opening of a coronary artery is occluded, although there is probably no damage to the coronary artery itself. The angina is merely a symptom of the late cardiac changes in syphilis. Where this origin of the angina is definitely recorded in the death certificate, such deaths are properly charged to syphilis. Since, however, many of the deaths from angina occur very suddenly, the origin of the disease is often either unknown or not revealed by the physician. The etiology is, of course, usually unknown to the coroners or medical examiners who certify an appreciable number of these sudden and unattended deaths. Angina pectoris of syphilitic origin probably accounts for many of the deaths reported as due to angina at ages under 50. This partially explains the high differential between the death rates of white men and women at these ages, which is simply a reflection of the higher incidence of syphilis among men than among women. The same explanation applies to the preponderance of the colored rate over the white in early adult life because syphilis is much more common in Negroes than in white persons.

The reasons for the higher death rate from coronary artery disease and angina in males, as compared with females, at ages past 50 are still obscure. This situation has been the subject of much discussion, most of which thus far has been rather fruitless. No doubt essentially the same causes are at work in producing

the sex differentials here, as in the case of cardiovascular-renal diseases generally. Among the reasons suggested are the great tension under which men work, their great proneness to excesses in diet, in the use of alcohol and tobacco, and to their greater exposure to infection.

As regards the enormous increase that has been recorded in the mortality from these conditions, it is extremely unlikely that any but a small part of it can be accepted as valid. This is the consensus of opinion of most physicians who have given close attention to the problem. Unfortunately, it is not possible to determine how much, if any, of this rise may be accepted as real. Most students of the situation believe, however, that there has been some true increase in the incidence of coronary disease.

In certain respects the situation in coronary artery disease is much better than appears on the surface. Few diseases are today under as close scrutiny as are these conditions, and an immense amount of research and study has been devoted to the fundamental problems of the disease, its pathology, its physiology, and its treatment. Already important results have been achieved.

Probably the most important benefit of these studies is to make the public realize that these cardiac conditions are by no means hopeless. It is a common impression even among many physicians that coronary artery disease is fatal and this has tended to arouse a feeling of hopelessness and despair regarding it. A series of studies which deserve to be better known show that this feeling is largely unwarranted. Although the mortality in the first recognized attack or shortly thereafter is high, a good proportion of persons so afflicted survive this attack and live for many years. For example, in a series of 259 cases studied by Conner and Holt,¹⁵ in which the subsequent history of the patients was known, 117 were living at the time of their report and 142 had died. Of 117 cases surviving the first attack, 88, or 75 percent, were alive and in good health at the end of one year; 65, or 56 percent, at the end of two years; 25, or 21 percent, at the end of five years.

In another series of 370 patients, reported by Willis¹⁶ of the Mayo Clinic, 45.7 percent were living and 54.3 percent had died. Of 169 living and 190 fatal cardiac cases, 77 percent lived one year or more; 67 percent, two years or more; and 28 percent, five years or more. Of the living cases, regardless of the time of their

¹⁵CONNER, L. A., and HOLT, E. "The Subsequent Course and Prognosis in Coronary Thrombosis. An Analysis of 287 Cases." *American Heart Journal*, Vol. 5. 1929-30. Pages 705-719.

¹⁶WILLIS, F. A. "Life Expectancy in Coronary Thrombosis." *Journal of the American Medical Association*. Vol. 106. 1936. Pages 1890-1894.

first attack, 43 percent were in good health, 23 percent were well but restricted their activities, and 34 percent were ill or disabled, chiefly because of recurrent attacks.

It is likely that a further increase in the incidence and mortality of diseases of the coronary arteries will be reported. The chief contributing factors will be first, the wider acceptance of the concept of coronary artery disease as an important factor in cardiac pathology and, secondly, the growing skill in recognizing it when it exists. There is a powerful stimulus in this direction from the intensive research in various phases of coronary disease and the rapid diffusion of the new knowledge which is accumulating. The actual number of coronary cases will increase also because the proportion of older persons, who are chiefly affected, is steadily rising in our population. The startling rise in coronary disease mortality is not really a cause for alarm. We know that these diseases are largely due to degenerative changes of the same nature as those which take place with advancing age in other arteries and the body as a whole. Being essentially a phase of the aging process, diseases of the coronary arteries are not curable, but only postponable. Much can be and is being done to improve the treatment of persons affected, so that a significant proportion of them live comfortably for years after the onset of the disease.

The real problem in coronary artery disease from the point of view of public health and prevention is the high mortality among men in the prime of life. There is a real opportunity of saving life, chiefly among men between 40 and 60 years of age. Whether we are dealing here with an entirely new problem or simply a new aspect of an old problem is open to question. For, hypertension is the most common single etiological factor in coronary artery disease. The cause of hypertension in the absence of proved antecedent systemic disease is still unknown, and one of the important medical problems of today. Much can be done, however, by early detection of hypertension and proper medical care. This is the chief hope at present for postponing the onset of many cases of coronary disease.

CHRONIC NEPHRITIS¹⁷

Chronic nephritis may be defined as a progressive and diffuse inflammatory or degenerative disease process in the kidney. Under this title are included a number of conditions which are known today to differ in their origin and in their mode of development. For, in the course of the past 25 years considerable attention has been given to the nature and differentiation of chronic diseases of the kidney and this has resulted in fundamental changes in their classification. It is recognized that the types and causes of the disease vary at different ages. Moreover, certain types of cases, numerically important, which formerly were considered primary kidney lesions, are now viewed by most authorities as late or secondary manifestations of vascular disease. These developments and changes in the incidence of causative factors have had a profound effect on the recorded mortality from the disease. Clinically, these various conditions have certain features in common, and this partly justifies their inclusion together.

Chronic nephritis is marked by interference in the ability of the kidneys to carry on their function of concentrating urine and removing waste products from the blood. The disease may start in any one of the three essential elements of the kidney units, but most commonly it begins either in the glomeruli, as a result of inflammation, or in the tiny arteries (arterioles) of the kidneys, as a result of sclerosis. Less frequently the tubules are first involved. But regardless of the point of origin, the whole kidney unit becomes affected, and except in recovery from acute infections involving the kidney, the unit atrophies and is either absorbed or replaced by scar tissue. In the early stages of nephritis, symptoms often are slight because the number of units, about 4,000,000 in each kidney, is in excess of the normal needs of the body. Only

¹⁷Under this title are included deaths specified as due to the several types of chronic Bright' disease, for example, chronic interstitial nephritis, chronic parenchymatous nephritis, chronic diffuse nephritis, arteriosclerotic nephritis, cardiovascular-renal sclerosis, chronic glomerulonephritis, chronic tubular nephritis, etc. Included also are deaths certified as due to "Bright's disease", "nephritis", "albuminuria," and "uremia," without further qualification, for decedents 10 years of age and over. For the period 1911 to 1920 unqualified certifications of these four terms were allocated to this title regardless of the age at which death occurred. The number of deaths thus classified was nevertheless small and does not seriously disturb the comparability of the rates over the 25-year period. Comparability of the series is somewhat affected, however, by changed procedure in the classification of joint causes of death, effective in 1925. Prior to that date cerebral hemorrhage, angina pectoris, and "chronic heart disease" were preferred causes when reported jointly with chronic nephritis; beginning with 1925 the preference was reversed. It is estimated by the Bureau of the Census that the recorded death rate from chronic nephritis in the general population was increased about 10 percent because of this change in joint cause assignment.

when a sufficiently large number of units is involved or destroyed, do objective manifestations of the disease appear. The remaining kidney units carry on their work but, as the destruction continues, less and less efficiently. As a result, waste products, which are normally removed from the blood by the healthy kidney, accumulate in the blood. At the same time there is a loss through the kidney of serum albumin, a component of the watery portion of the blood. It is the presence of albumin in the urine in larger than normal amounts that is one of the earliest and most distinctive evidences of nephritis. Other chemical tests of the blood and urine, as well as certain symptoms, such as edema, help to establish its diagnosis.

We have already called attention to the fact that chronic nephritis is frequently associated with vascular disease. In these cases a great change in medical thought has occurred regarding the priority of the vascular disease and regarding the role of the cardiac and renal manifestations in the pathogenesis of the disease process. This is a vital matter because cases with both renal and cardiac complications form a large part of the total number of nephritics. In general, the joint cause procedure used in classifying these deaths is largely based upon earlier clinical conceptions in which the kidney was considered the original site of the process. Consequently, large numbers of the deaths assigned to chronic nephritis are jointly certified with cardiovascular diseases. In the Registration Area in 1925, about half of the 93,587 persons certified as dying from chronic nephritis were reported also to have had either chronic heart disease, arteriosclerosis, cerebral hemorrhage, paralysis, or thrombosis. Furthermore, in 23,424 cases in which chronic nephritis was reported as the contributory cause of death, it was a complication of these cardiovascular diseases 40 times out of every 100.

Deaths from chronic nephritis form a considerable part of the total death toll. During the 25-year period under review, 246,217 deaths at ages 1 to 74 years were ascribed to this disease among Metropolitan policyholders. The adjusted death rate for the entire period was 83.9 per 100,000. These deaths from chronic nephritis comprised 7.7 percent of the number from all causes, and 25.2 percent of the total from chronic cardiovascular-renal diseases. Over the 25 years its rank as a cause of death was fifth and it has retained this position even in the last five years of this experience, despite the great changes in the mortality picture during the quarter century.

Mortality by Age, Sex, and Color

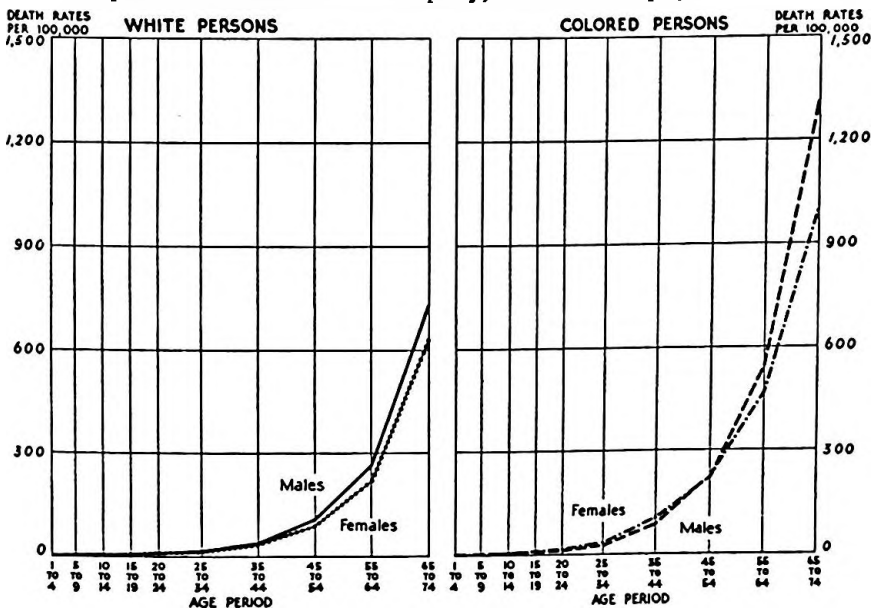
Age Chronic nephritis occurs most frequently in middle and later life. The death rates are low in childhood and increase very slowly until adult life is reached. Indeed, the disease is a relatively unimportant part of the death toll until middle life, but from then on the death rates and the relative importance of the disease increase very rapidly. This is clear from Chart XIV, which shows the death rates by age in each color and sex group during 1931 to 1935. The actual death rates for this and certain other periods of time are given in Table 12.

The age distribution of chronic nephritis is a reflection of its varying etiology. At the younger ages practically all cases of the disease begin as an acute inflammatory process from an infection involving the kidney, and if it fails to clear up, the disease goes on to the chronic stage in which more and more of the functioning kidney becomes involved. The data regarding the specific infections which cause chronic kidney disease are not very satisfactory, but throat infections seem to be the most common.¹⁸ The bacteria

CHART XIV CHRONIC NEPHRITIS

Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935



¹⁸FISHBERG, ARTHUR M. *Hypertension and Nephritis*. Philadelphia. Lea and Febiger, 1931. Pages 332 ff. and 392-3.

TABLE 12
CHRONIC NEPHRITIS

Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000						PERCENTAGE CHANGE 1931-1935 SINCE 1911-1915	
	MALES			FEMALES			Males	Females
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915		
WHITE								
1 to 74*	89.9	60.0	126.6	70.9	52.0	89.2	-52.6	-41.7
1 to 24*	5.0	3.1	7.6	5.4	3.5	7.6	-59.2	-53.9
25 to 44*	44.2	23.9	77.8	36.7	22.3	55.2	-69.3	-59.6
45 to 74*	392.1	271.2	526.5	302.5	230.1	364.4	-48.5	-36.9
1 to 4	2.7	0.9	5.7	2.0	0.5	3.9	-84.2	-87.2
5 to 9	2.5	1.4	4.1	2.4	1.2	4.0	-65.9	-70.0
10 to 14	3.2	2.3	4.1	4.5	3.8	5.7	-43.9	-33.3
15 to 19	5.9	3.9	8.0	7.0	5.0	9.3	-51.3	-46.2
20 to 24	10.7	6.9	16.6	11.1	7.3	15.2	-58.4	-52.0
25 to 34	24.2	13.4	42.0	21.7	12.8	34.2	-68.1	-62.6
35 to 44	70.4	37.8	124.8	56.5	34.9	82.8	-69.7	-57.9
45 to 54	174.3	103.6	270.4	130.0	88.1	176.8	-61.7	-50.2
55 to 64	397.4	266.3	556.0	305.5	221.8	377.8	-52.1	-41.3
65 to 74	969.8	731.8	1,163.8	763.4	628.4	846.0	-37.1	-25.7
COLORED								
1 to 74*	136.9	116.0	160.6	115.1	105.1	117.5	-27.8	-10.6
1 to 24*	7.2	3.8	13.0	8.1	5.1	11.6	-70.8	-56.0
25 to 44*	62.7	49.2	84.6	73.7	62.9	84.5	-41.8	-25.6
45 to 74*	605.6	525.7	680.4	471.0	442.9	456.9	-22.7	-3.1
1 to 4	7.2	0.9	19.3	4.5	1.9	9.2	-95.3	-79.3
5 to 9	3.2	1.8	5.4	3.1	1.8	6.2	-66.7	-71.0
10 to 14	5.2	3.1	8.8	5.8	4.7	6.4	-64.8	-26.6
15 to 19	7.7	5.1	10.9	9.8	6.1	14.0	-53.2	-56.4
20 to 24	13.3	8.1	22.2	17.7	11.0	23.2	-63.5	-52.6
25 to 34	31.8	23.8	46.2	39.6	33.4	50.6	-48.5	-34.0
35 to 44	103.3	82.5	135.2	118.5	101.6	129.0	-39.0	-21.2
45 to 54	261.8	221.1	316.6	253.1	221.3	271.2	-30.2	-18.4
55 to 64	650.2	546.8	743.4	506.0	469.6	514.2	-26.4	-8.7
65 to 74	1,452.4	1,309.4	1,547.8	995.3	992.3	854.0	-15.4	+16.2

*Standardized for age.

most frequently responsible for the various infections which cause nephritis are certain strains of streptococci, but others, such as the pneumococcus, the influenza bacillus, and the gonococcus sometimes occur.

While these infections are almost entirely responsible for kidney disease in children and young adults, they still play a role in every period of life, and indeed are probably numerically more frequent at older ages than at the childhood ages, though their relative importance as causes of kidney impairments decreases. Among women in the childbearing ages, kidney complications are an important contributory cause of puerperal mortality. In a large proportion of such cases it is believed the complications arise as a result of an earlier, often unrecognized, kidney impairment, rather than as a result of the pregnancy itself. In the other cases, where there is definitely no previous history of kidney disease, the mother, after confinement, usually makes a complete recovery and does not become a chronic kidney case.¹⁹ It is doubtful, therefore, whether any considerable part of the chronic nephritis among women is a direct result of childbearing, although childbirth may be a factor in causing the early fatal termination of a previously established nephritis.

By far the most important type of chronic nephritis is that which is variously termed the degenerative, arteriosclerotic, or senile. These cases are relatively seldom clear-cut in their origin and development. The outstanding feature is a persistent high blood pressure. This was for a long time considered to be caused by the kidney disease. Such cases exist in large numbers as a result of sclerosis of the arteries, especially the smaller branches, of the kidneys. But in perhaps the majority of cases of nephritis in middle life and old age, the hypertension antedates the disease in the kidneys, and causes other serious changes, particularly in the vascular system and in the heart.

The cause of hypertension of the type just described, commonly designated as essential hypertension, is unknown. Indeed, as Fishberg²⁰ has stated, "The very term essential hypertension is a confession of ignorance." Hypertension is only a symptom. The cause probably lies in some progressive derangement of the complicated mechanism that controls the tonus of the vascular system. This is one of the most fundamental problems in medicine today and is the subject of intensive study.

¹⁹FISHBERG, ARTHUR M. Loc. cit. Page 593.

²⁰FISHBERG, ARTHUR M. Loc. cit. Page 449.

In any case, a large proportion of the deaths classified as chronic nephritis are those in which the kidney condition is simply one phase of a disease which involves both the vascular and renal systems. The disease process in these cases is progressive and, by its very nature, becomes increasingly important with advancing age.

Sex The death rate from nephritis among males is moderately higher than that for females. This is true in both the white and colored races. During 1931 to 1935 the excess mortality of the males was 15 percent for whites and 10 percent for the colored.

This sex difference in mortality varies considerably according to age. This also is brought out by Table 12. White boys under age 10 have had, in recent years, a somewhat higher death rate than girls, but between ages 10 and 25 the female rate has been the higher. Between 25 and 45 the death rates for the two sexes have been approximately the same, but after 45 the mortality of white men has been appreciably higher, the excess averaging nearly 20 percent in the broad age group 45 to 74. Among colored persons in the same calendar period the death rate among females has been consistently and appreciably higher than that among males up to age 45, and between 45 and 55 it is practically identical with that of colored men. After 55, however, when the mortality from chronic nephritis is heaviest, the death rates for colored men are the higher, and at ages 65 to 74 the excess is more than 30 percent.

The higher mortality of young white boys as compared with girls may simply reflect the higher incidence of complications of infectious disease among them. While this matter of the kidney sequelae of infectious disease is a factor which, throughout life, makes for a higher nephritis death rate among males, it is evidently somewhat less important during the second decade when the rate among females has been most markedly and consistently higher than that of males. It is possible that in this period of life developmental difficulties of puberty, which affect females at an earlier age than males, are a factor. Among young women between 15 and 25 some deaths from nephritis may occur as a result of the strain of childbearing where there has been previous kidney disease. With advancing age, however, the mortality of males is the higher, because hypertensive and arteriosclerotic changes which involve the kidneys are more common and develop earlier in men than in women.

Among the colored, however, where the sex differences in the nephritis death rate are not altogether the same as among whites,

except at the older ages, it is less easy to explain these differences satisfactorily. Environmental differences very likely play an important part. Colored women lead, for the most part, a much less protected life than white women, and at the younger ages they probably suffer from kidney sequelae of infectious disease to a far greater extent than white females, and not much less frequently than colored males. Extremely important during the childbearing period is the high maternal mortality among Negro women, a significant part of which may be due to chronic nephritis and so certified. At ages past 55, however, the arteriosclerotic and hypertensive factors outweigh all these other elements, and the situation is the same as among the white persons, with males having a higher death rate.

Color Colored persons suffer a far higher mortality from chronic nephritis than do the white. As shown in Table 12, among both males and females, the colored death rate in recent years has been approximately double that for whites. Moreover, the differences are large throughout the life span, but more particularly in adult life. In the preceding section we have already suggested one reason for these important differences, namely, a higher prevalence of serious sequelae of infectious disease among the colored, as compared with the white. The reliability of diagnosis in the two races probably differs also; and, in this case, would probably result in a higher recorded rate among the colored. The general view that the easy-going nature of the Negro contradicts early hypertensive changes would lead us to expect a lower mortality from chronic nephritis among them. But apparently such is not the case. Although the blood pressure of Negroes in Africa has been found to be on the average lower than that of whites²¹, the situation is entirely different for the urban Negroes in the Northern cities of this country²² from which this colored insurance population is largely drawn. Hypertension is relatively frequent among them. It is likely that environmental factors enhance the early development of hypertension in these Negroes, even though constitutional factors favor a relatively low blood pressure. In any case, because of the undeterminable degree to which the factor of diagnosis is involved in these differences, it is impossible to be certain as to the real cause of the higher mortality from nephritis among Negroes.

²¹DONNISON, C. P. "Blood Pressure in the African Native." *Lancet*, 1929. Vol. 1 Page 6.

²²FISHBERG, ARTHUR M. Loc. cit. Page 470.

Life Conservation Studies: III. Physical Impairment Among Negro Factory Workers. The Heart Council of Greater Cincinnati, 1931. Page 48.

Mortality in the Insured and in the General Population Compared

Attention may be called to the fact that the death rate from chronic nephritis among the insured population is substantially higher than in the general population. This is clear from Chart XV, which shows that this is a consistent phenomenon over the period covered by the chart. These insured are representative of the urban wage-earning population. The lower mortality from nephritis in the general population is chiefly accounted for by low rates in the rural population and, in lesser degree, in the economically better situated urban residents. A completely satisfactory explanation of this difference is hard to find. It is likely that both living and working conditions of people in the cities, in which these insured persons reside, are conducive to the early development of the physical changes that lead to nephritis. This may be true both for nephritis originating in infections, and that following or associated with hypertension and arteriosclerosis. Occupational hazards of the urban industrial worker may be another factor, although exposure to the elements, so often required of the farmer, might lead one to expect a greater frequency of certain types of the disease in males in rural regions. Differences in quality of medical service may also play a part, although we should expect on that ground a lesser rate in cities than in the countryside, because the physicians in the former tend to be younger and more cognizant of new ideas in the medical field, and would be more inclined to diagnose nephritis as secondary to hypertension or cardiac disease. On the other hand, this difference in the mortality from nephritis between city and country may reflect, to a real degree, differences in the populations, their racial, constitutional, and hereditary backgrounds.

Trend of Mortality

Over the 25-year period of this survey, there has been a considerable fall in the recorded mortality from chronic nephritis. Parallel trends are found in the insured population and the general population, as Chart XV shows. This trend has not been continuous, however. For the first seven years, from 1911 to 1917, the death rate in this insured population varied little, from a low of 107.2 per 100,000 in 1915, to a high of 113.7 in 1912. After 1917, however, there was a very sharp and continuous fall in the death rates from the disease, extending over a period of four years. In this short period the rate fell from 111.5 in 1917 to 73.4 in 1921, or

approximately 35 percent. From this low point the mortality from nephritis rose at a moderate rate for several years, and by 1926²³ the death rate was back to the 1919 level. But even at this point the nephritis death rate was about 25 percent lower than that which had prevailed before 1917. From 1926 on the trend was reversed, and the death rate from chronic nephritis has fallen without interruption. New low death rates were recorded in each year beginning with 1930. The minimum death rate, recorded in 1935, was 52.9 per 100,000, which represents a decline of more than 35 percent since 1926, and of more than 50 percent from the levels of 20 years ago. Actually the decline since 1926, as compared with the earlier figures, is even greater than the figures show, for this fall has occurred despite the assignment to the nephritis rubric of deaths which prior to 1925 would have been assigned elsewhere.

This improvement extends in varying degree to white and colored persons of both sexes. The initial fall in the nephritis

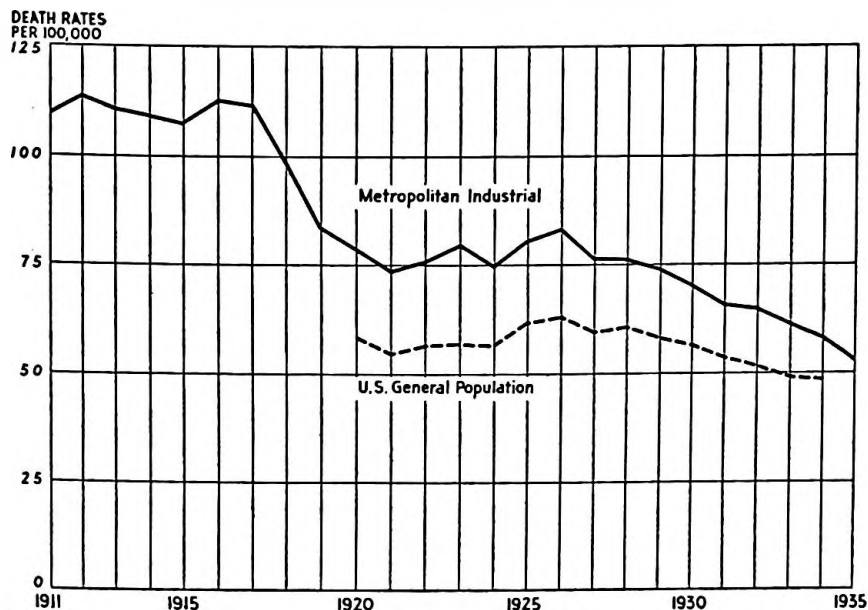
CHART XV

CHRONIC NEPHRITIS

Standardized Annual Death Rates per 100,000

Total Persons. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935
and U. S. Registration States of 1920, 1920 to 1934



²³The gain between 1924 and 1925 may have been due almost entirely to the change in joint cause procedure which formerly gave less weight to chronic nephritis when it was associated with other conditions.

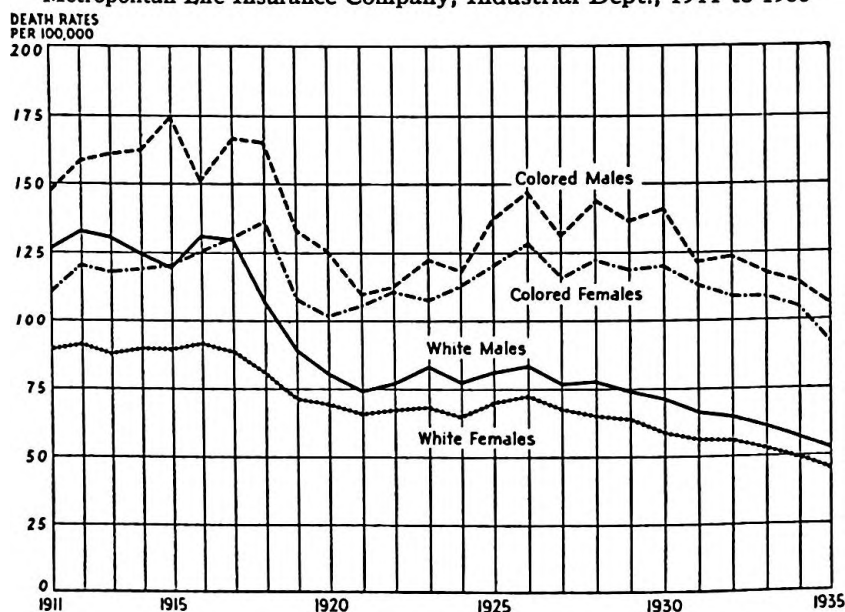
mortality between the preinfluenza and postinfluenza years was somewhat greater among males than among females, and among whites as compared with the colored. Thus, the decline in the death rate from 1911–1917 to 1921 was 41.6 percent for white males, 25.7 percent for white females, 31.3 percent for colored males, and 12.3 percent for colored females. This is likewise true over a long term, for if we compare the death rates in 1911 to 1915 with those prevailing in 1931 to 1935, the decline was 52.6 percent for white males, 41.7 percent for white females, 27.8 percent for colored males, and 10.6 percent for colored females.

In general, as Chart XVI shows, the mortality curves over the 25 years for each of the color and sex groups are similar in shape. All show a marked decline after 1917 or 1918. A most significant departure from the general picture, however, is the relatively large rebound from the 1921 low point in the case of colored males, which carried their death rate from nephritis to a level not much below that prevailing prior to 1917. Even more important, however, is the relatively small decline for colored females after 1918, and the sharp increase in their rates during the 1920's to a point that was

CHART XVI CHRONIC NEPHRITIS

Standardized Annual Death Rates per 100,000
By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



in excess of the level of most of the preinfluenza years. It may be noted, moreover, that this group exhibited a definitely upward trend in this early period, much different from the trends in the other color-sex groups.

The trends by age in the mortality from chronic nephritis are likewise similar to those at all ages combined. The chief features are (1) relative stability prior to 1918, except among children, whose death rate from nephritis was declining; (2) sharp and general decreases to new low levels between 1917 or 1918 and 1921; (3) relative stability for several years at these levels among white persons under age 45, but moderate to severe increases among white persons over 45, and colored persons in every age group; and (4) marked and steady declines at practically every age period among both races for the last six to eight years of this experience. The trends among the colored are sometimes obscured because the small number of deaths from nephritis in the detailed age groups results frequently in wide year-to-year fluctuations in the death rates in these groups.

The general improvement in the mortality from chronic nephritis has brought the death rates to far lower levels than those of 20 years ago. The degree of improvement, however, varies considerably. By far the greatest relative decrease is found in young children. Table 12 shows that among them, the death rates in 1931 to 1935 were only one fifth of the rates recorded in 1911 to 1915, or even less. Large declines are also found at the later childhood ages, but in all groups except the colored males the declines registered at ages 10 to 14 are smaller than in most of the remaining periods of life, except old age. Comparing the rates in 1931 to 1935 with those in 1911 to 1915, it is found that among white males declines exceeding 50 percent have been recorded at every age group between 15 and 65. Maximum declines of nearly 70 percent were recorded between ages 25 and 44. Among females the range of improvement is slightly lower, and the maximum decline of 62.6 percent is found at ages 25 to 34. Among colored males the percentage change diminishes consistently and appreciably after age 25, and among colored females after age 20. In every case the smallest improvement is found at 65 to 74, the oldest age group included in this experience, and, in fact, among colored females the rates in recent years have been actually higher than those recorded at the beginning of the experience.

The decline in the death rate from chronic nephritis has resulted from a variety of influences. Part of the decline is genuine and can

be traced to definite sources; part is purely artificial. Unfortunately, the several factors cannot be accurately weighed, but even if we only identify them and point out where they are most effective, it will help considerably to clarify the trends in chronic nephritis.

In the first place, the decline in the incidence of serious inflammatory kidney conditions, as sequelae of infectious disease, has had a definite part in lowering the mortality from acute nephritis, usually a forerunner of the chronic stage in this type of case. Direct preventive measures against acute infections in general, as well as indirect measures, such as improvement in environmental conditions, have been effective in reducing the prevalence of these infectious diseases. Another source of improvement is the emphasis placed on proper nursing care during acute infections, for this has reduced the proportion in which acute nephritis develops. These influences have had a part in reducing the mortality from the type of chronic nephritis caused by infectious disease or focal infection.

Prenatal care of pregnant women with chronic nephritis has probably helped also by preventing deaths during childbirth. The discovery of kidney disease may be made for the first time as a result of an examination early in pregnancy. The decline in the birth rate itself has probably operated to cut down the mortality from chronic nephritis in women of childbearing age, simply by cutting down the frequency of exposure to childbearing with its accompanying risk of kidney complications.

A part of the decline in chronic nephritis resulting from antecedent infections may have been brought about by the decreased virulence of such infections as scarlet fever, for example, in which a change in virulence is believed to have taken place. It is possible also that a small part of the decline in the chronic nephritis rate at the younger ages is spurious and results from greater precision, both in diagnosis, and in the use of the term "chronic."

Another factor tending to lower the death rate from chronic nephritis is the increased longevity of the patient with nephritis. In various ways, but largely because of the greater frequency of physical examinations, many cases of nephritis are today discovered early when most can be done for the patient. Moreover, better understanding of the way in which the types of chronic nephritis common in middle and later life develop and of the necessity for particular care regarding cardiac complications, have tended to retard the progress of such complications for many years. Improved treatment of chronic nephritis has been a beneficial

influence, though probably less by prolonging life than by keeping the patient in better physical condition.

The drastic decline that took place at practically every age during and after the influenza pandemic is discussed in the chapter on pneumonia and influenza. The fall in the death rate from nephritis at that time had little to do with improved knowledge of the disease or the application of that knowledge, but reflects a profound change in the mortality picture resulting from the pandemic itself.

Totally different in nature are the declines in the mortality from chronic nephritis due to changing medical conceptions regarding the disease itself. This has two important aspects, first, the nature and seriousness of albuminuria and, second, the relationship of hypertension to nephritis. Many individuals 20 years ago were considered to have chronic nephritis, and were treated for it because of the presence, intermittently or persistently, of albumin in the urine. Such cases were probably most frequent in childhood and adolescence. Certain types of albuminuria, however, are now considered to be perfectly benign, and not symptomatic of kidney disease. It is likely that a small part of the improvement in nephritis mortality, more especially that under age 30, arises from recognition of this situation. Deaths which would formerly have been ascribed to a supposed nephritis, the diagnosis of which was based solely upon the presence of albuminuria, are less frequently so certified today.

The changing conception of the role of hypertension in nephritis, on the other hand, is of far-reaching importance. Here we are dealing with a development in medical thought which only began to gain recognition early in the period covered by this review, and as is the case in all changes of this nature, has taken considerable time in exercising its full effect. In fact, this trend still continues. In 1911 a finding of hypertension was frequently synonymous with a diagnosis of nephritis. Indeed, routine blood-pressure estimations were just then coming into vogue, and the diagnosis of nephritis was made on the basis of superficial symptoms or of albuminuria. Even though cardiac complications were known to occur often, they were believed to be merely secondary to the kidney condition. This was the situation even in our more advanced medical institutions. Only recently the eminent cardiologist, Paul D. White,²⁴ said, in a review of the trends in the treatment of heart disease at

²⁴WHITE, PAUL D. "The Study and Treatment of Heart Disease at the Massachusetts General Hospital from 1821 to 1936." *New England Journal of Medicine*. Vol. 215. 1936. Page 1265.

the Massachusetts General Hospital, "While I was medical interne in the years 1912 and 1913 . . . two of the new methods of study of cardiac cases were becoming firmly established. It was now for the first time the custom to measure the blood pressure in all patients and to take X-ray pictures of the heart whenever there was uncertainty about heart size or diagnosis. We still talked about Bright's disease to the exclusion of hyperpiesia [high blood pressure], however. . . ." Today it is widely recognized that many, if not most, of these cases of hypertension do not result from nephritis, and that the effects on the heart are of greater importance than the renal manifestations, which, in fact, may be postponed for a long time.

In assessing the current situation in chronic nephritis, it seems fairly certain that the large decline in the death rates, especially in late years, is due chiefly to these ideological changes. Large numbers of these cases are now classified under other categories, particularly myocardial disease, coronary artery disease, angina pectoris, and, possibly, cerebral hemorrhage. It is this shifting of classifications and of diagnoses which is responsible for part of the increase in heart disease death rates, as well as the decline in chronic nephritis.

The time which it takes for a new idea such as this modern concept of hypertension to become established, shows up in our statistics. For in the early years of this experience, when the idea was still comparatively new, the death rate from chronic nephritis changed only a little. The very drastic decline from 1917 or 1918, at the time of the influenza pandemic, lasting into the early 20's, is a fundamentally distinct phenomenon, and by its very size overshadows any reduction in the death rate due to the wider acceptance of a new theory regarding nephritis and hypertension. During the last decade, however, in which the spread of this opinion has been more rapid and in which there has been no event in our mortality history so catastrophic as the influenza pandemic, it stands out as the leading factor in the fall of the death rate from chronic nephritis.

It is easily seen, also, that in sections of the population which get the better medical service, the effect of these new ideas would be reflected soonest and to the greatest degree, in the mortality statistics. It is largely for that reason that relatively greater improvement has taken place in the death rate for whites than for colored.

Future Trends

It is likely that a further decline in the death rate from chronic nephritis will take place, but it is impossible to say how long this will continue or how far it will go. Among children, the rates are now so low that little more improvement can be anticipated. In young adults, particularly among Negroes, there are still many preventable or postponable deaths from the disease. Enough is known about the cause of the disease at these ages, and the bearing upon it of constitutional factors, such as build, to establish a program for further health education to prevent the disease. In addition, with decreasing needs for preventive work against tuberculosis and acute diseases, some effort should be made to direct public attention to these chronic conditions. It must be admitted, however, that progress made during the past 25 years in lowering nephritis mortality among young adults is highly satisfactory. At the older ages little real improvement may be expected, because of the fundamental nature of the disease at these ages. It is likely, however, that the full effect of current etiological theories of nephritis has not yet been displayed, and a further and spurious decline in mortality from this cause may be recorded.

CEREBRAL HEMORRHAGE AND PARALYSIS²⁵

Cerebral hemorrhage has received, up to the present, very little attention from vital statisticians; far less, in fact, than the other cardiovascular-renal diseases. Despite the numerical importance of cerebral hemorrhage as a cause of death, it is not difficult to understand this situation. Deaths from cerebral hemorrhage are concentrated in the upper age groups to a greater extent than heart diseases or nephritis. The condition is least amenable to treatment. When death from cerebral hemorrhage occurs rather suddenly, as it often does, it is considered a relatively merciful and painless end of life, particularly in the aged. Finally, the causes of cerebral hemorrhage even today are imperfectly understood.

In a sense, cerebral hemorrhage is not a disease at all, but rather a terminal symptom or a mode of dying. In most cases it is only the terminal event in hypertensive or arteriosclerotic disease of the heart, kidney, or brain. Frequently these conditions coexist; but in many cases also changes in the cerebral-vascular system antedate those in other vital organs, and cerebral hemorrhage may then be the dominant manifestation. For this reason the statistics of cerebral hemorrhage deserve separate and careful attention.

During the quarter century 1911 to 1935 a total of 200,217 deaths at ages 1 to 74, of Industrial policyholders of the Metropolitan Life Insurance Company, has been ascribed to cerebral hemorrhage or to "paralysis without specified cause." Practically all of the deaths under the latter classification are probably due to cerebral hemorrhage, and we shall, therefore, make no further separate mention of paralysis. The standardized death rates for cerebral hemorrhage over this period averaged 67.3 per 100,000. This condition ranked seventh in the list of causes of death and accounted for 6.3 percent of all deaths, and for 20.5 percent of the

²⁵Included under this chapter heading are titles 74a (Cerebral Hemorrhage) and 75 (Paralysis Without Specified Cause) of the 1920 Revision of the International List of Causes of Death. The latter are included because most of these deaths are due to cerebral hemorrhage. Cerebral embolism and thrombosis (74b) are excluded because these conditions, in accordance with general statistical practice, were not segregated from other types of embolism and thrombosis prior to 1921.

The comparability of this 25-year series is disturbed by changes in joint cause assignment beginning with 1925. For the period 1925 to 1935 acute and chronic endocarditis, acute and chronic myocarditis, chronic nephritis, and other conditions were preferred over cerebral hemorrhage; in prior years the preference was the other way. According to an estimate by the Bureau of the Census, the death rate from cerebral hemorrhage for the general population of the United States in 1925, 81.5 per 100,000, was 10.5 per 100,000 lower than it would have been if the change in joint cause assignment had not been effected. (*U. S. Mortality Statistics, 1925, Part II, Page 39.*) Beginning with 1930, diseases of the coronary arteries were also preferred over cerebral hemorrhage.

deaths in the cardiovascular-renal group. The importance of cerebral hemorrhage is further evident from the fact that in the United States in 1934 the probability at birth of eventually dying from cerebral hemorrhage was 80 per thousand for white males, and 100 per thousand for white females. These probabilities increase with age so that at 70 the figures are 113 per thousand, or one out of nine for white males, and 126 or one out of eight for white females.

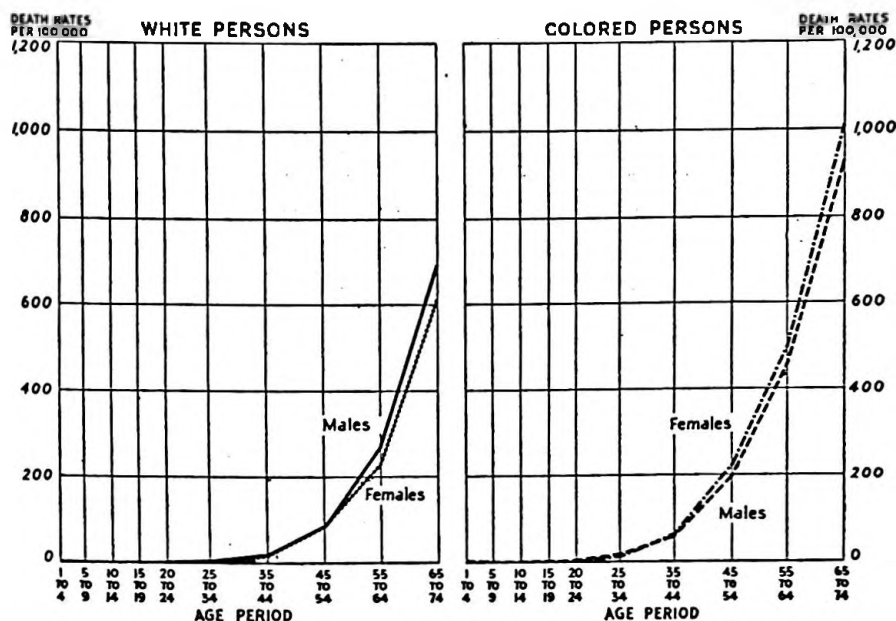
The condition is very frequently associated with other impairments, particularly those of arteriosclerotic or degenerative character. Of the nearly 90,000 deaths from cerebral hemorrhage in the United States Registration Area in 1925, one half were reported to be complicated by other conditions, chiefly arteriosclerosis and terminal respiratory disease. Moreover, in well over 25,000 additional deaths, cerebral hemorrhage was reported as a contributory condition, particularly in deaths from primary heart disease or Bright's disease.

CHART XVII

CEREBRAL HEMORRHAGE AND PARALYSIS WITHOUT SPECIFIED CAUSE

Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935



Mortality by Age, Sex, and Color

Table 13 gives the average death rates by age, sex, and color for the 25-year period as a whole, and also for the first and the last quinquennium of the period. Chart XVII shows the data for the last five years of the experience, and the discussion of the characteristics of the disease by age, sex, and color will be based generally on these figures.

TABLE 13
CEREBRAL HEMORRHAGE AND PARALYSIS WITHOUT
SPECIFIED CAUSE

Averages of Annual Death Rates per 100,000

By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
WHITE						
1 to 74*.....	67.1	51.1	84.0	61.2	46.0	74.2
45 to 74*.....	327.8	251.3	403.4	299.7	225.7	358.5
1 to 4.....	1.9	1.2	3.1	1.9	1.4	3.4
5 to 9.....	0.7	0.6	1.0	0.5	0.3	0.8
10 to 14.....	0.7	0.6	1.2	0.5	0.4	0.8
15 to 19.....	1.1	0.5	1.3	1.1	0.6	1.8
20 to 24.....	2.1	1.5	2.9	1.9	1.0	2.2
25 to 34.....	6.2	4.1	10.3	4.6	3.4	7.2
35 to 44.....	26.4	18.7	38.6	24.3	17.9	33.0
45 to 54.....	104.1	78.9	134.6	104.3	80.7	128.8
55 to 64.....	339.7	264.5	423.6	301.0	228.7	360.8
65 to 74.....	910.1	692.3	1,092.2	824.6	611.8	973.6
COLORED						
1 to 74*.....	93.8	90.2	103.2	111.4	97.7	117.0
45 to 74*.....	427.7	415.2	467.4	517.5	456.2	537.6
1 to 4.....	4.1	3.4	9.2	3.8	0.9	8.4
5 to 9.....	1.6	0.5	4.4	0.8	0.7	0.8
10 to 14.....	2.1	1.5	3.4	2.0	0.3	3.0
15 to 19.....	3.1	1.4	3.5	3.7	1.2	6.0
20 to 24.....	6.0	3.9	7.7	5.5	3.8	8.0
25 to 34.....	17.5	17.5	20.6	15.2	13.5	15.7
35 to 44.....	63.8	59.2	65.4	72.3	65.5	78.2
45 to 54.....	198.1	199.2	218.8	249.5	222.8	273.8
55 to 64.....	471.2	453.4	522.4	562.3	498.7	573.6
65 to 74.....	967.7	928.9	1,038.8	1,159.8	1,008.9	1,184.2

*Standardized for age.

Age Deaths from cerebral hemorrhage are rare under age 25, and a good part of these occur in infancy and early childhood, where they are probably after-results of injury at birth. The death rate begins to increase very rapidly after age 25, although it is still quite low for a decade or more. The rate of increase is very high. Among white males, for example, the death rate practically quadruples every 10 years between ages 25 and 65, and at 65 to 74 is over $2\frac{1}{2}$ times that in the preceding decade of life. In that age period the death rate is 170 times higher than at 25 to 34. These age changes are typical, although the rates of increase vary somewhat in the other color-sex groups.

Even higher death rates are recorded among very old people, and a significant element in the age picture is omitted when the description is not continued beyond age 74, the maximum age treated in this insurance experience. In the general population of the United States about one third of the deaths from cerebral hemorrhage occur at ages 75 and over, although only 20 percent of the deaths from all causes occur at these ages.

Sex Among white persons the death rates from cerebral hemorrhage for males are higher than those for females. At ages 1 to 74 the excess of the male over the female rate is 11 percent. A slightly higher excess is recorded at ages past 55.

Among the colored the situation is reversed. At ages 1 to 74 the female rate is 8 percent higher than that of males. At the younger ages, where death rates are low, the males have rates as high as or sometimes higher than the females, but after 35 the female rate is consistently the greater.

Color The death rates from cerebral hemorrhage are much higher for colored persons than for whites. During 1931 to 1935 the excess was more than 75 percent for colored males and actually well over 100 percent for colored females. The differences in mortality are of doubtful significance up to age 20. At the younger and middle adult ages, the relative disparity between the cerebral hemorrhage rates among the white and among the colored is greatest, and ratios of colored to white mortality decrease steadily throughout adult life, so that at ages 65 to 74, in recent years, the cerebral hemorrhage death rate for colored men averaged about one third higher than for white men, and the rate for colored women about two thirds higher than that for white women. It may be noted that the gap between the cerebral hemorrhage mortality of the two groups has increased considerably during the period under

review, for in the years 1911 to 1915 the death rate of colored males was only one fifth above that of white males, and the rate for colored females about three fifths higher than that of white females.

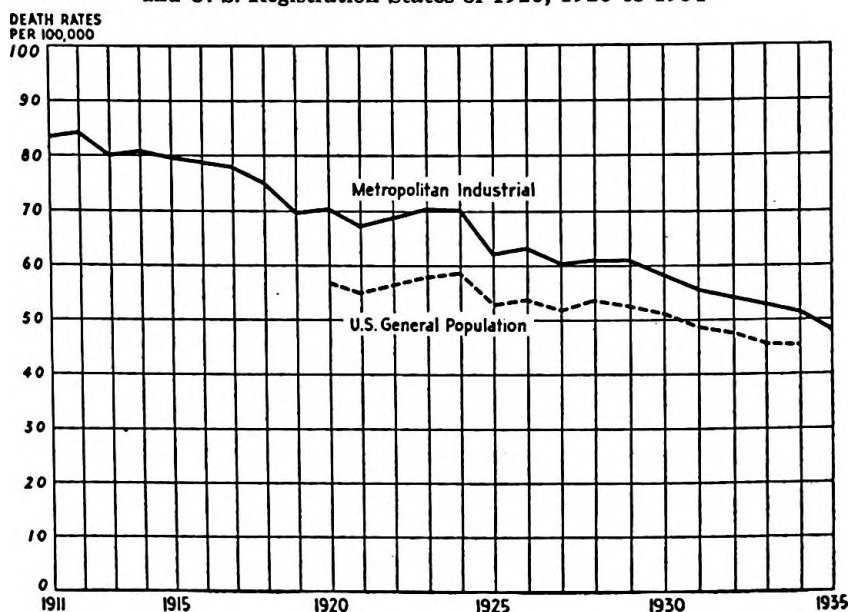
Trend of Mortality

The death rate from cerebral hemorrhage has fallen considerably during the past 25 years. This is evident from Chart XVIII, which shows the annual death rates from cerebral hemorrhage among the insured and in the general population. It is clear that the mortality trend from cerebral hemorrhage among Metropolitan policyholders is fairly representative of that for the country as a whole. The higher level of the death rate of the insured population is largely due to the same factors which are responsible for its higher mortality from chronic nephritis of arteriosclerotic or hypertensive origin and which are discussed in that section of this chapter.

The decline in the death rate from cerebral hemorrhage has been more persistent than that from most of the other categories in

CHART XVIII
CEREBRAL HEMORRHAGE AND PARALYSIS
WITHOUT SPECIFIED CAUSE
Standardized Annual Death Rates per 100,000
Total Persons. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935
and U. S. Registration States of 1920, 1920 to 1934



the cardiovascular-renal group, but the exact measure of the change is obscured by changes in the procedure of classifying deaths in which cerebral hemorrhage was jointly certified with other causes of death. Cases so certified are numerous. The new procedures give much less weight to cerebral hemorrhage than the old. The most important changes were introduced in 1925. Some further modification came into practice in 1930.

From 1911 to 1917 the cerebral hemorrhage death rate for the experience as a whole fell slowly, then at an accelerated rate between 1917 and 1921. This period includes the influenza pandemic. Cerebral hemorrhage was much less influenced by this event than the cardiovascular-renal diseases generally. Thus, while the death rate from cardiovascular-renal diseases as a group fell 20 percent between 1917-1918 and 1920-1921, the fall in cerebral hemorrhage was little more than 10 percent. There was a slight rebound for a year or two. The abrupt fall in the rate between 1924-1925 is almost entirely due to changes in joint cause procedure already described, and consequently the rates before and after 1925 are not altogether comparable, except, perhaps, at the younger ages. From 1925 to 1929 the death rate changed little, but since 1929 it has declined very considerably and steadily.

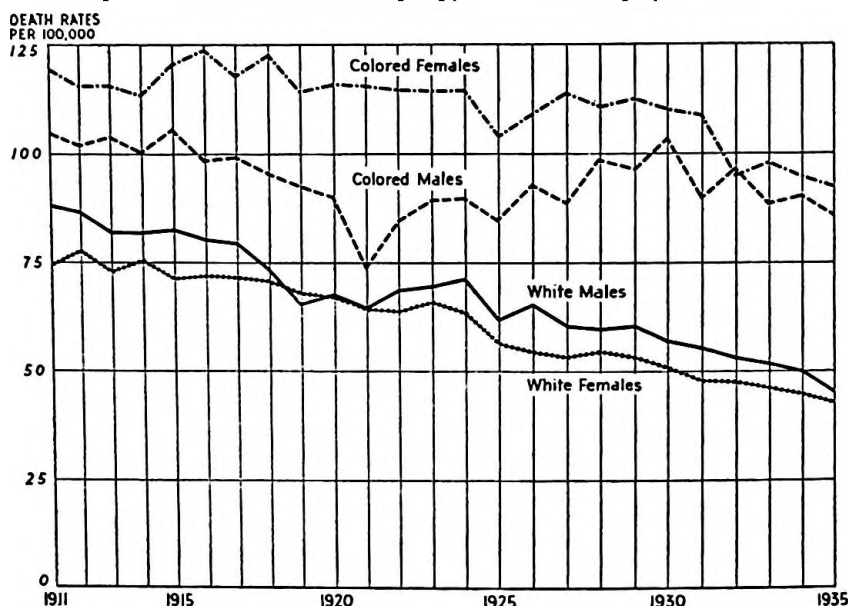
Trends by Color and Sex

Some important differences from the general picture are found when the separate trends by sex and color, shown in Chart XIX, are reviewed. Among white persons the curves for males and females are similar, except during the period 1917 to 1922. The death rate for males dropped rather sharply between 1917 and 1919 and remained near this low level until 1921. This decline was great enough to bring the male death rate down to the level of the female rate or even below it during 1919 to 1921, although normally the male rate is the higher of the two. From 1921 to 1924 the rate among males rebounded upward about 10 percent, but among females the rate actually fell slightly. Indeed, it is notable that the trend of the female death rate is almost continuously downward from 1911 to 1924, except for slight bulges in the curve in 1912, 1914, and 1923. This trend is apparently not at all influenced by the influenza pandemic. It will be recalled, however, that the changes in the female death rates in the cardiovascular-renal group during this period generally were much smaller than in males. Since 1925 the fall in the male rate has been slightly greater than in the female. Comparison of the averages of 1926 to 1930 and 1931

CHART XIX CEREBRAL HEMORRHAGE AND PARALYSIS WITHOUT SPECIFIED CAUSE

Standardized Annual Death Rates per 100,000
By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



to 1935 shows a fall of 15.4 percent for white males, and 13.4 percent for white females.

Among the colored the trends are rather different from those among whites. The death rate from cerebral hemorrhage for colored males showed a moderate downward trend from 1911 to 1919, somewhat steeper at the end than at the beginning of that period. Between 1920 and 1921 an abrupt drop of nearly 20 percent occurred, followed by almost as sharp an increase, so that in 1923 the rate was practically back to its 1920 level. From 1925 the rate rose appreciably for several years, but then fell again so that in 1935 it was about the same as in 1925. The death rates of the last five years, 1931 to 1935, however, average 6 percent less than in 1926 to 1930. Among colored females the cerebral hemorrhage death rate showed no definite upward or downward trend prior to 1924. The only notable feature during that period was the high rate during 1915 to 1918. Following a sharp rise in the rate between 1925 and 1927, the death rate has fallen in irregular fashion. The average of the rates in 1931 to 1935 was 12 percent lower than that

of 1926 to 1930. The improvement is thus twice as great as for colored males.

Trends by Age

At ages under 25, which are relatively unaffected by the joint cause changes, comparison of the death rates in 1911 to 1915 and 1931 to 1935 reveals a marked fall in cerebral hemorrhage rates. In most age periods up to 25, in each color and sex group, this decline exceeds 50 percent.

At the older ages it is somewhat more difficult to measure the amount of change in the death rate from cerebral hemorrhage. It is found, however, that comparing the rates in 1911 to 1915, the early years of this experience, with those in 1923-1924, the years just before the important changes in joint cause procedure affecting cerebral hemorrhage, that the death rate dropped more sharply at the young adult ages than at the older ages. The declines were especially marked among young white men. Moreover, in practically every age group, but more especially under age 55, the male rates, both white and colored, showed greater improvement than those for women. Subsequent to 1925 the detailed age trends of the death rates from cerebral hemorrhage during adult life follow rather closely those for all ages in each color and sex group. The exceptions are few and unimportant.

Underlying Causes of Variations

Age, Sex, Color

The data on the variations of cerebral hemorrhage mortality, according to sex, age, and color, and its trends should be viewed in the light of the causes of the condition and also its relation to other diseases. By far the majority of cases originate in hypertension or arteriosclerosis,²⁶ which are themselves often associated with each other. This in itself explains the rise in the rates according to age. The higher death rate of white men, as compared with white women, is due to their earlier development of high blood pressure and arteriosclerosis, a subject discussed in earlier sections of this chapter. The difference is, however, much smaller than in heart disease or nephritis. This may indicate that women are relatively less free of damage to the cerebral arteries than to the cardiac and renal arteries. One cannot be certain of this, however, because the factor of accuracy of diagnosis may explain this sex difference in

²⁶COBB, STANLEY, and BLAIN, DANIEL. Chapter on "Arteriosclerosis of the Brain and Spinal Cord" in *Arteriosclerosis*, edited by Edmund V. Cowdry, New York. Macmillan Company. 1933. Page 413ff.

FISHBERG, ARTHUR M. *Hypertension and Nephritis*. Philadelphia. Lea and Febiger, 1931. Page 538ff.

the mortality from cerebral hemorrhage. Because these deaths are very often sudden, sometimes occurring while the deceased is alone, there may be some doubt as to the actual cause of death, except in those cases which are autopsied, those in which there is a paralysis antedating the fatal attack, or those in which sufficient time elapses between the onset of attack and death to permit recognition of distinctive symptoms. It is doubtful whether these exceptional circumstances occur relatively more often among males than females, or whether fewer men than women die unattended by another person. These factors, however, should be considered in relation to the narrower margin between the two sexes in cerebral hemorrhage, as compared with cardiovascular-renal disease generally. As for the higher mortality of colored women, as compared with colored men, it is difficult to know why this should occur. This finding is not limited to this type of cardiovascular disease, however, and it is quite likely that the reasons previously cited for chronic nephritis hold for cerebral hemorrhage also.

The higher rates of colored persons as compared to the white are, in large part, due to differences in the quality of certification. Relatively few of the colored, especially in the older age groups, are under continued medical supervision for any considerable period, and, in the absence of any medical history, it is likely that sudden deaths among the colored will often be certified as due to cerebral hemorrhage or apoplexy. As we have already noted, however, our urban Negroes are possibly to as great a degree as the white population susceptible to hypertensive disease,²⁷ which, if untreated, may lead to sudden death at a relatively early age. Another factor, the importance of which should not be stressed unduly, is damage to the cerebral arteries resulting from syphilis.²⁸ This disease, which is more frequent in males than in females and in Negroes than in white persons, sometimes causes inflammation of the arteries of the brain, because of which death may occur suddenly. There is some disagreement among physicians as to the frequency of these lesions. It is certain, however, that such cases as do occur are often not diagnosed as syphilis, or the fact is not revealed in the death certificate.

Trend

The decline in the death rate from cerebral hemorrhage is to a large extent artificial. It is partly due to the more frequent recog-

²⁷FISHBERG, ARTHUR M. Loc. cit. Page 470.

²⁸COBB, STANLEY, and BLAIN, DANIEL. Loc. cit. Pages 44, 410, 420.

dition or reporting of primary arteriosclerotic heart or kidney disease in the course of which the cerebral hemorrhage occurs as the terminal event. More careful or, at least, different certification of causes of sudden deaths must also be a factor, because such cases are today more frequently reported as due to coronary disease than a decade ago. It is not unlikely, however, that, in some of these cases, the meager facts available may support a diagnosis of coronary disease no better than a diagnosis of cerebral hemorrhage. Some of the improvement in the death rate from cerebral hemorrhage is probably real and arises from better management of persons with an established hypertension. Early and proper treatment of this condition delays the onset of its serious arteriosclerotic complications. The growing practice of taking blood pressures routinely has tended to advance the diagnosis of hypertension.

While it is likely that the standardized death rate from cerebral hemorrhage will fall further and that this decline will be largely of the same spurious character as in the past 25 years, it is certain that cerebral hemorrhage will always loom large as a factor in mortality statistics. For, as control of infectious diseases proceeds, the proportion of persons with cardiac and renal disease of infectious origin will decrease. Consequently, arteriosclerotic lesions, in all sites, will grow in importance. This is especially true of such lesions in the brain, for they are so characteristically a phenomenon of advanced age. To that degree a relatively high proportion of deaths from cerebral hemorrhage is a favorable indication of longevity in a population. Thus, in women, the more favored group in respect to longevity, the probability of eventually dying from cerebral hemorrhage is appreciably higher than for males.

It is not hard to understand the reasons for the exceptionally high age at which these cerebral deaths usually occur. The brain in man, as in all mammals, is a vital and delicate organ of the body. As the dramatic nature of sudden death from lesions of the brain testifies, relatively brief disturbances of its circulation, if extensive, are fatal. Consequently nature has done much to protect the brain, from external damage, by the skull; and from internal damage, by a continuous and rich blood supply through an exceptionally well-developed, interconnecting circulatory mechanism. Despite the frequency of arteriosclerosis of the brain, this mechanism delays severe damage, except in the event of hemorrhage, or of the formation of large thrombi, and the involvement of areas controlling vital functions. Thus, physical and personality changes due to partial or total destruction of certain brain areas may be present

for years before death because they are limited in extent and involve less important areas of the brain. It must be emphasized that in the great majority of cases cerebral hemorrhage occurs in cerebral arteries already weakened by sclerosis. It has been shown that hemorrhage from healthy cerebral arteries is almost impossible because, in this state, they will stand pressures many times higher than those recorded clinically.²⁹ The high frequency of cerebral arteriosclerosis is brought out by Wartman,³⁰ who, in a study of the organ incidence of arteriosclerosis in 500 autopsies, found it to be present, and in severe degree, in the brain more frequently than in any other part of the body, except the spleen. At ages over 60 years marked arteriosclerosis of the brain existed in 91 percent of the men, and in 84.5 percent of the women. It is commonly accepted today that generalized arteriosclerosis is relatively rare, although more than one site often may be involved. According to Neuberger,³¹ cerebral arteriosclerosis usually occurs alone, and in not more than 10 percent of the cases is there generalized vascular disease.

It is these circumstances which warrant the judgment that cerebral hemorrhage is important as a separate cause of death, especially at advanced ages, and will remain so. Some individuals may be expected to live on to a great age with cardiac and renal functions intact, who eventually succumb to cerebral lesions. Even at the younger ages there will always be certain individuals who are predisposed to cerebral death, probably because of hereditary weakness of the cerebral arteries, as compared to those of other vital areas. Other elements may enter the picture, possibly less as etiological agents than as factors hastening death where the cerebral arteries are already weakened. Emotional and nervous factors are of this type. Apart from these influences, constitutional or hereditary factors, such as build and hypertension, will tend to keep cerebral hemorrhage high in the list of causes of death. The proneness of thick-set, florid, and corpulent individuals to succumb to the disease has long been recognized in the term "apoplectic habitus,"³² used by older physicians, and is proved by statistics of mortality from cerebral hemorrhage according to build classes.³³

²⁹FISHBERG, ARTHUR M. Loc. cit. Page 539.

³⁰WARTMAN, WILLIAM B. "The Incidence and Severity of Arteriosclerosis in the Organs from 500 Autopsies." *The American Journal of the Medical Sciences*. 1933. Vol. 186. Page 27.

³¹Neuberger quoted in Cobb and Blain. Loc. cit. Page 409.

³²FISHBERG, ARTHUR M. Loc. cit. Page 541.

³³DUBLIN, LOUIS I., and MARKS, H. H. "The Influence of Weight on Certain Causes of Death." *Human Biology*. Vol. II. 1930. Page 159.

Medico-Actuarial Mortality Investigation, published by the Association of Life Insurance Medical Directors and the Actuarial Society of America. New York. 1913. Vol. II. Page 34. *Supplement to Medical Impairment Study*, published by the Actuarial Society of America and the Association of Life Insurance Medical Directors. New York. 1932. Pages 32 and 33.

Hypertension, too, has been proved frequently to precede cerebral hemorrhage. Autopsy statistics of large groups of hypertensive individuals show that cerebral arteriosclerosis is almost always present and that cerebral hemorrhage is one of the important causes of death among them. Arteriosclerotic changes, however, whether or not hypertensive in origin, will always dominate the picture in the mortality from cerebral hemorrhage.

DISEASES OF THE ARTERIES

From what has been said in preceding sections, it is clear that sclerotic changes in the arteries are involved in most of the deaths from cardiovascular-renal diseases. Nevertheless, a separate title, "Diseases of the arteries," is required. This title is used, for example, for deaths certified as due to arteriosclerosis or atheroma, "other arterial diseases," and aneurysm. Arteriosclerosis accounts for more than 80 percent of the cases included in this title.

Little weight can be attached to the statistics in this category. In large part the deaths thus certified probably represent those cases in which the typical manifestations of arteriosclerotic diseases of heart, kidney, or brain were absent, or at least were not reported. Included also are cases in which the diagnosis of arteriosclerosis is made under a vague conception of generalized arteriosclerosis as a clinical entity. There is little doubt that if fuller clinical statements were available in these cases, thousands of deaths reported and tabulated each year as due to arteriosclerosis would be assigned to cardiac or renal disease or cerebral hemorrhage. Another defect in the data for the title "Diseases of the arteries" is their lack of homogeneity. They include aneurysm and arteritis, for example, which are very frequently sequelae of syphilis, but the absence of this history on the death certificate, whether intentional or not, prevents the correct classification of these deaths as syphilitic. Despite these shortcomings, it is necessary to give brief consideration to the data on arterial disease because the number of deaths certified as due to these conditions is large, even today.

It may be pointed out that the etiological significance of arteriosclerosis in cardiac, renal, and cerebral deaths frequently is recognized in the death certificate by the physician by recording arteriosclerosis as a contributory cause. In 1925 the number of deaths in which arteriosclerosis was thus reported was about three times that in which it was reported as the sole or primary cause of death.

In the 25-year period under review, a total of 36,584 deaths among Metropolitan Industrial policyholders, ages 1 to 74 years, were allocated to diseases of the arteries. This number accounted for 1.1 percent of the deaths from all causes and for 3.7 percent of the deaths attributed to cardiovascular-renal conditions. The standardized annual death rates for the period averaged 13.9 per 100,000.

The data for arteriosclerosis separately first became available in 1922 in this insurance experience. For the period 1922 to 1935 the death rate from this cause averaged 9.7 per 100,000. Since arteriosclerosis accounts for so large a part of the mortality from arterial disease, so certified, and is fairly homogeneous in itself, it is desirable to describe the characteristics of this condition rather than those of arterial diseases as a group. It should be noted, however, that deaths specified as due to arteriosclerosis of the coronary arteries, formerly included under arteriosclerosis, have since 1930 been allocated to the coronary disease title.

Mortality by Age, Sex, and Color

Age Arteriosclerosis is preeminently a condition of old age.

Deaths from the disease are seldom reported under age 45, but thereafter the death rate is significant and climbs rapidly with advancing age. Among white males, for example, the average death rate in 1931 to 1935 ranged from less than one per 100,000 at ages 35 to 44, to 189.3 per 100,000 at 65 to 74. This gradient is steeper than for cardiovascular-renal diseases generally. Indeed, the age picture is incomplete without reference to the death rate beyond age 74, the maximum age for which reliable data are available in this experience. The proportion of deaths charged to arteriosclerosis becomes increasingly large after age 75, and in extreme old age it is certified as the cause of death almost as frequently as nephritis or cerebral hemorrhage. In the general population of the United States more than 60 percent of the deaths from arteriosclerosis occur at ages 75 and over.

As Table 14 and Chart XX show, the same general age contour prevails in each color-sex group; the gradient of the rise among females, however, is not so great as that among males.

Sex Among both white and colored persons, the death rate for males exceeds that for females. For the period 1931 to 1935, this excess was 60 percent among white persons and 31 percent among the colored. Because of the unsatisfactory nature of the data, it is impossible to ascribe specific cause for these differences. They are, however, probably of the same nature as those previously found in cardiac and renal disease.

Color The mortality from arteriosclerosis among colored persons is materially higher throughout adult life than that among whites. In the quinquennium 1931 to 1935 the death rate for colored males was 13.4 per 100,000, or 35 percent higher than the

TABLE 14
ARTERIOSCLEROSIS

Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 25 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1922 to 1935

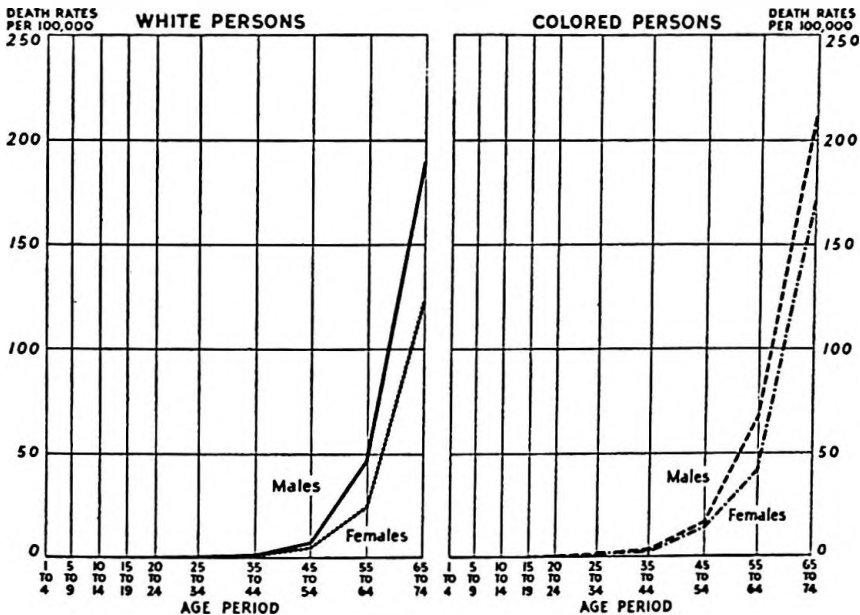
AGE PERIOD YEARS	MALES			FEMALES		
	1922 to 1935	1931 to 1935	1922 to 1925	1922 to 1935	1931 to 1935	1922 to 1925
WHITE						
1 to 74*	12.0	9.9	13.2	7.1	6.2	8.0
45 to 74*	62.0	51.4	67.9	36.9	32.4	41.5
25 to 34	0.2	0.1	0.4	0.1	0.1	0.1
35 to 44	1.6	0.9	1.8	0.8	0.7	0.7
45 to 54	9.0	6.3	9.6	4.8	4.1	5.3
55 to 64	50.7	42.6	49.9	28.7	24.4	30.5
65 to 74	225.3	189.3	257.1	137.8	123.1	158.7
COLORED						
1 to 74*	13.1	13.4	12.3	10.8	10.2	10.6
45 to 74*	66.7	68.3	62.6	54.7	51.6	54.2
25 to 34	0.3	0.3	0.6	0.3	0.5	0.2
35 to 44	3.1	3.5	2.2	3.1	2.6	2.7
45 to 54	16.3	15.4	12.1	12.4	13.9	9.5
55 to 64	60.7	68.3	50.1	50.0	42.3	48.5
65 to 74	213.7	211.0	221.2	177.2	170.1	184.6

*Standardized for age.

rate of 9.9 recorded for white males; the death rate of colored females, 10.2 per 100,000, was 65 percent higher than the rate, 6.2, for white females.

This difference in the mortality from arteriosclerosis between the two groups probably reflects hardly more than the less accurate certification of causes of death among the colored, as compared with whites, as a result of which an excessive proportion of deaths among the colored are reported as due to arterial disease instead of to a more specific disease in the cardiovascular-renal group. Nevertheless, even when allowance is made for such deficiencies, the excess of the colored death rate may be still sufficient to justify the conclusion that Negroes suffer the higher mortality from this cause. This is confirmed by their higher death rates from specific lesions of arteriosclerotic origin in the heart, brain, and kidneys.

CHART XX
ARTERIOSCLEROSIS
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years
 Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935



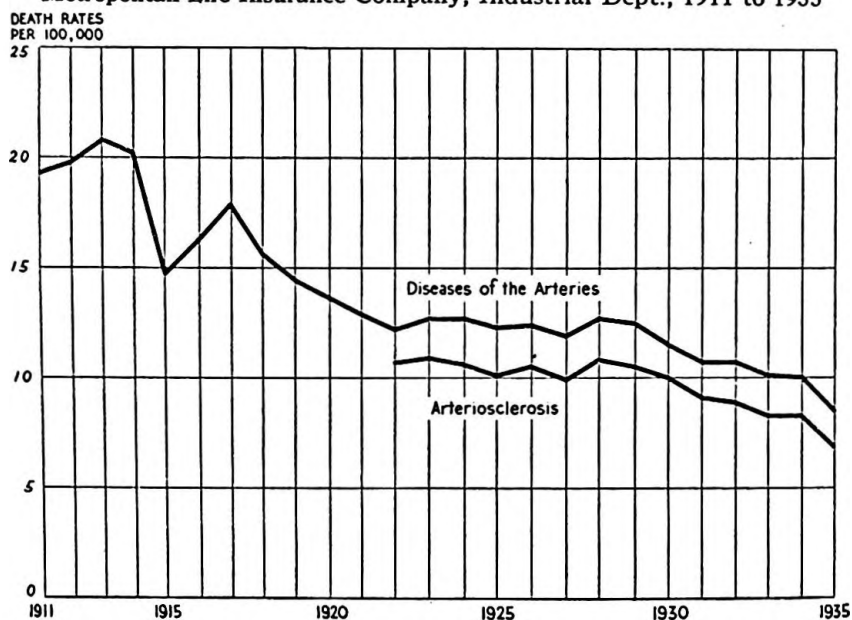
Trend of Mortality

The death rates from diseases of the arteries as a whole, and from arteriosclerosis, exhibit a slow, irregularly downward movement. These trends are shown in Chart XXI. The lowered mortality from these diseases among the insured is almost entirely accounted for by the decline in the death rate among white persons. Among white males, at least, the rate from arteriosclerosis was kept up during the late 1920's by the increasing frequency of deaths from sclerosis of the coronary arteries which were classified under arteriosclerosis until 1930. The recorded decline in the rate from arteriosclerosis among whites has been especially marked since that year and is partly influenced by the up-surge of coronary disease mortality. Among the colored the death rates have fluctuated widely and no definite tendency is discernible for the period under review. The trend among colored women has been favorable since 1931.

The standardized annual death rates from arterial diseases as a whole, and from arteriosclerosis separately, are shown according to color, sex, and broad age groups, in Appendix Table C.

CHART XXI
DISEASES OF THE ARTERIES†
Standardized Annual Death Rates per 100,000
Total Persons. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



†Prior to 1915 arterial disease was a preferred cause when reported jointly with broncho-pneumonia, endocarditis, and a number of other conditions; beginning with 1915, the preference was reversed. For the years 1930 to 1935 the rates for diseases of the arteries, comprising titles 96 and 97 of the 1930 International List, were not strictly comparable with those of prior years. The resulting difference, however, is negligible.

CHAPTER IX

DIABETES MELLITUS



DIABETES MELLITUS

In the quarter of a century covered by this investigation, there were 60,407 deaths from diabetes among the weekly premium-paying policyholders of the Metropolitan Life Insurance Company. A very particular interest attaches to the study of the mortality from this disease during the period under review, for within that period fell the epoch-making discovery of the insulin treatment for diabetes. Such a development would have been of the highest interest in connection with any disease; but it has a particular significance because it is the only instance so far of an efficacious specific treatment for one of the major chronic diseases characteristic of later life. The continued advance in the knowledge of insulin and in its use has greatly improved the prospect of the diabetic. Yet, singular as this may appear, despite the materially improved prognosis of the disease, its death rate is not declining. To a consideration of this striking paradox and the key to its explanation we shall proceed in this chapter, after describing the characteristics and trends of diabetes mortality during the 25-year period, and the forces influencing them.

In the years from 1911 to 1935 the standardized annual death rates at ages 1 to 74 years among Metropolitan Industrial policyholders averaged 17.6 per 100,000. In 1935 diabetes accounted for 3.0 percent of all deaths and ranked ninth among the causes in this insured group. If we disregard deaths from violence and limit our comparison to diseases, diabetes was eighth in importance. In contrast, at the beginning of this experience in 1911 diabetes accounted for only 1.1 percent of the deaths and was 16th in rank. Thus, while certain other diseases have declined, diabetes has advanced rapidly in the registers of mortality, and may be considered one of the major health problems of the present day.

Mortality by Age, Sex, and Color

Age Diabetes is primarily a disease of later life. In the ages under 10 the disease is relatively rare, and in recent years the death rates from it at this period of life have been less than two per 100,000. Apart from a slight peak during puberty, the mortality from the disease shows a very gradual rise up to age 35, but past that age it increases rapidly. The rate of increase varies considerably with age. Among white males in the period 1931 to 1935 the average death rate at 35 to 44 years was more than

$1\frac{3}{4}$ times that at 25 to 34. The death rate at 45 to 54 was $3\frac{1}{4}$ times that for the preceding 10-year age period, the maximum relative increase. Beyond this point the percent rise in mortality

TABLE 1
DIABETES MELLITUS
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
WHITE						
1 to 74*	13.5	14.0	13.3	21.9	26.7	18.7
1 to 24*	2.8	1.8	3.3	2.6	1.8	3.1
25 to 44*	6.7	5.2	8.3	6.2	5.6	6.4
45 to 74*	53.5	60.9	48.6	99.0	127.4	80.5
1 to 4	1.7	1.3	1.8	1.4	1.1	1.9
5 to 9	1.6	1.4	1.6	1.7	1.2	1.8
10 to 14	2.6	1.7	3.2	3.3	2.3	4.3
15 to 19	3.8	2.3	4.4	3.3	2.3	3.9
20 to 24	4.2	2.2	5.5	3.2	2.0	3.6
25 to 34	5.4	3.8	6.7	4.2	3.2	4.8
35 to 44	8.5	7.0	10.6	8.9	8.8	8.4
45 to 54	24.3	22.9	25.6	39.0	42.4	36.6
55 to 64	63.7	72.6	55.8	125.8	156.0	103.6
65 to 74	113.5	142.2	97.4	212.6	305.2	157.2
COLORED						
1 to 74*	10.9	12.8	9.5	18.1	27.1	10.1
1 to 24*	1.8	1.9	1.4	1.8	2.1	1.3
25 to 44*	6.7	6.6	7.2	10.6	14.0	5.4
45 to 74*	42.0	52.0	35.3	74.1	115.3	41.4
1 to 4	1.1	1.2	0.0	1.0	0.4	0.8
5 to 9	1.4	1.6	2.8	1.0	1.0	0.8
10 to 14	1.3	2.0	0.0	2.5	3.6	2.6
15 to 19	2.6	2.1	1.5	2.1	2.6	1.4
20 to 24	2.6	2.7	2.4	2.4	3.0	0.9
25 to 34	4.7	3.4	4.6	5.9	7.6	4.4
35 to 44	9.4	10.9	10.6	16.7	22.5	6.7
45 to 54	24.2	27.2	21.0	51.4	74.7	31.8
55 to 64	50.0	62.9	46.7	87.9	137.7	50.9
65 to 74	75.7	99.3	53.6	110.6	184.4	49.9

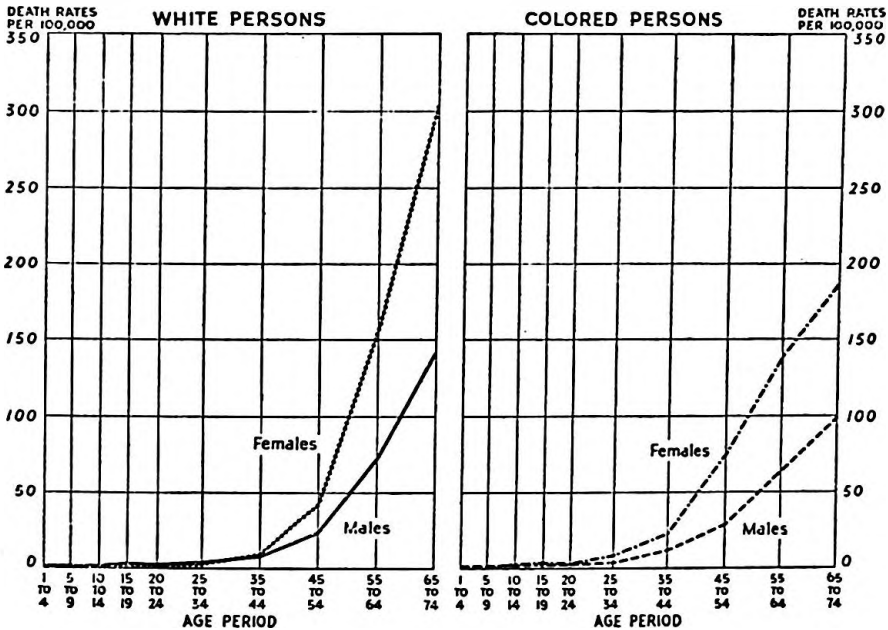
*Standardized for age.

CHART I

DIABETES MELLITUS

Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935



with age becomes less marked, and at 65 to 74 the death rate among white males was twice that at 55 to 64. Among white women the increase in mortality with age was even more pronounced than among the men. These facts are apparent from Table 1; the age curves for 1931 to 1935, by sex and color, are shown in Chart I. This insurance experience is deficient in data beyond age 75, but from other sources it is evident that maximum death rates are reached in old age although at these ages they are not much higher, nor consistently higher, than those at ages 65 to 74.

Sex It is clear from Table 1 that women are the chief victims of diabetes. This is contrary to early clinical experiences, and even to some relatively recent population data in which there was a predominance of male diabetics. In this insurance experience the death rate for white females at ages 1 to 74 exceeded that of white males by 91 percent during the five years ending in 1935. Among the colored the excess of the female over the male rate was 112 percent.

Among white persons the excess is almost entirely limited to middle and old age. The only exception is observed at ages 10 to 14, and this probably reflects merely the earlier attainment of puberty by girls, as compared with boys, a period of life, in both sexes, at which diabetes frequently appears. Just about at the ages when the menopause begins in women, their diabetes death rates increase very rapidly, much more so than the rates for males of corresponding ages. This high rate of increase continues for the next 30 years of life. As a result, with advancing age the death rates for women exceed those for men by an increasing margin. Thus, at ages 35 to 44 the excess of the female death rate over that for males is 26 percent, and increases rapidly to 85 percent at 45 to 54. The maximum disparity in mortality for the two groups, 115 percent, occurs in the ages past 55.

Among the colored this tendency of the female death rate to depart from that for males is apparent somewhat earlier. Indeed, except at ages under 10 the colored females suffer a far higher death rate than the males. This becomes particularly marked in early adult life and persists to the end of life. Past age 25 the diabetes death rates of colored women are consistently double or more the male rate, except at 65 to 74, when the rate falls a little short of this. The excess is proportionally highest in the decade 45 to 54, when the rate is $2\frac{3}{4}$ times the male rate.

Color Negroes were formerly thought to be relatively immune to diabetes, but time has proved this to be a misconception. With exposure to conditions of urban life and with the improvement in medical diagnosis available to them, Negroes have been found to be as prone to the disease as whites. Thus, in the five-year period 1931 to 1935 the standardized death rate from diabetes of colored men in this experience, has been less than 10 percent below the white rate, while that of Negro females has been practically identical with that for white females.

When the material is studied in separate age groups, a somewhat different aspect appears. The diabetes mortality among colored persons is marked by relatively high rates in early adult and middle life. Especially is this so in the case of females in certain age groups. Among them the death rates are higher than in white women between ages 10 and 55. Between 25 and 44 they are well over twice the white death rates. Among colored men these differentials are much smaller and not consistent. The

maximum difference recorded is at ages 35 to 44, when the Negro male death rate is approximately $1\frac{1}{2}$ times the white male rate.

Trends of Diabetes Mortality

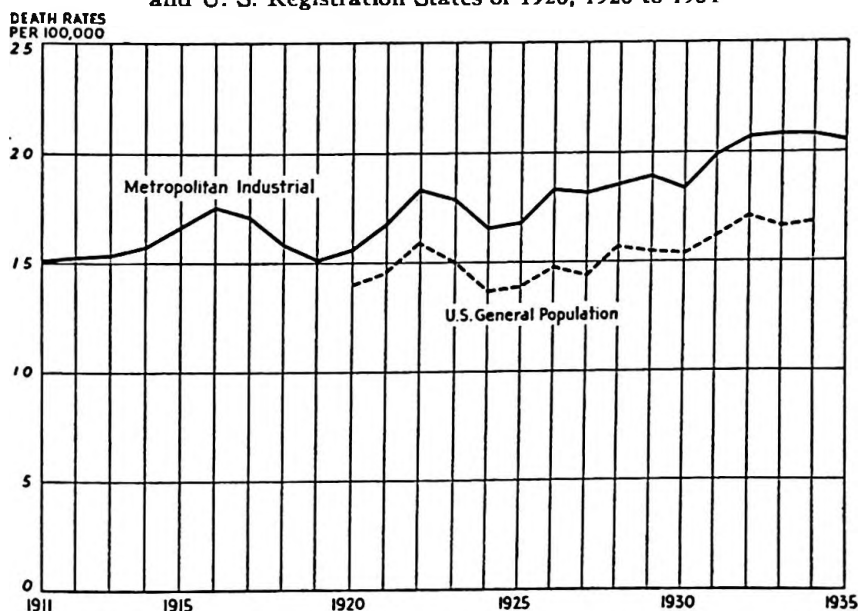
For the last four years in this series the death rate from diabetes for the experience as a whole has been constant. But this stability has taken place at a level far higher than that which prevailed in earlier years. The maximum rate (standardized for color, sex, and age), 20.8 per 100,000, was reached in 1933, but this rate is little different from that of 20.7 recorded in 1932 and 1934, and 20.5, in 1935. These peak rates are the culmination of a steady advance in the mortality from diabetes since 1924, when the rate was only 16.5. Thus, in the relatively short span of 10 years the death rate from diabetes has gone up 25 percent. Yet, even this advance, as is clearly shown in Chart II, is but the continuation of a broad rise in the death rate from this cause, which began in the early years of our experience. For the whole period 1911 to 1935, the mean annual rise amounts to 0.23 per 100,000, or 1.3

CHART II

DIABETES MELLITUS

Standardized Annual Death Rates per 100,000
Total Persons. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935
and U. S. Registration States of 1920, 1920 to 1934



percent per year, based on the mean death rate for the period. This trend has been interrupted at only three points: (1) in the late war years and immediately following the war, when it may have been influenced by the restrictions on the use of foodstuffs through government regulation and high prices; (2) in the years immediately following the introduction of insulin treatment; and (3) in the present period of stability.

To some extent the marked decline in the diabetes death rate in 1918 and 1919 reflects also the epidemic of influenza which raged during the last quarter of 1918 and the early months of 1919. Although deaths reported as due to influenza and diabetes jointly are charged to the latter, there is little doubt that during the pandemic, with so many medical men in war service, influenza was frequently reported in these cases as the sole cause of death. Normally, the diabetes death rate rises during epidemics because infections are particularly dangerous to diabetics. Some evidence of this is seen in the increased diabetes death rates in 1926 and 1929, when minor epidemics of influenza occurred.

The rise in diabetes mortality was moderate in the beginning of this experience, reaching its first peak—17.5 per 100,000—in 1916. This represented a rise of but 15.5 percent from the level of 1911-1912. The death rate then dropped to 15.1 in 1919 but from this low point rose rapidly, reaching 18.3, a new peak, in 1922. In the latter part of 1922 insulin, which had been discovered in the previous year by Drs. Banting and Best, of Toronto, began to be introduced on a commercial scale for use by physicians. The effect on diabetes mortality was immediate, the death rate in 1923 showing the first decrease since 1919. In the next year, 1924, the experience was even better, with a death rate of only 16.5 per 100,000, or 9.8 percent below the peak rate of two years before. Even at this new level, however, the death rate from this cause was appreciably above the prewar mark. Between 1924 and 1932 there was no important interruption in the rise of the diabetes mortality. From 1932 on, however, the rate showed practically no change. In general, it is found that the rate of increase in diabetes mortality has been greater since the discovery of insulin than in the 12 years preceding. Thus, from 1911 to 1922 the mean annual increase in the death rate was 0.16 per 100,000, or 1.0 percent of the mean death rate for the period, compared with 0.40 per 100,000 from 1924 to 1935, or 2.1 percent of the mean rate for that period.

It is apparent from Chart II that the trend of the diabetes mortality among Metropolitan Industrial policyholders is representative of that for the general population of the United States. The comparison of the two experiences is made for the years beginning with 1920, because comparable data for the general population are not available prior to that date.

Mortality Trends by Color and Sex

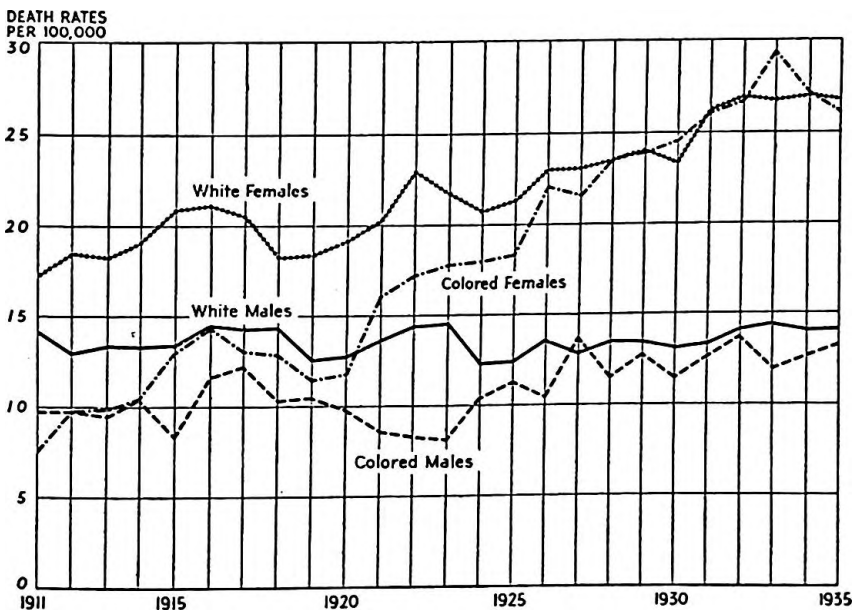
The long-term trends of the death rates by color and sex, shown in Chart III, are by no means parallel. Among white males the death rates have been remarkably stable, a minimum death rate of 12.3 per 100,000 being registered in 1924, and a maximum of 14.5, registered in both 1923 and 1916. The features of greatest interest at present are (1) the sharp drop in the rate from the maximal levels immediately after insulin came into use, and (2) the subsequent rise in the death rate, which, though gradual, has restored the rate to a level little below the maximum.

CHART III

DIABETES MELLITUS

Standardized Annual Death Rates per 100,000
By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



Among colored males the trend over the 25 years has been definitely upward. The increase has been most marked in the last 10 years. As a result, their death rate in the last five years of the experience is within 10 percent of the rate for white males, although in the years 1911 to 1915 the colored averaged about a third less.

In contrast with these moderate changes in diabetes mortality among males are the very sharp and unmistakable increases in the death rates of women, both white and colored. Among white females the mean annual increase in the rate was 0.39 per 100,000 over the 25 years, or 1.8 percent of the mean death rate during this period. The course of their death rate has dominated that for the experience as a whole and is, therefore, similar in its details to that for our total experience, as described above, differing mainly in the rate of the increase.

It is among colored women, however, that the rise in the diabetes mortality has been greatest. At the beginning of our experience their death rate was far lower than that for whites, both male and female, and on a par with that for colored males. The literature on diabetes commented on their relative freedom from the disease. Within the past quarter of a century, however, the picture has changed completely. Advancing at a rate which has averaged annually 4.8 percent of the mean rate for the 25 years, the mortality of colored females has caught up to that of white females and in some recent years has actually exceeded it, despite the large increase in the death rate among the latter.

Mortality Trends by Age and Sex

These movements in the death rates at ages 1 to 74 combined conceal significant and contrary trends by age in the several sex and color groups. Stated briefly, among white persons the rise in diabetes has been limited to older persons; to men over 55, and to women over 45. Among white children and young adults, however, there has been definite and substantial improvement in the diabetes death rate, and early middle life has been characterized by a practically stationary death rate. Among colored persons, on the other hand, there has been little if any improvement in the 25 years under review, except among the young men. In practically every other age group among the colored the diabetes death rate has increased, but more especially at the older ages. These developments are discussed in greater detail in the paragraphs which follow.

Declining Diabetes Mortality at Ages Under 25

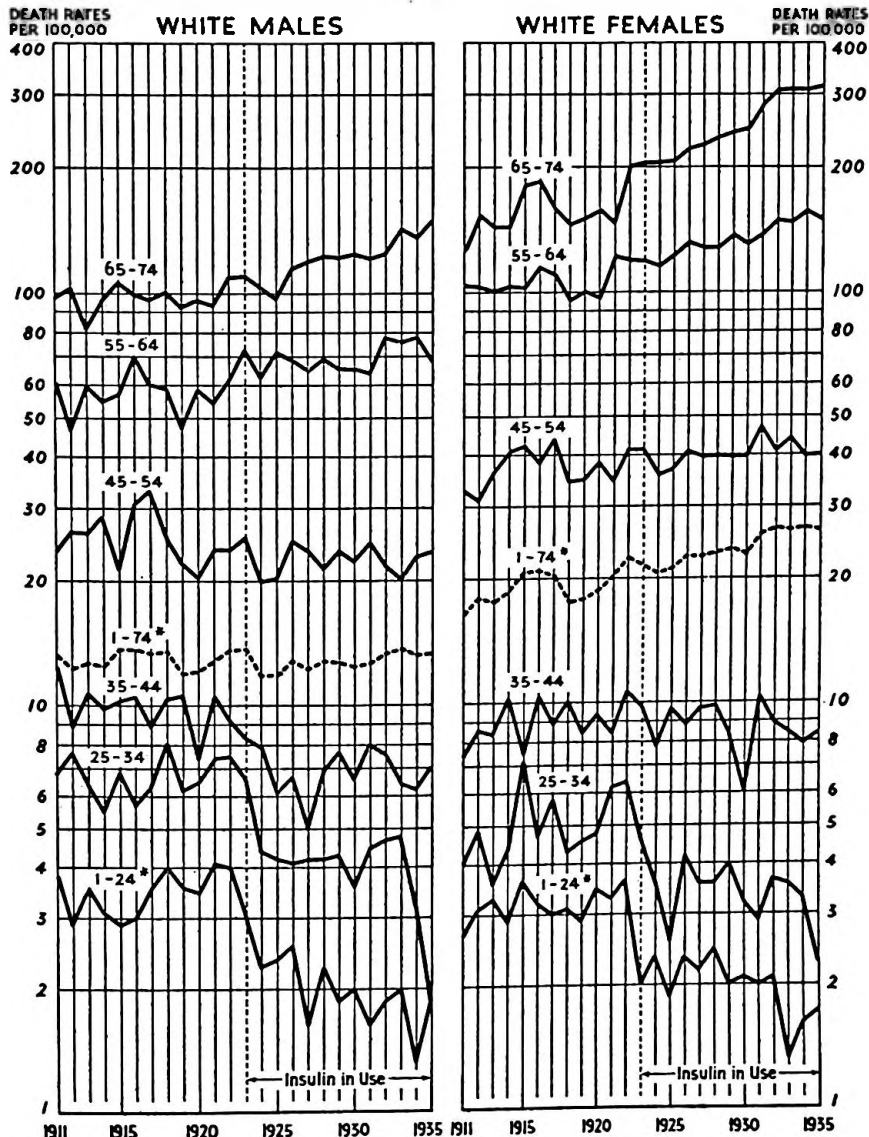
The decline of the diabetes death rate among young white persons not only has been large, but of great significance because

CHART IV

DIABETES MELLITUS

Annual Death Rates per 100,000 White Persons
By Sex and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



* Standardized for age

it is, in great measure, a result of the use of insulin. Prior to the discovery of insulin, the trend of the death rate of children and young people was moderately upward. Following immediately upon the beginning of the insulin treatment, the standardized death rate of white males at ages 1 to 24 dropped from 4.0 to 3.0 per 100,000 in a single year, between 1922 and 1923; and among white females from 3.7 to 2.0. Subsequently, the rate in each sex has fallen still further. Chart IV illustrates the record of this favorable experience.

The extent of the change among young white males is quite large. The mean death rate in the period 1924 to 1935 was only 2.0 per 100,000, which represents a decrease of 43 percent from the level of 3.5 per 100,000 prevailing in the 12-year pre-insulin period 1911 to 1922. Among young white females the decrease was only slightly less, namely, $37\frac{1}{2}$ percent. Among young colored persons, on the other hand, the diabetes situation has apparently become worse. Among colored males at ages 1 to 24, the post-insulin level of the diabetes death rate, 2.1 per 100,000, is actually over 20 percent higher than the level of 1.7 prevailing during 1911 to 1922; among colored females the rate at these ages has risen nearly one third, from 1.6 to 2.1. It is believed, however, that this rise in the diabetes death rate of Negro children and young persons is due in large measure to increased frequency of diagnosis of the disease. It is likely, too, that many of them do not get insulin or adequate medical supervision, both of which are so essential to the young diabetic.

Trend in Early Adult Life

In early adult life, as in the younger ages, there has been marked improvement in the mortality from diabetes among white persons, particularly since the discovery of insulin. Prior to 1922 the death rate of white males between ages 25 and 44 had fluctuated, with a slightly downward tendency around a mean death rate of 8.2 per 100,000. From this level it has fallen sharply. The mean death rate in the period 1924 to 1935, 5.2 per 100,000, is 36.6 percent below that of 1911 to 1922. The decline in the death rate was particularly large in the early years of insulin use. Among white females the improvement in the death rate at ages 25 to 44 is less marked. The mean death rate in the 12 years ending in 1922 was 6.8 per 100,000, and the trend during that period was quite sharply upward. The mean rate in the period 1924 to 1935 was 5.7 per 100,000, a drop of 16.2 percent from the pre-

insulin average. As in the case of white males, the trend since the introduction of insulin treatment has shown a slightly downward tendency which was most marked in the years immediately following the new treatment. While the death rates in this age period are at a satisfactorily low level, as compared with pre-insulin days, they have shown no tendency in very recent years to decline further, despite the fact that most of the deaths from diabetes at these ages are clearly preventable.

Among colored men at ages 25 to 44, the post-insulin diabetes rate showed little change from the average of 7.0 of the 12 years preceding insulin. The rate has fallen slightly to 6.5 per 100,000 in the period 1924 to 1935. Among colored females of the same ages, however, the diabetes situation has shown a distinct change for the worse. From a level of 7.4 prevailing in the period 1911 to 1922, the rate has risen sharply, averaging 13.4 in the period 1924 to 1935.

Trend in Middle Life and Old Age

Among persons past 45 there has been a distinct rise in the death rate, without exception as to color or sex. The rise has been most marked among women, particularly of the Negro race. Thus, in the age group 45 to 74 the death rate of white males fluctuated little prior to insulin, but since insulin it has been rising at the rate of approximately 1.9 percent per year. Among colored males, likewise, the rate before insulin showed a slight tendency to fall, whereas since insulin it has gone up at a rate of approximately 2.4 percent per year. Much greater are the changes among females. For the whole period 1911 to 1935, the mean annual increase among white women was 2.3 percent of the mean rate, and in the period 1924 to 1935, 2.9 percent. Among colored females past 45, the increase has been large and practically continuous, averaging 5.1 percent per year of the mean rate for the 25-year period.

Changes in Relative Mortality According to Sex and Color

These differences in the trends of the diabetes death rates in the various color, sex, and age groups have resulted in interesting changes in the relative mortality of males as compared with females, and of white persons as compared with the colored. This may be summarized by comparing the levels of the rates during the pre-insulin years 1911 to 1922, with those in the five years ending in 1935.

Among white persons it is found that, at all ages combined, the excess of the white female rate over that for white males has

increased from 45 percent in the earlier period to 90 percent in recent years. At ages under 25 white males formerly suffered a slightly higher death rate than the females, but recently the rates have been identical. Between ages 25 and 44 an appreciable excess in the male death rate has been actually replaced by a slight margin in the female rate over that of males. Past age 45 the rate among white women is now well over twice that of men, compared with a two thirds excess prior to 1923.

Among the colored the female death rate from diabetes at all ages was one fourth higher than that of males in the period 1911 to 1922, but was more than double the latter in 1931 to 1935. At ages under 25 the slight excess in the male over the female rate in the earlier period has been replaced in recent years by an excess in the female rate. Between ages 25 and 44 the female death rate was little higher than the male prior to 1923, but recently it has been more than 100 percent higher. Past 45 an excess of one third in the female rate has increased to approximately 120 percent.

Similar changes have taken place in the relationship between white and colored persons as regards diabetic mortality. Among males the excess of the white rate over the colored, at all ages combined, has fallen from 35 percent in 1911 to 1922, to 10 percent in 1931 to 1935. Under age 25 the white male rate was formerly double the colored, but now is actually slightly lower. At ages 25 to 44 the slight excess of the white male rate has been reversed by an appreciable margin. Past age 45 the excess of the white rate declined from over 30 percent to about 15 percent. Among females at all ages combined, the pre-insulin death rate of the whites was nearly 60 percent higher than the colored, but in recent years the two have been almost identical. Under age 25 a margin of 100 percent in the white female rate over the colored has been replaced by a slight margin on the side of the colored. Between 25 and 44 a 10 percent excess in the colored rate has increased to 150 percent, while at ages past 45 an excess of 70 percent in the white female rate dropped to approximately 10 percent.

Mortality from Diabetes in the Insured and in the General Population Compared

The diabetes death rate among Industrial policyholders is higher than that in the general population of the United States. The excess amounted to more than 20 percent in the five years

TABLE 2
DIABETES MELLITUS
Averages of Annual Death Rates* per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Department
and U. S. Registration States of 1920, 1930 to 1934

AGE PERIOD YEARS	DEATH RATES* PER 100,000				PERCENTAGE METROPOLITAN OF UNITED STATES RATE	
	MALES		FEMALES		Males	Females
	M. L. I. Co.	U. S.	M. L. I. Co.	U. S.		
WHITE						
1 to 74.....	13.8	12.5	26.0	20.1	110.4	129.4
1 to 24.....	1.8	2.0	1.9	2.2	90.0	86.4
25 to 44.....	5.4	4.3	5.5	5.0	125.6	110.0
45 to 74.....	59.6	53.8	123.9	92.7	110.8	133.7
COLORED						
1 to 74.....	12.4	10.6	26.8	21.9	117.0	122.4
1 to 24.....	2.0	1.7	2.5	1.6	117.6	156.3
25 to 44.....	6.6	6.6	14.0	12.0	100.0	116.7
45 to 74.....	49.9	41.0	112.9	92.2	121.7	122.5

*Standardized for age.

ending in 1934, the latest year for which Federal data are available. In this period the death rate among the insured at ages 1 to 74 was 20.1 per 100,000, compared with 16.4 in the States included in the Registration Area in 1920. The death rates of both groups are adjusted to the same color, sex, and age basis.

Table 2 shows considerable variations in the relative levels of the rates in the two groups by color, sex, and age. Among white men the rate for the insured was only 10 percent higher than that in the general population, but among females it was nearly 30 percent higher. Insured colored males had a diabetes mortality approximately 15 percent higher than colored males in the general population; for colored females the margin was about 20 percent. Among white persons, furthermore, the excess of diabetes deaths among the insured was limited to adult life. At ages under 25 the rate for insured males was 10 percent below the corresponding group in the population, and among the females it was 15 per-

cent less. The reasons for these differences are unknown. At these ages the death rate is very low and possibly the variations recorded are of little significance. At the older ages there is a definite margin between whites in the insured group and in the population, especially among women past 45. This reflects differences in the composition of the two groups. The insured are drawn almost entirely from the urban areas, whereas the general population includes a considerable proportion of persons residing in rural areas. In the latter the recorded death rate from diabetes is low, first, because the facilities for diagnosis are poorer than in the cities and, secondly, the relatively greater physical activity required by the work done in rural areas tends to keep the rural death rate below the urban.

Among the colored there is an excess mortality among the insured in both sexes at every age except in the broad age group 25 to 44, when the rates for the two male groups are identical. The reasons for these differences are much the same as in the case of whites, but greater emphasis in this case should probably be placed on diagnosis than on physical activity.

Factors in the Increase of the Diabetes Death Rate

The large increase in the diabetes death rate in the 25-year period for the experience as a whole, has taken place in the face of two important advances in the treatment of the disease, namely, undernutrition, introduced by Dr. F. M. Allen in 1914; and insulin, the general use of which began in 1922, a year after its isolation by Drs. Banting and Best. The benefits of these discoveries to the diabetic have been marked and unmistakable. It must be realized, therefore, that the increase in the death rate from the disease has occurred in spite of improved treatment. The causes of this rise in the *recorded* rate are to be found, first, in an *actual* increase in the crude and the standardized mortality due to the great changes that have taken and are taking place in the social milieu and, second, in an *apparent* increase arising out of the advance of medical science and in the growth of medical facilities, which have resulted in the more frequent diagnosis of the disease.

Population Changes

The most important factor in the increase of the crude death rate from diabetes is the change in the constitution of our population, which has resulted in the marked increase of certain groups in which the disease most frequently occurs. Chief among these

changes is the rapidly growing proportion of older persons, due in greatest measure to the decreasing birth rate and to the decline in mortality in the first half of life. Thus, in 1930, persons aged 45 and over constituted 22.8 percent of the population, but in 1910 only 18.9 percent, and in 1900 only 17.7 percent. Stated in another way, the population at these older ages more than doubled in the 30-year interval, while the total population grew by only 62 percent. Even greater has been the growth of the female population at ages 45 and over, whose numbers increased by 110 percent in 30 years.

Another feature of change in the population has been the shift from country to city. In the relatively short space of 30 years we have become an urban people. In 1930, 56 percent of our population lived in cities and towns; in 1900, only 40 percent. During these 30 years the population of our cities increased by more than 125 percent, but that of the rural areas by only 15 percent. It is interesting, moreover, to note that between the last two census years, 1920 and 1930, the only period for which the data are available, the farm population actually decreased slightly, while the nonfarm population in rural areas increased by nearly 20 percent. The urbanization of the population has likewise had a profound effect upon the diabetes death rates among Negroes. In the quarter century covered by this review, the Negro population of rural areas of the Southern States decreased by approximately half a million, while the urban communities throughout the country increased their colored populations by $2\frac{1}{2}$ millions. The wide difference between the urban and rural diabetes death rates was mentioned before.

There has been, too, a rapid growth of those foreign race stocks which are peculiarly susceptible to the disease. This applies particularly to Hebrews, whose high mortality from diabetes is well known. In the last 30 years the Jewish population in the United States has increased from slightly more than a million to more than four millions. And it is significant that these people are just now beginning to enter in great numbers into those ages where the mortality from diabetes is highest. This will be clear when it is realized that these immigrants were mostly young people whose coming dates from the 80's of the last century to the beginning of the war. It was heaviest at the end of this period. The facts on the mortality of other foreign race stocks in the United States are not available in detail, but the existing data

show high diabetes rates among persons of German, English, and Irish descent.

As a result of these developments, the population susceptible to diabetes has been growing rapidly. While all of these factors play some part in the increasing mortality of the population, and, to a lesser extent in that part represented by the Industrial policyholders, we have discounted the factors of age and sex by using "standardized" death rates, which virtually eliminate differences due to changes in the color, sex, and age composition of the population in the period under survey. Indeed, since diabetes is a disease of later life, we have really understated the problem, because the changes in the population are such as to increase greatly its importance. Thus, within the last 10 years alone the crude death rates from diabetes in the Registration States of 1920 have increased nearly 44 percent, while the adjusted rates have gone up only 27 percent.

The Growing Use of Machines; Higher Standards of Living; Overweight

This changing population has been subject to two great social forces which have a direct bearing upon the incidence of diabetes. The first of these is the rapid extension in the use of machines driven by mechanical power, in every type of work—in the field, in the factory, on the farm, in the office, and in the home. The result has been to make man more and more a tender of machines, and to reduce enormously the expenditure of his own energy in his work. Moreover, it is significant that the greatest use of machines is in the factories in cities and towns, which constitute the fastest growing part in our population. On the farm, too, the extent of this mechanization is by no means small and our rural areas have progressively taken on the aspect of our towns. The other great social force has been the long-time rise in the standard of living of our population. This is a result of the increase in real wages, which, during most of the period under survey, progressed at a rate unprecedented in the history of our own or any other country. Consequently, as a people we have been enabled to command both necessities and luxuries in abundance as never before. This change is significant in that it has favored overindulgence in food and drink, if not absolutely, at least relatively to the energy requirements of large numbers of people.

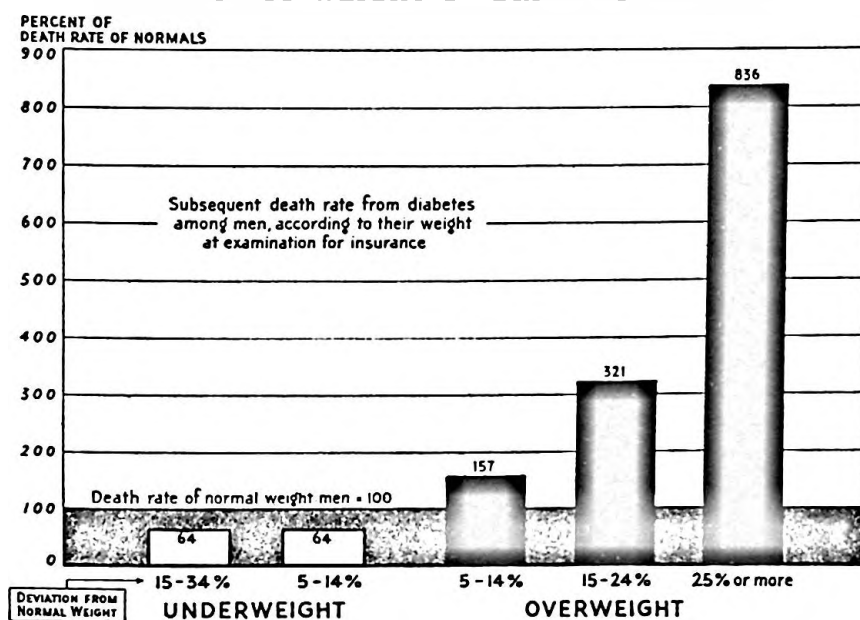
These outstanding changes bear directly on the diabetes problem because the disease takes its greatest toll among over-

weight persons. Analysis of insurance data shows that the subsequent diabetes death rate among healthy overweight men who were able to pass a Life insurance examination and were granted insurance, was $2\frac{1}{2}$ times that of average weight persons, and four times that of underweights. Moreover, as Chart V shows, the greater the degree of overweight the higher was the diabetes mortality. These findings are substantiated by clinical data. Among adult patients of Dr. Elliott P. Joslin, of Boston, the eminent authority, 78.5 percent of the men and 83.3 percent of the women were at least 5 percent above average weight at their maximum prior to diagnosis of diabetes. Indeed, 16.5 percent of the men and 25.8 percent of the women were frankly obese, *i.e.*, 40 percent or more above average weight.

Improved Diagnostic Technique

Advancements in medical science and practice also have favored the increase in the recorded cases and deaths from diabetes. For the definite diagnosis of diabetes, particularly in the early stages of the disease, is based on the findings of the biochemical laboratory. As a whole, the underlying laboratory technique is

CHART V
INFLUENCE OF WEIGHT ON DIABETES MORTALITY*



*Analysis by Metropolitan Life Insurance Company of Union Central Life Insurance Company records, 1887 to 1921.

relatively modern, and the methods which make possible a diagnosis that is both sure and quick are comparatively new. The essential elements of the diagnosis of the disease are the blood-sugar level and the established presence of sugar in the urine.

The method most frequently used in this country of estimating the blood-sugar level from a small specimen of blood was first evolved by Folin and has been in use since 1928. The methods in common use before that were more involved and the blood sugar was less frequently estimated than now. The methods of testing the urine for the presence of sugar are much older, but the quantitative method in use today was discovered in 1909. The laboratory diagnosis of diabetes was formerly made on the basis of the urine findings only, but methods of ruling out glycosuria that was merely transient by giving a measured amount of glucose came into general use only about 1920.

On account of the greater ease with which these modern procedures can be carried out, their use has expanded tremendously. Thus, in the medical examination of sick persons, analysis of the urine for sugar and, in suspicious cases, of the blood, has become much more common. The advancement of this practice has been favored by the increase in the number of laboratories in new and old hospitals and in the offices of medical practitioners. Moreover, as the years have passed, a new generation of physicians has come in which has been trained in these newer techniques and is imbued with enthusiasm for their value and use.

Medical Examinations and Diabetes Control

The early discovery of diabetes in many cases has resulted from the more frequent medical examination of supposedly healthy persons in which urinalyses and, less frequently, blood-sugar examinations are made. The growth of Life insurance has contributed most to this development, for one of the usual requirements for insurance is a fairly complete medical examination including a urinalysis and, in a few cases, a blood test. In recent years about 4,000,000 persons annually have applied for Life insurance requiring medical examination, and the number of persons insured under these policies is now about 30,000,000. In view of the preponderance of diabetes in females, it is significant that women have been applying for Life insurance in greater numbers than ever before, and the volume of their insurance has been growing faster than that of men.

Nor does the importance of Life insurance in the discovery of diabetes end here, for many insurance companies have extended to their policyholders the privilege of periodic examinations at the Company's expense, and these examinations too include a urinalysis and sometimes a blood-sugar estimation. That the discovery of diabetes as a result of insurance examinations is not infrequent is shown in the experience of Dr. Joslin, who reported that 12.6 percent of his male diabetic patients came to him following the finding of glycosuria on such examinations.

Many individuals have also formed the habit of being examined annually by their personal physician. Moreover, many large business organizations have adopted the practice of having their own or outside physicians give each of their employees an annual medical examination. The urinalyses which are usually a routine part of such examinations also add to the number of cases of diabetes discovered.

The discovery of insulin is itself an important factor in the recorded increase in the incidence of diabetes. The intense and widespread interest aroused by this important event in medicine gave a powerful impetus to the search for cases of the disease. Moreover, by prolonging the lives of diabetics insulin has increased the number of living cases.

Thus, not only has that portion of our population which is more susceptible to diabetes increased greatly—namely, older persons, particularly women, city dwellers, and certain foreign race stocks—and the conditions of life changed in such manner as to favor the development of the disease, but the probability of its being diagnosed has also greatly increased, especially in the early stages of the disease. It is not surprising, therefore, that the number of persons known to be suffering from diabetes has grown apace, and that the number of deaths charged to the disease has likewise grown.

Insulin and the Diabetes Death Rate

After the discovery of insulin the opinion prevailed generally that following its introduction on a wide scale the death rate from the disease would decline continuously. This view could only be based on the mistaken idea that insulin cures diabetes. This it does not do. It is simply a specific means of treatment, wonderfully effective and valuable, for a disease which is not yet curable by any known means, but which can be controlled in such excellent manner by present methods of treatment, of which insulin

is only one aspect, that in most cases the patient can lead a nearly normal life.

Thus, while insulin has been of enormous benefit to diabetics, it could not in its limited role as a specific means of treatment and not of cure, be expected to check the rise in diabetes mortality which is due primarily to the increasing incidence of the disease. The truth of this observation is proved by the statistical evidence presented below, which shows the improvement in the diabetes situation brought about by insulin.

Evidence of the Increased Longevity of Diabetics

The most striking proof of the value of insulin is its success in prolonging the lives of diabetic children. As we have seen, diabetes is essentially a disease of later life, and is relatively uncommon among children. When the disease does occur at the younger ages, however, it is most severe. Prior to the discovery of insulin, the disease in children terminated fatally within a short time. The hopeless situation of the diabetic child at that time is described most graphically by Dr. Joslin. "The parents of a diabetic child were panic-stricken and doctors brokenhearted when they learned a child had the disease. One of the most noted children's specialists in the United States wished he might never have another diabetic child to treat, so sad was it to see a child starve to death. The average duration of life of diabetic children was surely less than a year, and that of the largest group of diabetic children in the world under careful observation was less than two years. Undernutrition was the only way of prolonging life, and was permitted by the despairing parents simply for the hope set before them that someone would discover something which might save their child."¹ Now the death rate of diabetic children has fallen to a fraction of its former level.

Another impressive proof of the value of insulin is the decline in the mortality from diabetic coma. These deaths formerly predominated, but today are the exception, even in childhood where formerly coma was most dreaded. The improvement in this aspect of diabetes is clearly illustrated by the experience of Dr. Joslin. Twenty-five years ago, one out of every two deaths among his patients was due to coma, but in the past five years the proportion of such deaths has fallen to one in 16. This decline in coma is demonstrated also by three special investigations made

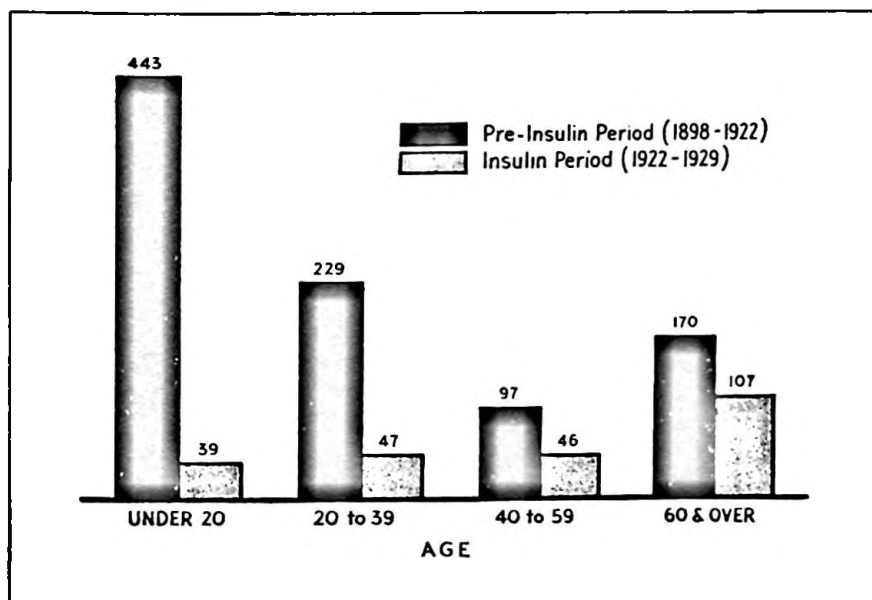
¹Joslin, Elliott P. *Diabetes: Its Control by the Individual and the State*. Harvard University Press. Cambridge. 1931. Page 24.

by the Metropolitan Life Insurance Company of the causes of death of diabetic policyholders in 1925, 1929, and 1935. Coma was reported as a terminal condition in 48 percent of these deaths in 1925; in 38 percent in 1929 but only in 28 percent of the deaths from diabetes in 1935.

Study of the causes of death among diabetics yields further evidence of the improvement brought about by insulin. In most cases today the diabetes is under control at death, and the patient succumbs to conditions which are characteristic of the later ages of life, when diabetes occurs most frequently. This is clear from the investigations of the Metropolitan Life Insurance Company. Thus, in 1935, 53 percent of 3,519 deceased diabetic policyholders, for whom the facts were known, died from degenerative conditions of the heart, kidneys, or arteries, 13 percent from infectious diseases, 4 percent from cancer, and 4 percent from tuberculosis.

Final and convincing proof of the benefit of insulin, however, is found in a study of the mortality in a diabetic population. This has been done for the patients treated by Dr. Joslin who have been traced from the date of first treatment to the anni-

CHART VI
DECLINE IN MORTALITY OF DIABETICS AS
THE RESULT OF MODERN TREATMENT
Death Rates per 1,000 Years of Life, By Age



Experience of Elliott P. Joslin, M.D., Boston, Mass.

versary of this date in 1929. Comparison of the mortality in the period prior to the discovery of insulin with that in the years following its introduction shows a definite and large improvement at every age. This is brought out in Chart VI, which gives the death rates per 1,000 years of life exposed, in four broad age groups. The decline is especially great at the younger ages, amounting to more than 90 percent at ages under 20, and to 80 percent between 20 and 39. It will be noted, moreover, that prior to the discovery of insulin the mortality rate among diabetics under 40 was greater than that among diabetics over 40. Today, the death rate among diabetics is lowest at the younger ages. Thus, in contrast to the increase in the death rate *from diabetes* the death rate *of diabetics* has definitely improved.

The Future Mortality from Diabetes

Consideration of the factors affecting the trend of diabetes mortality rates leads to the conclusion that the crude death rate from the disease may be expected to continue upward for a time, probably until a period of population stabilization sets in. This view should not be considered a pessimistic one. Altogether, the outlook is favorable. We know that the diabetic today lives longer than the one of pre-insulin years. Insulin has made it possible for the patient to continue his usual activities, a situation which is in sharp contrast with the severely restricted life of the diabetic in former days. Insulin has not only been a boon in the treatment of the disease, but it has also stimulated research in all phases of diabetes, which has resulted in improved knowledge of the disease and its management. Indeed, insulin itself has been the subject of continued and intense study. Its quality has been improved and its cost steadily reduced so that today it is within the reach of almost all diabetics. Furthermore, the search for a method of slowing its absorption has apparently been crowned with success in protamine insulin, which may introduce a new era in the treatment of the disease. Early diagnosis has likewise brought about an increase in the number of diabetics recognized, but the prognosis for the individual diabetic is now much better. If, despite these facts, a source of alarm is seen in the rising death rate from diabetes, reassurance may be gained from the presence in this country today of many hundreds of happy, active diabetic children, leading normal lives through the aid of insulin, whereas hardly more than a decade ago the diabetic child was doomed to death after a few months of miserable existence.

Diabetes as a Problem for Preventive Medicine

The present level of diabetes mortality, and the fact that even if this level does not rise more than 2 percent of the population will eventually acquire the disease, make it an important problem in the field of preventive medicine. To a far greater extent than cancer and heart disease, diabetes is amenable to definite methods of control by using our present knowledge of the development of the disease, its treatment, and its complications. The problem of the control of diabetes is twofold. The first and most important part is prevention of the disease. The other aspect is the prolongation of the life of diabetics.

The prevention of diabetes is largely a matter of education. The most likely candidate for diabetes is the stout person with a family history of the disease. These circumstances indicate the lines of attack on the disease. First, the public, and particularly those persons with a diabetic heredity, must be taught the dangers of those habits of life which are conducive to diabetes. The disease may also be attacked from the hereditary side. There is some evidence that the tendency to the disease is inherited as a recessive characteristic, transmitted in the usual Mendelian ratios. Persons with a family history of the disease, therefore, should be warned of the possible dangers to their offspring if they marry into families with the same predisposition.

Diabetics may be helped to overcome most of the handicaps of their disease. Improved methods of treatment and the use of insulin have already added years to the lives of diabetics, but much more may yet be accomplished. It is still necessary to guard against diabetic coma, formerly the most feared complication of the disease, and responsible for many unnecessary deaths even today. Patients and their families must be taught how coma may be avoided and, once it supervenes, what emergency measures must be taken until the doctor arrives. They should know, too, the necessity for adherence to the prescribed diet and the danger of permitting the patient to overeat and become fat. The diabetic patient must also be taught the importance of cleanliness and of carefully attending to even minor injuries, so that gangrene may be avoided. The value of exercise should be brought home to him. Finally, he must be impressed with the necessity of periodic visits to his physician for careful examination. Thus, adverse changes in his condition may be detected as early as possible and corrected.

An effective program against the disease, originally outlined by Dr. Joslin, embodies the establishment of clinical centers and visiting nursing services for diabetics in large cities. Already such programs have been inaugurated in whole or in part in several cities, notably in New York, Boston, and Cincinnati, and plans for similar programs are being considered in some other cities. The purpose of these centers is not only to make available expert medical care to patients in emergencies such as coma, gangrene, and the surgical and medical complications of the disease, but also to serve as a school for both patients and physicians. The nursing service, composed of specially trained nurses, should function by helping the individual patient in his particular problems of diet and care in the home, by seeing that the doctor's instructions are being carried out, and by urging patients to report to their physicians if they have not been seen by a physician for a long period of time. In many ways, the nurse can help both patient and physician to their mutual advantage.

These programs of prevention and organization of medical facilities will bring diabetes under some measure of control. The number of new cases may be reduced by directing public attention to the role of heredity and obesity in the development of the disease. On the other hand, the life of the diabetic may be prolonged by a well-rounded program to combat the disease. This program, in which physicians, public health workers, and patients can cooperate, will yield worth-while results in securing early diagnosis for the diabetic and in keeping him a useful and efficient citizen quite unlike that hopeless invalid—the diabetic of only two decades ago.

CHAPTER X

DISEASES OF THE PUERPERAL STATE

THE PUERPERAL STATE—TOTAL	345
PUERPERAL SEPTICEMIA	354
PUERPERAL ALBUMINURIA AND CONVULSIONS	357
OTHER DISEASES OF THE PUERPERAL STATE	359

DISEASES OF THE PUERPERAL STATE—TOTAL

During the 25 years covered by this report 55,141 women insured in the Industrial Department of the Metropolitan Life Insurance Company lost their lives from puerperal causes. In the same period in the general population of the United States there were some 375,000 deaths of women from these causes. Although the decline in the birth rate has reduced the annual number of puerperal deaths per 1,000 *population*, the maternal mortality per 1,000 *live births* was only slightly less at the end than at the beginning of the 25-year period. Whatever gains are shown, have occurred only very recently. Few of the important causes of death where control is possible through the application of modern science and improved medical practice have shown so little improvement.

The mortality data presented in this chapter on the basis of the Company's experience are necessarily limited in scope. The risk of childbearing is usually measured by the annual number of puerperal deaths per 1,000 live births,¹ but the denominator required to form this "case-fatality" is not available for our policyholders. We have a record only of the deaths, not of the total births, in this experience. We shall, therefore, depend in some instances on material derived from statistics of the general population, for the more complete discussion of this topic.

Diseases incidental to pregnancy and childbirth cause about one in every 60 deaths in our total experience (including deaths of males). Among women 15 to 44 years the ratio is one death in every 10, while between the ages of 20 and 34 the proportion is one out of eight. In this age group, only tuberculosis now outranks the puerperal diseases as a cause of death among women. The puerperal conditions in 1935 ranked ninth as a cause of death among females of ages 1 to 74 years, about the same position they held at the beginning of the period.

Mortality by Age and Color

Age The number of puerperal deaths at each age of life is the resultant of two factors—the frequency of births, and the case-fatality per birth. As already indicated, our insurance experi-

¹The ideal measure, of course, is obtained by relating the puerperal deaths to the number of pregnancies. But because the number of pregnant women in the United States is not known, official statistics express maternal mortality on the basis of live births.

ence cannot give us any data on case-fatality. But from vital statistics for the general population for the five-year period 1929 to 1933, we know that this case-fatality is relatively high for very young mothers, diminishes to a minimum in the age group 20 to 24, thereafter rises at first gradually and then very rapidly for mothers who give birth to a child towards the end of their reproductive period. These facts are clearly seen in the first panel of Chart I, which exhibits a typical U-shaped curve representing these relations.

From our insurance experience we can only obtain data regarding the resultant of the two factors indicated above. The corresponding facts are shown in Chart II, which naturally presents a totally different appearance, the curves in this case having the form of an inverted U. The maternal death rates, figured with respect to the population of female policyholders as a basis, are low in the earliest age group because there are relatively few births taking place at these age groups; the curve then rises to a maximum, which in our insurance experience is at ages 20 to 24 for

CHART I
DISEASES OF THE PUERPERAL STATE
Mortality by Age and Color, Computed on the Basis of Live Births
and on Female Population
United States (Exclusive of South Dakota and Texas) 1929 to 1933

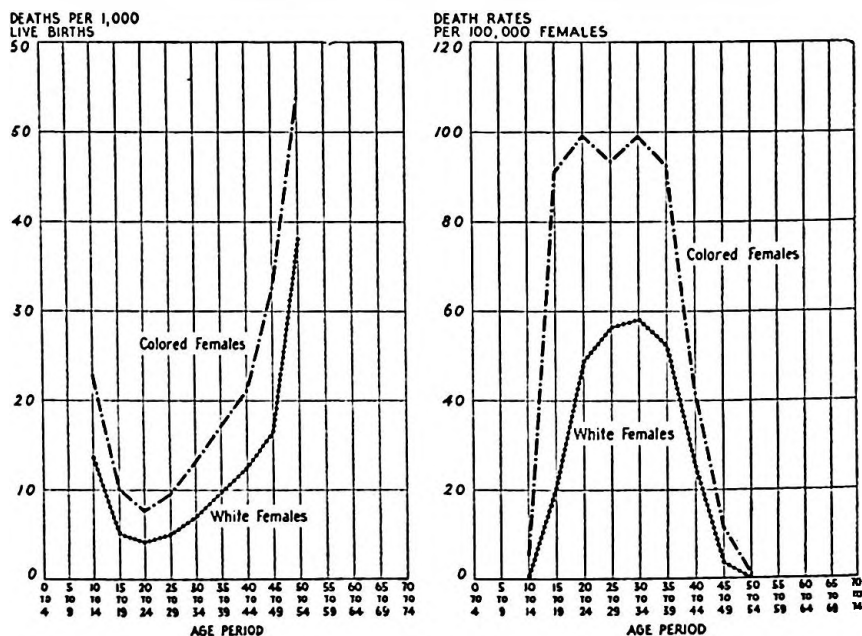
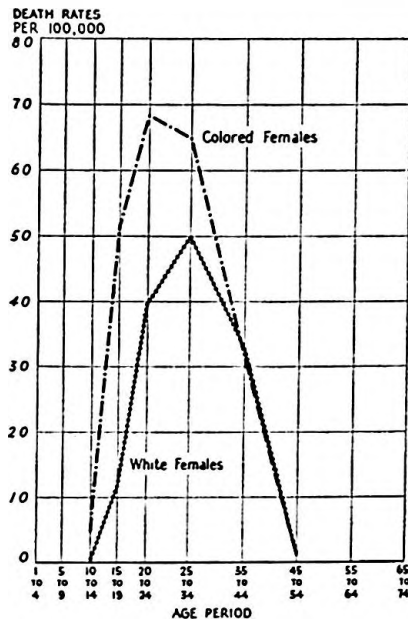


CHART II
DISEASES OF THE PUERPERAL STATE
Averages of Annual Death Rates per 100,000 Females
By Color and Age

Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935



colored women and at ages 25 to 34 for white women. In both cases the death rate then drops rapidly to zero at ages beyond 55 years. The curves relating to the general population (shown in the second panel of Chart I) resemble in general character those for our Industrial policyholders, with certain minor differences which will be noted presently.

Color Negro women register a higher maternal mortality than white women, whether calculations are on the basis of total women or of total births at each age period. In this urban insurance experience the puerperal death rate, per policyholder, was $1\frac{1}{2}$ times as great for colored females as for the white in the period 1931 to 1935. It is undoubtedly true that some of this excess in mortality is due to the higher birth rate among the colored, particularly at the younger childbearing ages. At 10 to 14 years the puerperal death rate among white females was 0.1 per 100,000, as compared with 4.6 among the colored; at ages 15 to 19 the corresponding rates were 11.7 and 51.5. At the later childbearing ages,

35 to 45, there is virtually no difference in the puerperal death rates by color, as is evident from Table 1. In the general population, which of course includes rural as well as urban areas, the mortality for Negro women runs ahead of that for the white at every age period without exception. Even when we take into account the relative frequency of childbearing among white and colored females, by computing rates per 1,000 live births, we find that relatively more colored females than white die as a result of puerperal conditions. The excess colored over white mortality per 1,000 live births runs from 70 to 100 percent.

A number of reasons have been advanced for the higher mortality among colored than white women. The colored group receives less prenatal care, has relatively poorer obstetrical attention in confinement, and suffers from a higher incidence of syphilis and rachitic pelvis with the resulting puerperal complications. Moreover, a maternal mortality considerably above normal attends illegitimate births, and these account for one seventh of all births among colored women, as compared with about 1/50 among the white. Obviously, the situation is more serious for the colored women, and preventive work is even more necessary for them than for white mothers.

TABLE 1
DISEASES OF THE PUERPERAL STATE
Averages of Annual Death Rates per 100,000 Females
By Color and Age

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000						PERCENTAGE COLORED OF WHITE RATE		
	WHITE FEMALES			COLORED FEMALES					
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
1 to 74*.....	29.3	17.8	34.5	38.5	27.7	43.5	131	156	126
15 to 44*.....	58.2	35.5	68.7	75.7	54.3	86.0	130	153	125
10 to 14.....	0.2	0.1	0.2	4.5	4.6	2.1	2,250	4,600	1,050
15 to 19.....	23.9	11.7	29.9	83.2	51.5	100.6	348	440	336
20 to 24.....	66.4	39.5	77.3	89.8	68.3	105.1	135	173	136
25 to 34.....	80.0	49.9	94.2	83.4	64.9	88.7	104	130	94
35 to 44.....	50.9	32.7	59.8	48.6	31.8	55.7	95	97	93
45 to 54.....	2.0	1.2	1.9	2.6	1.0	3.9	130	83	205

*Death rates standardized for age.

Trend of Mortality

The death rate from puerperal causes, as computed per 100,000 females, has declined considerably since 1911 among the insured, as can be seen from Chart III. The shorter series for the general population likewise shows a marked downward trend.

In the 25 years under review the standardized death rate among the insured, ages 15 to 44, declined approximately 50 percent from the first to the last quinquennium among white females, and 35 percent among colored females. In the period 1920 to 1934 for which comparable data are available for the general population, the decline from the first to the last five-year period was 43.6 and 34.1 percent, respectively, for white and colored females among the insured, as compared with 36.0 and 28.2 among the general population. Such figures for the relative improvement among the insured and among the general population are not, however, directly comparable. Factors such as differential birth rate, proportion of first births and of illegitimate births, proportion of urban women, etc., all affect mortality too much to be ignored, and accurate adjustment for them cannot be made. It is a fact, however, that today there are fewer deaths per 100,000 insured women than in 100,000 women of the general population, while the reverse was true 25 years ago.

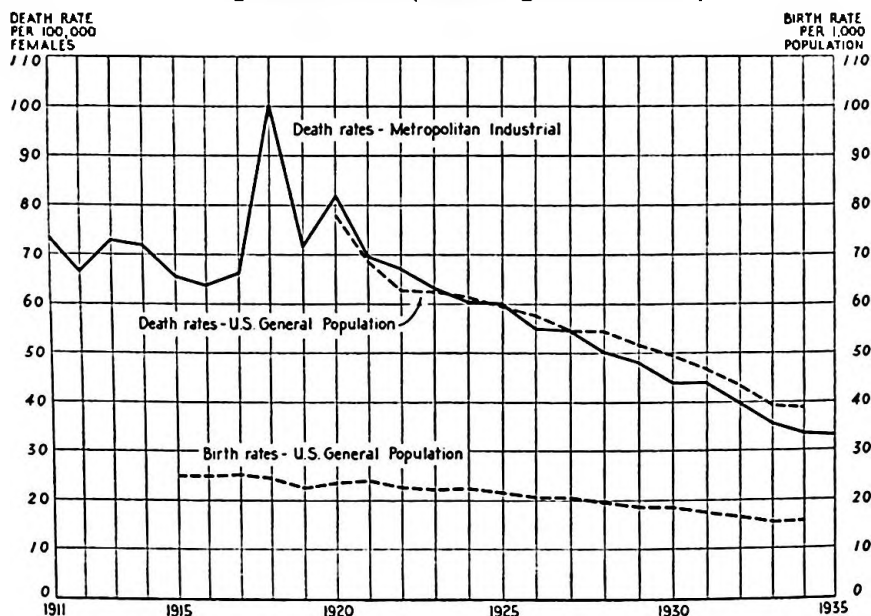
The decline in the puerperal death rate, when based on mortality per 100,000 females, does not directly reflect the changing hazards of childbirth, for the reason already indicated, namely, that there has been a marked decline in the birth rate. For light on this aspect of the matter we must necessarily turn to data for the general population, but even there we cannot go back further than 1915, when the Birth Registration Area was first organized. It was not completed until 1933.

The birth rate for the Original Birth Registration Area (exclusive of Rhode Island) has fallen almost continuously from 25.1 per 1,000 population in 1915, to 15.7 in 1934, as is shown in Chart III. In the expanding Birth Registration Area the rate fell slightly less—from 25.1 in 1915, to 17.1 in 1934. The decline in the birth rate in both the constant and the expanding area has not, however, been as steep as the decline in the maternal mortality based on persons exposed, suggesting the possibility of a real decrease in the hazard of maternity.² The mortality based on deaths per

²The downward trends of the birth rate and the puerperal death rate, on a percentage basis (so as to discount the difference in the levels of the two curves), are more nearly alike than is apparent from Chart III.

CHART III
PUERPERAL MORTALITY AND THE BIRTH RATE
Standardized Annual Death Rates per 100,000 Females
Ages 15 to 44 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935
 and U. S. Registration States of 1920
 Birth Rates per 1,000 Population in Original Birth
 Registration Area (Excluding Rhode Island)



1,000 live births does, in fact, show a slight downward trend for the period. Beginning with an average of 7.1 maternal deaths per 1,000 births in the years 1915 to 1919, the record shows an average of 6.9 from 1920 to 1924, of 6.7 from 1925 to 1929, and of 6.3 in the last five years, 1930 to 1934. Chart IV indicates that the higher rates in 1918 and the immediately following years, when influenza was prevalent, contributed largely to the high rates in the five years 1915 to 1919, and 1920 to 1924. The decline from the first to the last quinquennium of the period was 11 percent. In view of the fact that this figure is favorably colored by the effect of the influenza epidemic in the first quinquennium, it is not very impressive, especially when we consider that many deaths from this group of causes are essentially preventable.

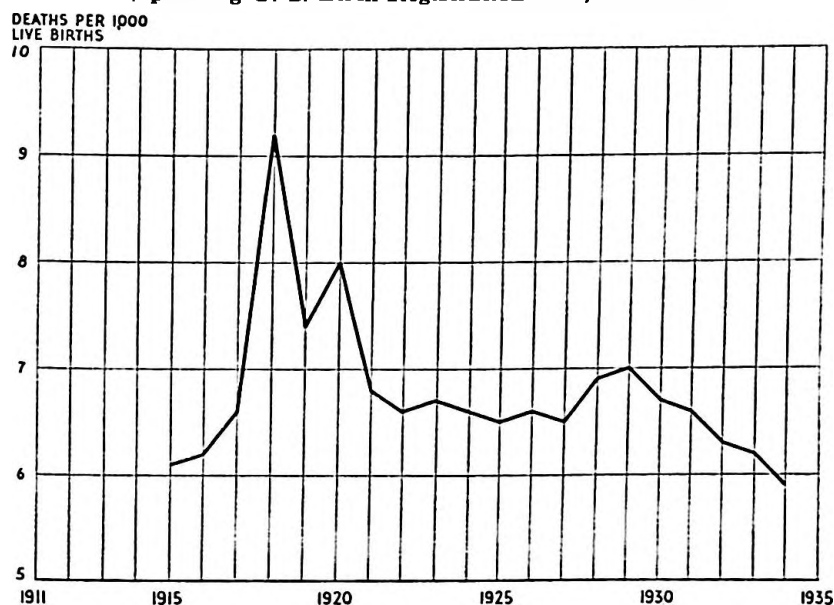
Possibly, however, the situation is more favorable than appears on the surface. It is difficult to arrive at a definite conclusion regarding this, for there are various conflicting factors bearing on

the situation. A change in the average age of mothers, in the proportion of primiparae, or in the frequency of abortions, may have obscured the evidence of what actually is an improvement in puerperal mortality. The exact adjustment for these various factors is not practicable, but we may seek to obtain at least some indication of the direction in which they may be expected to affect the observed mortalities.

The statistics published by the Bureau of the Census show that the proportion of first births has increased as the birth rate has declined. At the same time the proportion of births of high order has also decreased. Other studies³ show that the mortality of primiparae is considerably higher than that of women in their later confinements, up to the sixth. From the second confinement on the mortality rises, but it is only at the seventh or eighth birth that it again reaches the level of the first confinement. What exactly may be the resultant of the relative increase of the first births on the one hand and decrease of births of higher order on the other, it is difficult to say. Data available for the State of New York seem to show that the two effects largely counterbalance one

CHART IV
DISEASES OF THE PUERPERAL STATE
Deaths per 1,000 Live Births

Expanding U. S. Birth Registration Area, 1915 to 1934



³New York State Department of Health. 55th Annual Report, Vol. 2, 1934, page XLV.

another. Standardization of crude rates for change in composition as regards order of birth over the period of this report does not change the figures significantly. Mary Dublin⁴ came to the same conclusion in her work with Australian data.

The effect of abortion on the maternal mortality rate can be gauged only indirectly. The opinion is quite general, and is endorsed by good authority, that abortions are more common now than formerly, although accurate data to prove this are not available. Attempts to require registration of abortions have met with failure in the past and no doubt will continue to do so. It has been estimated, however, that from one to two out of every five pregnancies now terminate in abortion. Qualitatively their effect on puerperal mortality may be gauged from several excellent studies. It is found that the chances of infection after abortions are far greater than following delivery at term. In the maternal mortality study of the Children's Bureau,⁵ for example, 45 percent of all deaths assigned to puerperal septicemia were preceded by abortions. It appears extremely likely, therefore, that the increase in abortions, with their greater hazard, has masked some improvement which may have occurred in the mortality of mothers at term.

Taking into consideration the information available, it can be stated that maternal mortality is actually somewhat lower today than it was earlier in the century. The improvement, however, is at best slight and cannot, in any case, be considered adequate in the light of the advances made in medical science and practice during the same period. That thousands of American mothers are still needlessly being sacrificed each year is apparent from the fact that the puerperal death rate per 1,000 live births in this country is higher than that of most civilized nations and is virtually double that of Denmark, France, Italy, The Netherlands, Norway, or Sweden.

Causes of Puerperal Deaths

Table 2 sets forth the relative importance of the various items in the puerperal mortality picture of Metropolitan Industrial policyholders. Over the 25-year period as a whole, puerperal septicemia accounted for 38.5 percent of the deaths among women in the childbearing ages, puerperal albuminuria was responsible for 23.1 percent of the deaths, and all other puerperal causes combined comprised 38.4 percent of these female deaths.

⁴DUBLIN, MARY. "Maternal Mortality and the Decline of the Birth Rate." *The Annals of The American Academy of Political and Social Science*, November 1936.

⁵*Maternal Mortality in Fifteen States*. U. S. Department of Labor, Children's Bureau. Publication No. 223, p. 116.

TABLE 2
DISEASES OF THE PUERPERAL STATE
Number of Deaths and Death Rates per 100,000 Females
Ages 15 to 44 Years
 Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

CAUSE OF DEATH	NUMBER OF DEATHS	PERCENT OF DEATHS		DEATH RATE* PER 100,000
		All Causes	Puerperal State	
PUERPERAL STATE—TOTAL	54,581	9.8	100.0	59.7
Puerperal septicemia	21,031	3.8	38.5	23.0
Puerperal albuminuria and convulsions	12,604	2.3	23.1	14.1
Other diseases of the puerperal state	20,946	3.7	38.4	22.6

*Averages of annual death rates standardized for color and age.

PUERPERAL SEPTICEMIA⁶

Puerperal septicemia, the leading cause of puerperal deaths, is largely preventable. It is not caused by any abnormality of the ordinary processes of pregnancy, labor or puerperium, but is due, except in rare instances of autogenous infection, to the introduction of germs into the canal prior to or during labor. While it is a well-established fact that there are organisms of various kinds in the vagina and in the cervix of every pregnant woman, recent investigators are agreed that in the majority of puerperal infections the organism is introduced from without. The means of prevention has been available for many years. The continuance of high rates for puerperal septicemia is a reflection on all who are responsible for the health and welfare of women at this critical period of life.

During the 25 years under review, puerperal septicemia among women 15 to 44 years caused 21,031 deaths, or 38.5 percent, of the total charged to the puerperal state, and constituted 3.8 percent of all deaths among women of this age range insured in the Industrial Department of the Metropolitan Life Insurance Company. Only 191 septicemia deaths occurred outside of these ages.

Mortality by Age and Color

The average of the adjusted death rates from puerperal septicemia, ages 1 to 74, for the period 1911 to 1935 was 11.6 per 100,000 females. The age specific rates by color, and the ratio of colored to white deaths, are given in Table 3.

The age curves for puerperal septicemia among both white and colored are similar to those for the total puerperal state, although the proportion of maternal deaths charged to septicemia is not entirely constant, septic deaths being somewhat heavier at the early ages. This is no doubt due, in large part, to the greater proportion of primiparae in the early age groups, with their higher fatality rates from septicemia.

Septic deaths are more common among colored than among white women at every age—the excess being greatest among young women. At ages 15 to 19 the death rate from puerperal septicemia among colored women was five times that among the white; at ages 20 to 24 it was nearly twice; and at ages 25 to 44 it was about $1\frac{1}{3}$ times that among the white, in the period 1931 to 1935.

⁶Does not include puerperal tetanus. Deaths from puerperal tetanus are included under puerperal albuminuria for the entire 25-year period.

In considering these figures it must be noted that nearly one third of the births among colored women ages 15 to 19 are illegitimate, as against 1/14 among white women.

Trend of Mortality

Just as the total mortality from puerperal causes has declined, largely because of the decline in the birth rate, so the death rate from septicemia has decreased since 1911. The average of the adjusted death rates from this cause, ages 15 to 44, was 30.0 per 100,000 females for the years 1911 to 1915, or more than twice the figure for the years 1931 to 1935, which was 14.4 per 100,000. Despite the increased knowledge of asepsis and the increased skill in obstetrical practice in recent years, deaths from puerperal septicemia have continued to be responsible for approximately two fifths of all maternal mortality throughout the period under review.

As already remarked, maternal death rates referred to 1,000 live births cannot be computed on the basis of Life insurance statistics. But in the United States Birth Registration Area since 1920, the mortality rate for puerperal septicemia, based on live births, has remained almost constant, the average number of septic deaths for the last three quinquennia being 2.4, 2.5, and 2.5 per 1,000 live births.

TABLE 3
PUERPERAL SEPTICEMIA
Averages of Annual Death Rates per 100,000 Females
By Color and Age

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000						PERCENTAGE COLORED OF WHITE RATE		
	WHITE FEMALES			COLORED FEMALES					
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
1 to 74*.....	11.1	6.8	14.5	17.3	12.4	20.5	156	182	141
15 to 44*.....	22.0	13.5	28.9	34.0	24.3	40.7	155	180	141
10 to 14.....	0.1	0.1	0.0	2.1	2.5	1.1	2,100	2,500	†
15 to 19.....	10.2	5.2	13.8	39.3	26.9	50.0	385	517	362
20 to 24.....	27.7	17.9	35.1	43.7	33.2	53.1	158	185	151
25 to 34.....	30.7	19.1	41.5	36.8	27.6	41.5	120	145	100
35 to 44.....	15.7	9.5	19.9	18.4	11.0	22.3	117	116	112
45 to 54.....	0.6	0.3	0.5	1.0	0.1	0.9	167	33	180

*Death rates standardized for age. †Not computed.

Control of Puerperal Septicemia

There are actually two conditions involved in the control of puerperal deaths from septicemia. First is the elimination of septic deaths following abortion, and second, the control of septicemia in full-term deliveries. In induced abortions the responsibility is largely that of the patient. It is difficult to plan an effective attack against abortions because at present economic and social conditions are too deeply involved to make a solution of the problem simple.

In the cases arising from causes other than abortion, the responsibility is usually with the physician or midwife. These cases are often preventable. The New York Academy of Medicine Committee on Public Health Relations, in its study, *Maternal Mortality in New York City*, 1933, page 35, estimated that 75.1 percent of the fatalities were preventable, with the physician responsible 81.7 percent of the time, the patient 14.6 percent, and the midwife 3.7 percent. The committee says: "The large number of caesarean operations of the classical type performed on previously infected patients, undue prolongation of labors inevitably demanding operative termination, repeated internal examinations preceding operative deliveries, all contributed to the large preventable percentage in which the responsibility was judged to lie with the physician." Also, "...many of the preventable deaths for which the midwife was judged responsible were due to the fact that the particular midwife concerned had failed to maintain proper asepsis."

All workers in the field are agreed that the reduction of deaths from septicemia is one of the most practical and likewise most effective methods of reducing the present excessively high maternal mortality in the United States.

PUERPERAL ALBUMINURIA AND CONVULSIONS⁷

Among women 15 to 44 years of age insured in the Industrial Department of the Metropolitan Life Insurance Company, there were 12,604 deaths from puerperal albuminuria and convulsions in the 25-year period 1911 to 1935. This number is 23.1 percent of the deaths from all puerperal diseases combined. The standardized annual death rates from puerperal albuminuria and convulsions averaged 14.1 per 100,000 females at ages 15 to 44.

Mortality by Age and Color

The average age-specific rates for both white and colored females, for the period under study are shown in Table 4.

Age Deaths from albuminuria and convulsions in the period 1931 to 1935 were most common at ages 20 to 34 years among both white and colored women. The distribution of deaths by age is the result not only of the variation in the risk with age but also with gravidity. Primigravidae are more apt to develop a fatal case of toxemia than multigravidae. In the study made by the Children's Bureau⁸ it was found that "Puerperal albuminuria and convulsions caused 41 percent of the deaths of primiparae of less than 20 years, 37 percent of the deaths of primiparae between 20 and 25 years old, and 29 percent of the deaths of primiparae of 25 years or older.

"The proportion of the deaths of multiparae due to puerperal albuminuria and convulsions was about the same in the different age groups—19 or 20 percent—except in the age group 35 to 39 years, where it was 23 percent, and in the age group 40 to 44 years, where it was 28 percent." Approximately the same relationship has been found by other investigators.

Color The mortality among colored women is higher than that among white women. In recent years between ages 15 and 19 the death rate has been about three times as high for colored as for white, and at ages 20 to 24 more than 1½ times as high.

⁷Since 1930 the list of causes included under this designation has been slightly increased. Certain minor causes formerly charged to accidents of pregnancy are now included with toxemia. The change in procedure is slight and does not affect the results materially. Deaths from puerperal tetanus are included for the entire 25-year period.

⁸*Maternal Mortality in Fifteen States.* U. S. Department of Labor, Children's Bureau. Publication No. 223, page 150.

TABLE 4
PUERPERAL ALBUMINURIA AND CONVULSIONS
Averages of Annual Death Rates per 100,000 Females
By Color and Age

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000						PERCENTAGE COLORED OF WHITE RATE		
	WHITE FEMALES			COLORED FEMALES					
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
1 to 74*.....	6.9	3.6	9.1	9.1	5.6	10.6	132	156	116
15 to 44*.....	13.8	7.2	18.1	17.7	10.9	21.0	128	151	116
10 to 14.....	†	†	0.1	1.8	1.5	0.5	†	†	500
15 to 19.....	8.5	3.4	11.2	26.0	11.0	37.2	306	324	332
20 to 24.....	17.6	9.0	23.2	19.9	14.5	23.9	113	161	103
25 to 34.....	16.6	9.0	22.1	16.1	11.6	15.8	97	129	71
35 to 44.....	11.4	6.6	14.5	11.4	7.0	12.5	100	106	86
45 to 54.....	0.5	0.3	0.4	0.4	0.0	0.5	80	†	125

*Death rates standardized for age.

†Less than 0.05.

‡Not computed.

Trend of Mortality

The death rate from puerperal albuminuria has fallen almost continuously since 1911. The decline has been somewhat greater than for all puerperal causes combined. Since the disease is more frequently fatal in the early gravidae, even a small decrease in a period of falling birth rates is significant.

Prevention is the best method to control this condition. Alertness in detecting the first signs of albuminuria in pregnancy, combined with prompt treatment, should obviate three quarters of the deaths now arising from albuminuria. Against no other cause is good prenatal care so effective.

OTHER DISEASES OF THE PUERPERAL STATE

About two fifths of the maternal deaths are due to puerperal causes other than septicemia and albuminuria. The accidents of labor account for one seventh of all puerperal deaths, accidents of pregnancy and puerperal hemorrhage each for approximately 1/10, and puerperal phlegmasia alba dolens and embolus, for 1/25. The average annual rates, by color and age, for the combined group are shown in Table 5, for the first and last five-year periods as well as for the 25 years, 1911 to 1935.

Color and Age

When the death rates from the above causes are based on lives exposed they are low at ages 10 to 14, rise to a maximum between ages 25 and 34, and then fall abruptly to zero above age 54. That is, they follow rather closely the curve for the total puerperal causes. The mortality of the colored women, for all ages combined, in the period 1931 to 1935 exceeds that for white women by 31 percent. At the early childbearing ages, moreover, the mortality of the colored is far higher than that of the white women.

TABLE 5
OTHER DISEASES OF THE PUERPERAL STATE
Averages of Annual Death Rates per 100,000 Females
By Color and Age

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000						PERCENTAGE COLORED OF WHITE RATE		
	WHITE FEMALES			COLORED FEMALES					
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
1 to 74*.....	11.3	7.4	10.9	12.2	9.7	12.4	108	131	114
15 to 44*.....	22.4	14.7	21.6	24.0	19.1	24.4	107	130	113
10 to 14.....	0.1	†	0.2	0.6	0.7	0.4	600	†	200
15 to 19.....	5.3	3.0	4.9	17.9	13.6	13.5	338	453	276
20 to 24.....	21.1	12.6	19.0	26.1	20.6	28.2	124	163	148
25 to 34.....	32.6	21.8	30.7	30.5	25.7	31.5	94	118	103
35 to 44.....	23.9	16.6	25.4	18.9	13.8	21.0	79	83	83
45 to 54.....	0.9	0.6	1.0	1.2	0.8	2.4	133	133	240

*Death rates standardized for age.

†Less than 0.05.

‡Not computed.

Trend of Mortality

The adjusted mortality rates per 100,000 females, ages 15 to 44, from the causes classed together as "other diseases of the puerperal state" have declined 31 percent from the first to the last five-year period studied. This may be compared with the 47 percent decline recorded for the total puerperal state. The separate items in this title show varying amounts of improvement. The accidents of pregnancy decreased the most, or nearly as much as the total puerperal state; the puerperal hemorrhages and the accidents of labor declined about 20 percent, while puerperal phlegmasia alba dolens and embolus decreased only 16 percent during the 25 years. The residual group of other puerperal conditions, which has always been of minor importance, now accounts for only one death per million females of the childbearing ages.

On the whole, a larger proportion of the maternal deaths are due to the residual group "other diseases of the puerperal state" today than 25 years ago. In the first five-year period approximately 30 percent of maternal deaths were charged to a puerperal cause other than septicemia or albuminuria. In the last five years, 1931 to 1935, the percentage was approximately 40. An exception is noted in 1918 when accidents of pregnancy and labor were high because of the influenza epidemic.⁹ In that year 56 percent of the puerperal deaths fell in the classification "other diseases of the puerperal state." The increases, between the first and last five years of the period, in the percentages for the separate causes were as follows: phlegmasia alba dolens and embolus, 56 percent; puerperal hemorrhage, 51 percent; accidents of labor, 40 percent; and accidents of pregnancy, 3 percent.

Deaths due to phlegmasia alba dolens and embolus are fundamentally accidental. The increase in proportion of these deaths to the total probably reflects merely the decline in other causes rather than an increase in these deaths themselves. An increase in the proportion of deaths from hemorrhage calls for notice, as these deaths, like those due to accidents of labor, are almost entirely the result of a lack of skill on the part of the attendant. Of course, some cases of hemorrhage, due to placenta praevia, might have been avoided by treatment of the pregnancy toxemia. Likewise delay on the part of the patient in reporting for treatment may lead to disastrous results in spite of the most efficient care at the later stages.

In fatal accidents of labor the physician is frequently respon-

⁹See Chapter VI on Influenza and Pneumonia.

sible. In the words of the New York Academy of Medicine Committee on Public Health Relations,¹⁰ "Accidents of labor, embracing as they do all the types of operative shock, ruptured uterus, severe traumata to the birth canal, which result in death very soon after delivery, are almost all preventable. . . . Many of these cases represent instances of incompetence: repeated futile operative attempts; gross mishandling of delivery; inability to perform the operations without the infliction of severe and dangerous trauma to the birth canal; failure to recognize manifest obstructions; and allowing labor to continue until the patient's condition was so critical that any operative procedure would tax her strength beyond its limit."

The accidents of pregnancy have maintained approximately the same importance throughout the period under review, except for the period of the influenza epidemic of 1918-1919 when such deaths were unusually frequent. The residual group of "other puerperal conditions" has also remained fairly constant.

¹⁰*Maternal Mortality in New York City*. New York, 1933, page 36.



CHAPTER XI

MISCELLANEOUS DISEASES OF SPECIAL INTEREST

TYPHOID FEVER	365
ACUTE POLIOMYELITIS	369
SYPHILIS	371
ACUTE RHEUMATIC FEVER	375
EXOPHTHALMIC GOITER	377
PERNICIOUS ANEMIA	379
ULCER OF THE STOMACH AND DUODENUM	382
DIARRHEA AND ENTERITIS	386
APPENDICITIS	388
HERNIA	392
INTESTINAL OBSTRUCTION	394
CIRRHOSIS OF THE LIVER	397
BILIARY CALCULI	399

TYPHOID FEVER

For the quarter century from 1911 to 1935 deaths from typhoid and paratyphoid fever among Metropolitan Industrial policyholders, residing in the towns and cities of the United States and Canada, numbered 21,575;¹ the standardized annual death rates at ages 1 to 74 years averaged 7.5 per 100,000 persons. In the comparatively short span of 25 years, typhoid fever has dropped from a leading position among the causes of death to one of minor importance. It is a noteworthy fact that the death rate from this cause has declined more rapidly than that for any other disease. Among the insured the standardized death rate in 1935 was only 1.1 per 100,000, as compared with 22.1 in 1911. Chart I shows the rapid decline in mortality for these policyholders and for the general population of the United States. A remarkable reduction not only in premature deaths, but also in the number of cases of sickness and disability has followed the great advances made by the sciences of environmental sanitation during the past three decades. The installation of sewerage systems, the supervision of carriers, the inspection of food supplies, the examination of food handlers, antityphoid inoculation, the adoption of central water supplies, and, above all, filtration and chlorination, have been followed by a precipitate downward movement of the typhoid fever death rate over the whole country.

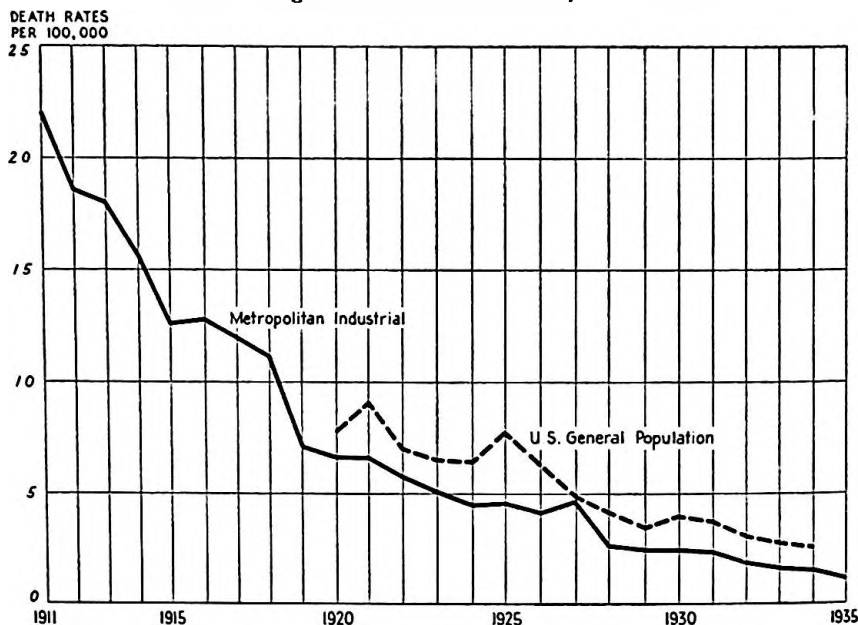
The rate of decline in mortality between 1911 to 1915 and 1931 to 1935 has been about equal for each of the four color and sex classes. Analyzed by age, the fall in the death rate likewise exhibits no marked differences. The figures appear in Table 1.

In each color and sex class the maximum mortality is recorded in adolescence and early adult life. The average death rate for ages 1 to 74 years combined is higher for males than for females. The differences by sex, however, are less marked among white persons than among the colored; the death rates for the 5-year period 1931 to 1935 among white persons were 1.6 per 100,000 for males and 1.2 for females; among the colored, 5.2 and 3.6, respectively. The higher average for males results from the higher death rates among them beginning with age 15, and continuing throughout life. In childhood, little difference exists in the mortality by sex.

¹Deaths from paratyphoid fever in this experience were not segregated prior to 1923. For the period 1923 to 1935 these deaths accounted for 2.5 percent of the total for typhoid and paratyphoid.

CHART I
TYPHOID AND PARATYPHOID FEVER
Standardized Annual Death Rates per 100,000
Total Persons. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935
 and U. S. Registration States of 1920, 1920 to 1934



The death rate from typhoid fever is considerably higher among colored policyholders than among the white. This reflects in part the fact that there is a greater concentration of colored policyholders than white in Southern areas. In the general population of the Southern States the typhoid fever death rate among the colored is from two to three times that for white persons.

There is danger that the brilliant victory over typhoid fever may lull us into a feeling of false security. The disease still exacts a heavy toll in certain areas. Contrary to the general impression, typhoid fever has been most common in recent years not in the rural regions but in those communities which may be considered to be neither strictly rural nor urban in character, namely, the larger villages and small towns with less than 10,000 population. Analysis of typhoid fever mortality data in the general population of the country shows clearly that these small incorporated places generally record higher average death rates from typhoid fever than do either the large cities or strictly rural

TABLE 1
TYPHOID AND PARATYPHOID FEVER
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000						PERCENT DECLINE 1931-1935 SINCE 1911-1915	
	MALES			FEMALES			Males	Females
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915		
WHITE								
1 to 74*	7.4	1.6	17.5	5.9	1.2	13.7	90.9	91.2
1 to 4	4.3	0.8	11.4	4.4	0.8	12.4	93.0	93.5
5 to 9	4.3	1.0	9.1	5.1	1.1	12.5	89.0	91.2
10 to 14	6.1	1.4	12.8	6.8	1.4	14.6	89.1	90.4
15 to 19	10.6	2.2	21.8	9.7	1.6	20.7	89.9	92.3
20 to 24	11.4	3.0	26.3	8.3	1.7	18.8	88.6	91.0
25 to 34	9.1	1.8	23.0	6.0	1.3	13.7	92.2	90.5
35 to 44	7.5	1.5	18.6	5.0	1.2	11.9	91.9	89.9
45 to 54	6.7	1.5	16.1	4.0	1.1	9.9	90.7	88.9
55 to 64	6.0	1.3	15.7	3.5	0.9	8.0	91.7	88.8
65 to 74	4.9	1.1	12.7	3.3	0.9	8.2	91.3	89.0
COLORED								
1 to 74*	17.5	5.2	38.5	16.2	3.6	37.5	86.5	90.4
1 to 4	14.1	3.1	32.5	13.1	2.6	34.3	90.5	92.4
5 to 9	18.3	3.5	45.4	20.8	4.5	47.7	92.3	90.6
10 to 14	21.2	5.7	36.8	27.3	6.1	61.6	84.5	90.1
15 to 19	30.4	10.7	62.1	27.8	5.5	61.0	82.8	91.0
20 to 24	22.0	8.9	50.3	18.8	3.8	39.9	82.3	90.5
25 to 34	13.1	5.3	30.3	12.4	2.6	30.4	82.5	91.4
35 to 44	11.7	2.5	26.3	9.2	2.8	23.1	90.5	87.9
45 to 54	13.6	3.6	30.8	8.7	2.1	20.9	88.3	90.0
55 to 64	14.1	3.4	30.2	9.3	3.5	21.2	88.7	83.5
65 to 74	20.6	6.4	51.7	10.6	0.0	21.8	87.6	100.0

*Standardized for age.

areas. During the three-year period 1930 to 1932, the typhoid fever rate in these small communities for the white population was 4.2 per 100,000, as against 3.6 for the rural regions, and 1.9 for the larger cities. Among the colored it was 17.5 per 100,000 in these small places, compared with 13.6 for the rural regions and 6.3 for the larger cities.

The problem of the future control of typhoid fever in this country lies chiefly in the small semiurban communities and also in the rural areas, especially among the colored population of such places in the Southern States. It is a hard fact that the death rate for typhoid fever among Negroes in these small communities is higher today than the figure for the general population at the beginning of the century. Many small cities and large villages still have to acquire adequate central water supplies or establish proper purification plants. Others need to install modern sewerage systems and sewage disposal plants. Moreover, inspection of milk and public food supplies and supervision of "carriers" will have to be more complete and effective. The dangers of a typhoid epidemic are always imminent in these places. It is also necessary for the population in these areas to build up specific resistance through antityphoid inoculation. With typhoid fever, as in so many other fields of public health, a financial investment for protection against disease can pay handsome dividends in life conservation.

ACUTE POLIOMYELITIS

The death rate from acute poliomyelitis is generally low, but at times the disease assumes serious epidemic proportions. An epidemic occurred during the year 1916 which far surpassed all others on record, both in extent and intensity.² Beginning in New York City, this epidemic spread over a large area, being gradually dissipated as the distance from the point of origin increased. Seven eighths of the deaths from the disease in the general population of the Death Registration Area of that year occurred within a zone comprising Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and Maryland.

During the 25-year period 1911 to 1935, 5,175 deaths of Metropolitan Industrial policyholders were certified as due to poliomyelitis, of which 1,245 occurred in 1916. In that year the death rate among Industrial policyholders at ages 1 to 74 mounted to the high point of 12.1 per 100,000. In more recent and far less serious outbreaks in 1921, 1927, and 1931, the death rate rose to 1.5, 1.7, and 2.5, respectively. Prior to the 1916 epidemic the average death rate from poliomyelitis was 1.5 per 100,000, but since that year it has been 1.0. The standardized death rates for the four color-sex groups in each year of this experience are presented in Appendix Table C.

Poliomyelitis is typically a disease of childhood, although deaths from the disease are to be found throughout life. The largest number of deaths occurs before age 5, and from this high mark the mortality declines rapidly with advancing age, becoming rare in middle adult life. The difference in mortality, however, between the youngest children and those of more advanced age is not so sharp today as it was during the earlier years of our study.

Poliomyelitis takes a consistently greater toll among boys than among girls. During the period 1931 to 1935, among white persons the death rate of boys was about 45 percent higher than that of girls.

The death rate for white persons exceeds that for the colored in this insurance experience. However, no great importance can be attached to this difference in the mortality among the white and the colored, since the total number of deaths among the latter in the experience covered by this study is relatively small. There is definite need for further investigation into the comparative

²"Epidemiologic Studies of Poliomyelitis in New York City and the Northeastern United States During the Year 1916." *Public Health Bulletin No. 91*, Washington, Government Printing Office, 1918, page 210.

mortality from poliomyelitis in the two races, in order to obtain a more complete knowledge of case incidence and case fatality rates according to sex, age, and geographic distribution.

The history of poliomyelitis has been one of sporadic outbursts, and while the death rate has shown no significant tendency toward either increase or decrease, the average is today somewhat lower than it was prior to the 1916 epidemic. Among policyholders under 5 years of age, there has been such marked improvement that the death rate today is only a fraction what it was prior to 1916. In contrast, higher death rates have been recorded in recent years than formerly in the ages between 5 and 24. These facts are evident from Table 2, which presents the mortality rates by color, sex, and age for the 25-year period as a whole (omitting 1916) and for the first and last five years of the series. Similar changes in the mortality rates from this disease have been observed also in the general population.

TABLE 2
ACUTE POLIOMYELITIS
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 24 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935†

AGE PERIOD YEARS	MALES			FEMALES		
	1911 to 1935†	1931 to 1935	1911 to 1915	1911 to 1935†	1931 to 1935	1911 to 1915
WHITE						
1 to 74*.....	1.3	1.3	1.7	1.0	0.9	1.3
1 to 4.....	6.2	5.2	9.5	5.5	3.5	9.3
5 to 9.....	2.7	3.5	2.2	2.1	2.2	2.2
10 to 14.....	1.5	1.9	0.9	1.1	1.6	0.7
15 to 19.....	0.9	1.1	0.8	0.4	0.5	0.4
20 to 24.....	0.4	0.5	0.4	0.4	0.6	0.3
COLORED						
1 to 74*.....	1.2	0.9	2.0	1.0	0.5	2.0
1 to 4.....	7.0	2.6	14.8	5.9	2.6	10.7
5 to 9.....	2.0	1.8	2.4	2.2	0.8	4.6
10 to 14.....	1.0	1.0	0.4	0.5	0.5	1.2
15 to 19.....	0.5	0.8	0.4	0.1	0.3	0.3
20 to 24.....	0.3	0.6	0.4	0.1	0.0	0.0

*Standardized for age.

†Omitting the epidemic year 1916.

SYPHILIS³

Syphilis, locomotor ataxia, and general paralysis of the insane, which etiologically form essentially a unit, were reported as the cause of 44,480 deaths among the Industrial policyholders of the Metropolitan Life Insurance Company during the 25 years of the present review. The standardized annual death rates from this group of diseases averaged 13.7 per 100,000 at ages 1 to 74 years. Because of the tendency of physicians to omit syphilis from the death certificate, the actual number of deaths from this cause is greatly in excess of the number recorded. Moreover, many deaths allocated to cerebral hemorrhage, arteriosclerosis, and heart disease are, in fact, largely of syphilitic origin. These facts notwithstanding, syphilis appears as the 11th cause of death in numerical importance in this insured group, and occupies about the same position in the mortality picture for the general population.

Syphilis is a major public health problem in the United States. In 1934 approximately 17,700 deaths in this country were attributed to syphilis and its allied diseases, a figure which does not begin to reveal the toll that these diseases exact. It has been estimated that about 7,000,000 persons in the United States have syphilis at any given time; that one out of every 10 adults will be affected by the disease at some time during his or her life; and that the annual number of new cases receiving medical care each year is about a half million. This is certainly a shocking toll of death and disability.

The ravages of syphilis are greatest among colored persons. Among Metropolitan Industrial policyholders the death rate from this disease in the period 1931 to 1935 was $4\frac{1}{2}$ times as high among colored men as among the white, and over six times as high among colored women as among white women. The preponderance of mortality from syphilis among the colored extends over the entire life span.

Men much more frequently than women are the victims of syphilis. Among white policyholders there are proportionately three times as many men as women killed by the disease; among the colored the death rate among males is twice that of the females.

³Included under this title are deaths reported as due to syphilis, locomotor ataxia, and general paralysis of the insane. In order to obtain comparable data over the 25-year period, it is necessary to consider these diseases together. Prior to 1925 deaths reported as due jointly to syphilis and locomotor ataxia or general paralysis of the insane, were allocated to syphilis; beginning with 1925 the procedure was reversed.

Except in the first year of life,⁴ the death rates from syphilis are highest in middle and later adult life, although the infection in most cases is acquired at a much earlier age. Among white males the death rate takes on significant proportions around age 30, and among white females about a decade later in life. For the colored, however, deaths from syphilis present a serious problem at the very threshold of adulthood. Among both men and women, and white and colored, the mortality from the disease increases progressively with advancing age, except at the highest age group considered in this experience. The average death rates from syphilis, locomotor ataxia, and general paralysis of the insane, as a group, by color, sex, and age for the 25-year period as a whole, and for the first and last quinquennia of that period, are shown in Table 3.

The record of the Industrial policyholders indicates that there has been a substantial decrease in the mortality from syphilis in the wage-earning population since the World War. For the entire insured group the trend of mortality from this cause has shown five distinct phases over our 25-year series. From 1911 to 1917 the recorded death rate rose steadily, probably, in part, as a result of the constantly increasing accuracy in the certification of causes of death. In 1918 and 1919, that is, during and immediately following the war, the wholesale physical examination of large numbers of young men, plus the intensive educational campaign against syphilis, combined to reduce the death rate to the level at the beginning of the series. Little change then occurred until 1923. From that year until 1930 a constant improvement was shown; and during the last five years of our time series, the death rate has remained at this new low level. The death rates from syphilis, locomotor ataxia, and general paralysis of the insane, for the individual years 1911 to 1935, are shown in Appendix Table C.

When the various color and sex groups are observed separately, however, it is found that the improvement is confined to white policyholders. Colored females recorded no significant tendency toward either an increase or a decrease in the mortality from this cause; but the situation among colored males has, in general, become more serious since 1919. The importance of syphilis as a health problem among colored persons, as indicated by our figures, is thoroughly substantiated by independent surveys which have been made from time to time in various parts of the country.

⁴No adequate data regarding the first year of life are available in this Industrial experience. Statistics for the general population show that syphilis takes its greatest toll in infancy.

TABLE 3
SYPHILIS, LOCOMOTOR ATAXIA, AND GENERAL
PARALYSIS OF THE INSANE

Averages of Annual Death Rates per 100,000

By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000						PERCENT CHANGE 1931-1935 SINCE 1911-1915	
	MALES			FEMALES			Males	Females
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915		

WHITE

1 to 74*	17.9	11.9	21.2	6.0	4.0	7.3	-43.9	-45.2
1 to 4	1.3	0.8	2.0	0.8	0.4	1.4	-60.0	-71.4
5 to 9	0.4	0.2	0.6	0.3	0.1	0.2	-66.7	-50.0
10 to 14	0.5	0.3	0.7	0.4	0.5	0.3	-57.1	+66.7
15 to 19	0.9	0.7	0.9	1.0	0.6	0.9	-22.2	-33.3
20 to 24	2.4	1.3	2.8	1.7	1.3	1.8	-53.6	-27.8
25 to 34	11.3	6.0	14.2	4.4	2.9	5.5	-57.7	-47.3
35 to 44	38.8	21.5	47.8	11.8	6.8	14.0	-55.0	-51.4
45 to 54	54.3	38.1	63.4	15.9	11.6	18.0	-39.9	-35.6
55 to 64	56.7	48.0	62.2	17.4	13.0	22.0	-22.8	-40.9
65 to 74	55.9	38.3	65.2	22.6	12.8	32.7	-41.3	-60.9

COLORED

1 to 74*	47.4	54.1	39.3	24.3	25.4	22.3	+37.7	+13.9
1 to 4	10.6	6.3	12.3	9.8	5.6	15.3	-48.8	-63.4
5 to 9	2.2	2.2	2.4	2.3	2.6	1.5	- 8.3	+73.3
10 to 14	2.8	2.8	3.1	2.5	1.7	1.9	- 9.7	-10.5
15 to 19	5.8	5.9	4.2	7.7	8.5	7.5	+40.5	+13.3
20 to 24	15.4	14.1	14.4	16.1	18.4	13.2	- 2.1	+39.4
25 to 34	42.3	47.3	39.0	27.0	28.4	23.5	+21.3	+20.9
35 to 44	95.8	109.0	74.0	46.9	53.8	37.5	+47.3	+43.5
45 to 54	124.7	155.6	95.5	50.9	54.4	46.5	+62.9	+17.0
55 to 64	132.6	154.5	111.3	52.5	57.5	49.9	+38.8	+15.2
65 to 74	132.1	147.4	113.9	57.3	42.6	65.3	+29.4	-34.8

*Standardized for age.

The favorable trend of mortality among white persons should lend encouragement to those public health agencies which are conducting a vigorous campaign against syphilis. The disease is almost wholly preventable and practically always curable if aggressively

treated in its early stages. The crux of the problem is to overcome the present tendency toward concealment, so that persons who have been exposed to the infection will promptly seek proper medical attention. The campaign to stamp out syphilis must be directed toward correcting the public attitude toward this disease; and its ultimate control must be based upon the widespread provision of facilities adequate for early diagnosis, and prompt and sustained treatment.

ACUTE RHEUMATIC FEVER

In the quarter century under review acute rheumatic fever was charged with 13,503 deaths among the Industrial policyholders of the Metropolitan Life Insurance Company. This total includes many deaths reported as due to "rheumatism," without further qualification, which, in accordance with general practice, were allocated to this title although many of them, particularly at the older ages, were, in fact, due to some form of chronic rheumatism. In order to exclude these deaths, the discussion of acute rheumatic fever in this study will be limited to the ages under 35 years.

The disease has been called, with ample justification, the most serious of the affections with a low death rate. It attacks large numbers of children and young people, and frequently burdens them with a prolonged period of disability and serious impairments which greatly curtail their expectation of life. A cardiac involvement is the most frequent sequel. Endocarditis occurs in a considerable number of cases, and the inflammation may initiate changes which ultimately lead to chronic valvular disease. Investigators report that a large majority of the cases of heart disease found in young people are due to acute rheumatism.

The mortality from this disease is at a maximum in the age range 5 to 14 years. Among white persons acute rheumatic fever attacks both sexes alike, but among the colored the disease is considerably more frequent among females than among males.

The mortality from acute rheumatism declined considerably in the 25 years of the present review. The figures appear in Table 4. Among white persons the death rates between the quinquennia 1911 to 1915 and 1931 to 1935 showed a marked decline at every age period. The least improvement was registered at 1 to 4 years, where the decline was 12.5 percent for white boys and 16.7 percent for white girls. Between the ages of 5 and 34 years the drop in mortality ranged from 37 to 57 percent. Colored persons exhibit a similar experience, the exceptions at some age periods being due undoubtedly to the fluctuations of the death rates resulting from the small number of deaths annually from this cause among colored policyholders.

Some authorities attribute the decline in the mortality from acute rheumatic fever, in part at least, to the marked progress in dental and oral hygiene, whereby focal infections are better cared

TABLE 4
ACUTE RHEUMATIC FEVER
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 34 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES			PERCENT CHANGE 1931-1935 SINCE 1911-1915	
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915	Males	Females
WHITE								
1 to 74*	3.9	2.4	6.3	3.9	2.4	6.1	— 61.9	— 60.7
1 to 4	2.6	2.8	3.2	2.1	2.0	2.4	— 12.5	— 16.7
5 to 9	5.3	3.8	8.5	5.6	4.2	8.7	— 55.3	— 51.7
10 to 14	5.2	3.5	6.5	6.1	4.0	9.4	— 46.2	— 57.4
15 to 19	4.0	2.4	5.6	3.9	2.3	5.1	— 57.1	— 54.9
20 to 24	2.8	2.0	3.5	2.9	2.4	3.8	— 42.9	— 36.8
25 to 34	2.4	1.9	3.4	2.6	1.8	3.9	— 44.1	— 53.8
COLORED								
1 to 74*	5.7	3.9	8.8	7.1	4.6	10.2	— 55.7	— 54.9
1 to 4	2.6	1.7	4.6	1.7	2.3	0.8	— 63.0	+187.5
5 to 9	4.2	3.4	6.7	5.7	6.6	6.6	— 49.3	0.0
10 to 14	5.5	6.4	5.8	6.2	4.7	8.4	+ 10.3	— 44.0
15 to 19	4.5	3.4	5.1	5.7	4.2	7.5	— 33.3	— 44.0
20 to 24	3.7	3.7	6.5	4.6	4.1	5.0	— 43.1	— 18.0
25 to 34	2.9	2.3	4.6	5.3	3.7	7.4	— 50.0	— 50.0

*Standardized for age.

for, or prevented entirely, and to the increased practice of tonsillectomy. Another factor has been the pasteurization of milk, decreasing the danger of epidemics of septic sore throat and other infections which are causative factors in acute rheumatism. Furthermore, physicians are now diagnosing the disease earlier in its course than formerly, with the result that treatment is more frequently begun before severe cardiac impairments have had an opportunity to develop. In this connection, it is significant that the death rate from heart disease among children and young adults has declined along with that from acute rheumatic fever.

EXOPHTHALMIC GOITER

In this experience of Metropolitan Industrial policyholders, from 1911 to 1935, there was a total of 8,402 deaths from exophthalmic goiter, practically $\frac{1}{4}$ of 1 percent of the deaths from all causes combined. During this period, the standardized annual death rates from this disease averaged 2.1 per 100,000 lives exposed at ages 1 to 74 years. Exophthalmic goiter is predominantly a disease of women, the mortality from this cause being seven times greater among females than among males in the quarter century as a whole. The death rates among both white and colored women become increasingly important with advancing age.

The mortality from exophthalmic goiter doubled between the first and the last quinquennium of the 25 years covered by this study. In the initial five-year period, 1911 to 1915, the standardized death rates averaged 1.3 per 100,000; in the final five-year period, 1931 to 1935, the corresponding figure was 2.5 per 100,000. The trend of mortality, however, was not consistently upward throughout the 25-year period. Among females at ages 1 to 74 there was a rather steady rise in the death rate from 1911, culminating in a maximum in 1926, after which the trend turned downward. Among colored females the point of maximum mortality was reached in 1931. The death rates for males, both white and colored, present essentially the same picture.

On the whole, the increases in mortality from the earlier to the later period become greater with advancing age; the few instances of decreases occurred at the younger ages of life, where this disease is relatively unimportant. Considered by color and sex, the percent increase in mortality from exophthalmic goiter was more pronounced among males than among females, and greater among the colored women than among the white women. Although the mortality in these two groups of females was identical at the beginning of the 25-year period, as the result of subsequent changes the death rate among the colored in the closing years of the period was appreciably higher than that among the white. Death rates by color, sex, and age for the periods 1911 to 1935, 1911 to 1915, and 1931 to 1935 are presented in Table 5.

It is difficult to explain the changes observed in the mortality rate from exophthalmic goiter. Although diagnostic methods have improved, better diagnosis, obviously, does not account for all the

TABLE 5
EXOPHTHALMIC GOITER

Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 15 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
WHITE						
1 to 74*	0.5	0.7	0.2	3.5	4.0	2.3
15 to 19	0.2	0.2	0.2	1.6	0.8	1.2
20 to 24	0.4	0.3	0.4	2.1	1.6	1.9
25 to 34	0.5	0.7	0.2	3.3	2.2	2.9
35 to 44	0.9	1.2	0.3	5.9	5.8	4.7
45 to 54	1.2	1.9	0.4	9.3	11.3	4.6
55 to 64	1.3	2.6	0.2	9.9	15.9	4.7
65 to 74	1.2	1.6	0.3	10.0	16.0	3.3
COLORED						
1 to 74*	0.5	0.8	0.3	3.7	5.1	2.3
15 to 19	0.1	0.3	0.0	1.5	1.3	1.4
20 to 24	0.3	1.3	0.0	2.3	3.3	1.9
25 to 34	0.5	0.5	0.4	3.8	4.2	2.9
35 to 44	1.0	1.1	0.0	7.6	11.2	4.0
45 to 54	1.4	2.6	0.7	8.4	9.9	5.1
55 to 64	1.6	1.6	2.4	8.7	16.1	6.6
65 to 74	1.2	0.9	0.0	10.5	16.1	1.4

*Standardized for age.

increase in the latest quinquennium of our time series, as compared with the earliest. It must also be taken into account that the peak in the death rate was reached in the middle of the last decade, and that since then, in spite of whatever improvement took place in diagnostic technique, the death rate has dropped—and dropped decidedly. The same phenomenon was observed in the mortality from exophthalmic goiter in the general population of the United States. More accurate methods of diagnosis have undoubtedly led to earlier recognition of the disease, with the result that those cases which require surgical intervention are operated upon with less surgical risk. Possibly the considerable decline in the death rate since the high point in 1926 reflects the results of these advances.

PERNICIOUS ANEMIA

Mortality rates for pernicious anemia are available only from 1921, when revision of the International List of Causes of Death first made it possible to segregate pernicious anemia deaths from those due to chlorosis and other anemias, with which it had been previously grouped. In the 15 years from 1921 to 1935 there were 6,223 deaths⁵ reported as due to pernicious anemia among the Industrial policyholders of the Metropolitan Life Insurance Company. The standardized annual death rates over the period averaged 2.7 per 100,000 persons in the age range 1 to 74 years.

The average death rates from pernicious anemia by age, sex, and color, among Industrial policyholders, for the 15-year period as a whole and for the initial and final quinquennia of that period, are presented in Table 6.

Pernicious anemia is essentially a disease of middle and late life. Under 25 years of age deaths from this disease average less than one per 100,000, but the mortality rises rapidly with each decade of life, and after age 65 it approaches a rate of 20 per 100,000 among white persons.

The death rate from pernicious anemia is higher among women than among men. During the period 1931 to 1935 the rate for white females was about 10 percent higher than that among white males; among the colored the rate for females was more than 27 percent higher than among males. The relative infrequency of this disease among Negroes is frequently mentioned in medical literature. Among the Industrial policyholders of the Metropolitan Life Insurance Company the mortality of white males exceeded by approximately 75 percent that of colored males in the recent quinquennium. The rate among white females was 50 percent higher than that among colored females.

The trend of the mortality from pernicious anemia has exhibited a decided change in the past 15 years. In 1921 and 1922 the death rate in this insurance experience was 3.2 per 100,000; in 1923 it rose to 3.3; the next year to 3.6; in 1925 to 3.9; and the maximum figure, 4.2, was reached in 1926, the year in which the successful use of liver in the treatment of pernicious anemia by Whipple, Minot, and Murphy began to be widely publicized. The extensive use of liver and liver extracts was immediately reflected in the

⁵Included in this total are some cases of aplastic anemia or primary anemia with a rapid or progressive course.

TABLE 6
PERNICIOUS ANEMIA

Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 25 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1921 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000						PERCENT CHANGE 1931-1935 SINCE 1921-1925	
	MALES			FEMALES			Males	Females
	1921 to 1935	1931 to 1935	1921 to 1925	1921 to 1935	1931 to 1935	1921 to 1925		

WHITE

1 to 74*	2.4	1.9	2.8	3.3	2.1	4.5	— 32.1	— 53.3
25 to 34	0.5	0.4	0.5	1.2	0.6	1.8	— 20.0	— 66.7
35 to 44	1.9	1.0	3.0	3.3	1.6	5.2	— 66.7	— 69.2
45 to 54	4.6	3.0	6.4	7.2	3.9	10.1	— 53.1	— 61.4
55 to 64	12.0	9.5	14.3	15.4	9.3	21.4	— 33.6	— 56.5
65 to 74	20.2	18.2	18.2	24.4	19.6	27.5	0.0	— 28.7

COLORED

1 to 74*	1.1	1.1	1.0	1.5	1.4	1.6	+ 10.0	— 12.5
25 to 34	0.5	0.4	1.0	0.9	0.9	1.0	— 60.0	— 10.0
35 to 44	0.8	0.4	0.7	2.0	2.1	2.2	— 42.9	— 4.5
45 to 54	2.5	2.1	3.1	3.5	2.4	4.4	— 32.3	— 45.5
55 to 64	4.7	5.6	2.7	4.0	4.8	3.5	+ 107.4	+ 37.1
65 to 74	7.9	11.5	2.7	5.5	6.4	6.0	+ 325.9	+ 6.7

*Standardized for age.

mortality records. The death rate dropped by 48 percent—from 4.2 per 100,000 in 1926, to 2.2 in 1929. This downward movement of the death rate was temporarily halted in 1930, 1931, and 1932, but was resumed in 1933, and has continued downward since then to the end of our present time series.

The decline in mortality between 1921 to 1925 and 1931 to 1935 was 32.1 percent for white males and 53.3 percent for white females. A decrease in death rate was registered at every age period, except 65 to 74, among white males; among white females a drop was evident throughout adult life, and at each age the decline was greater than for the corresponding group of males. In both sexes the percent decline decreased progressively with advancing age.

The annual number of deaths among the colored policyholders was too small to furnish a reliable index of trend.

As the result of notable advances in liver therapy, pernicious anemia patients, under skilled medical care, may now look forward to a close-to-average expectation of life and physical well-being. The mortality statistics show that the average age at death from this disease is now considerably higher than it was a decade ago.

ULCER OF THE STOMACH AND DUODENUM

The loss of life from ulcer of the stomach and ulcer of the duodenum is largely concentrated among men, who have, since 1920, shown a steady and marked rise in mortality from these causes. The picture presents contrasting trends: an increasing mortality among men, both white and colored, and a decreasing mortality among women, particularly among white women. In fact, the single gratifying finding derived from this study is the consistent downward trend in the mortality from ulcer of the stomach among white women. As far as we know, no satisfactory explanation has been offered as to the reason for these divergent trends. The increasing use of the fluoroscope and X-ray, and a more extensive experience in their use, as well as more frequent surgical intervention, have undoubtedly contributed to greater diagnostic precision and have undoubtedly resulted in the recognition of an increasing number of cases; but these developments make the steady decrease of gastric ulcers among women all the more puzzling.

Ulcer of the Stomach

During the 25 years from 1911 to 1935, ulcer of the stomach caused the death of 12,183 Metropolitan Industrial policyholders; the standardized annual death rates averaged 4.1 per 100,000 at ages 1 to 74 years. In the early years covered by this study, 1911 to 1915, the death rate from ulcer of the stomach averaged 4.5; and no tendency toward increase or decrease was evident until 1917. Between 1917 and 1920, however, the death rate dropped from 4.5 to 3.3 per 100,000, but since 1920, the rate has moved upward and reached 4.3 in 1935. Hence, the death rate in the latest year of the experience here reported, for all policyholders combined, is practically the same as it was in the early years of the series.

Whereas the improvement in mortality from ulcer of the stomach that occurred during the war and immediate postwar years was shared by all four color and sex groups, except possibly colored males, the increase in the frequency of deaths during the 15 years following has been confined to men. Among white male policyholders the death rate increased from 4.2 per 100,000 in 1920, to 7.2 in 1935; and among colored male policyholders a rate

of 5.6 for 1920 contrasts with 8.5 for 1935. On the other hand, the death rate dropped among white women from 2.3 in 1920 to 1.3 in 1935, and the death rate among colored females decreased in the same years from 4.2 to 3.4 per 100,000.

Analysis of the data by sex shows that during the last five years of this study the mortality among white men was almost five times as great as among white women; and colored men recorded a mortality twice as great as that for colored women.

Deaths from stomach ulcer become numerically important only after the age of 25 years among white men and 45 years among white women; among colored persons mortality from this cause becomes appreciable at about age 20. Among both white and colored, and in each sex, the death rate becomes progressively higher with

TABLE 7
ULCER OF THE STOMACH
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 20 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000						PERCENT CHANGE 1931-1935 SINCE 1911-1915	
	MALES			FEMALES			Males	Females
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915		
WHITE								
1 to 74*	5.8	6.8	5.5	2.2	1.4	3.2	+23.6	-56.3
20 to 24	1.7	1.0	1.8	1.1	0.6	1.6	-44.4	-62.5
25 to 34	4.4	4.1	4.5	1.7	0.9	3.0	- 8.9	-70.0
35 to 44	10.7	11.8	9.9	3.0	1.7	5.0	+19.2	-66.0
45 to 54	16.8	21.4	15.2	4.7	3.7	5.7	+40.8	-35.1
55 to 64	18.8	25.4	16.4	7.1	5.3	9.5	+54.9	-44.2
65 to 74	20.8	26.0	20.6	12.4	8.0	17.9	+26.2	-55.3
COLORED								
1 to 74*	6.5	7.4	6.3	4.7	3.6	6.0	+17.5	-40.0
20 to 24	3.0	2.8	2.4	3.3	2.7	3.6	+16.7	-25.0
25 to 34	5.0	5.4	5.5	4.1	2.9	6.2	- 1.8	-53.2
35 to 44	10.8	11.9	12.8	6.2	3.9	9.1	- 7.0	-57.1
45 to 54	15.9	20.3	10.5	9.7	6.8	10.3	+93.3	-34.0
55 to 64	22.6	26.1	17.3	15.0	14.0	14.0	+50.9	0.0
65 to 74	26.8	32.8	36.8	22.2	17.7	31.2	-10.9	-43.3

*Standardized for age.

advance in age. The average death rates for the 25-year period 1911 to 1935, and for the first and last quinquennia of that period, are presented in Table 7; standardized annual death rates by color, sex, and broad age periods are given in Appendix Table C.

Ulcer of the Duodenum

Deaths from duodenal ulcer are considerably less frequent than those reported for gastric ulcer, although the incidence of the former condition is a good deal more common than the latter. Among white males the ratio of duodenal to gastric ulcer deaths is as 1 to 2.2; and among colored males the ratio is even lower, 1 to 3.4, according to data for the five-year period 1931 to 1935. Duodenal ulcers are comparatively infrequent among women, both white and colored, the rates for recent years being 0.5 and 0.6, respectively.

TABLE 8
ULCER OF THE DUODENUM
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 20 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1921 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1921 to 1935	1931 to 1935	1921 to 1925	1921 to 1935	1931 to 1935	1921 to 1925
WHITE						
1 to 74*	2.6	3.1	1.9	0.5	0.5	0.5
20 to 24	0.7	0.8	0.5	0.2	0.2	0.2
25 to 34	2.4	2.8	1.9	0.4	0.2	0.5
35 to 44	5.1	5.5	4.5	0.9	0.9	1.0
45 to 54	7.0	8.5	4.9	1.3	1.2	1.2
55 to 64	7.9	10.9	4.4	1.8	1.9	1.8
65 to 74	7.6	9.9	5.8	1.6	2.1	1.4
COLORED						
1 to 74*	1.5	2.2	1.1	0.5	0.6	0.4
20 to 24	1.1	2.2	0.5	0.3	0.0	0.4
25 to 34	1.6	2.1	0.9	0.5	0.6	0.5
35 to 44	2.2	3.2	1.6	0.6	0.7	0.4
45 to 54	4.6	7.0	3.3	1.4	1.4	0.9
55 to 64	4.8	6.2	4.7	1.2	1.4	1.3
65 to 74	3.3	5.3	2.6	1.9	4.1	1.0

*Standardized for age.

Our figures for ulcer of the duodenum date from 1921, because prior to the 1920 revision of the International List of Causes of Death, deaths from ulcer of the duodenum were included, without segregation, with those from diarrhea and enteritis. Ulcer of the duodenum accounted for a total of 2,940 deaths among Metropolitan Industrial policyholders, ages 1 to 74 years, in the period 1921 to 1935; the standardized annual death rates in this period averaged 1.5 per 100,000. During the 15 years of this series there has been, as with ulcer of the stomach, a considerable increase in mortality among the male policyholders, both white and colored. In contrast with the findings for gastric ulcer, deaths from duodenal ulcer appear to be about half again as frequent among white as among colored males; but there is practically no difference between the mortality rates of white and colored females.

Ulcer of the duodenum, like ulcer of the stomach, exhibits a higher mortality among men than among women. The age distribution of deaths is also much the same for both diseases, showing relative infrequency in youth, and becoming much more prominent as age increases. The average death rates for the five-year periods 1921 to 1925, 1931 to 1935, and for the 15-year period 1921 to 1935, are shown in Table 8; the standardized annual rates appear in Appendix Table C.

DIARRHEA AND ENTERITIS

In the quarter century from 1911 to 1935 there were 43,354 deaths⁶ reported as due to diarrhea and enteritis among the Industrial policyholders of the Metropolitan Life Insurance Company. The standardized annual death rates at ages 1 to 74 combined averaged 14.6 per 100,000 over the 25-year period. In 1911 the death rate was 28.7 per 100,000; by 1935 it had fallen to 3.4.

Deaths from diarrhea and enteritis are heavily concentrated among infants under 1 year of age, a group not included within the scope of this volume. In the general population of the United States almost three fifths of the deaths from diarrhea and enteritis occur among infants under one. In this insurance experience the death rates show a maximum in early childhood, decline sharply to a minimum point at adolescence, and then increase with advancing age.

In the recent quinquennium, 1931 to 1935, the death rate for colored persons was about double that for the white. Moreover, an excess of colored over white mortality was registered at virtually every age period. The sex differences in mortality are not marked. Among white persons at 1 to 74 years the death rate among males in the recent five-year period was 4.7 per 100,000, as compared with 4.0 for white females; among the colored the death rate for males was 8.6, and for females 9.2.

There has been a rapid downward sweep of the death rate from diarrhea and enteritis in the 25-year period under survey. Among white policyholders at ages 1 to 74 combined the decline was 82.3 percent for males and 84.4 percent for females, between the periods 1911 to 1915 and 1931 to 1935. It is apparent from Table 9 that a somewhat less rapid decline was registered for colored persons. At no age period, either among white or colored, males or females, was the percent decline between the first and last quinquennia less than 41 percent, and it extended up to 90 percent. The downward trend from diarrhea and enteritis marks a triumph for the public health movement. It reflects the advances in sanitary science and the generally rising standard of living over the quarter century. Other factors of importance have been the pasteurization of milk, better refrigeration of foods, and the purification of water supplies.

⁶In accordance with general practice, deaths from ulcer of the duodenum were allocated, without segregation, to the title Diarrhea and Enteritis in the period 1911 to 1920. The inclusion of these deaths does not, however, materially affect the comparability of the death rates from diarrhea and enteritis over the 25-year period.

TABLE 9
DIARRHEA AND ENTERITIS

Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000						PERCENT DECLINE 1931-1935 SINCE 1911-1915	
	MALES			FEMALES			Males	Females
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915		
WHITE								
1 to 74*	14.5	4.7	26.5	13.4	4.0	25.7	82.3	84.4
1 to 4	109.6	30.8	199.3	98.1	26.9	183.5	84.5	85.3
5 to 9	5.0	2.0	8.1	4.9	2.1	8.4	75.3	75.0
10 to 14	1.2	0.7	2.1	1.1	0.5	1.9	66.7	73.7
15 to 19	0.8	0.6	1.2	1.0	0.6	1.5	50.0	60.0
20 to 24	1.2	1.0	1.7	1.6	1.0	3.0	41.2	66.7
25 to 34	2.2	1.0	4.3	2.0	1.0	3.5	76.7	71.4
35 to 44	4.2	1.9	8.1	3.1	1.2	6.4	76.5	81.2
45 to 54	5.7	2.7	10.7	4.8	2.0	8.7	74.8	77.0
55 to 64	12.7	5.5	25.6	12.2	4.0	26.1	78.5	84.7
65 to 74	32.5	11.0	65.5	40.8	9.2	92.5	83.2	90.1
COLORED								
1 to 74*	21.9	8.6	39.2	23.0	9.2	39.6	78.1	76.8
1 to 4	159.5	49.9	291.3	139.1	46.5	238.7	82.9	80.5
5 to 9	7.8	3.6	10.1	8.2	2.8	16.8	64.4	83.3
10 to 14	2.4	1.0	3.0	3.2	2.2	6.4	66.7	65.6
15 to 19	3.5	1.8	6.9	4.1	1.8	4.7	73.9	61.7
20 to 24	1.9	0.9	4.1	3.8	2.3	6.1	78.0	62.3
25 to 34	3.5	2.2	6.1	6.0	2.9	9.0	63.9	67.8
35 to 44	5.7	3.3	10.8	10.0	5.3	15.3	69.4	65.4
45 to 54	9.5	6.6	15.4	15.1	7.2	26.7	57.1	73.0
55 to 64	25.5	11.8	46.2	32.3	15.8	58.3	74.5	72.9
65 to 74	46.9	28.7	84.5	67.5	31.3	123.1	66.0	74.6

*Standardized for age.

APPENDICITIS

Among Metropolitan Industrial policyholders appendicitis as a cause of death is numerically the most important of the acute intestinal conditions, and ranks high among the diseases or conditions usually treated by surgery. In the 25 years from 1911 to 1935 there were 45,337 deaths from appendicitis among these policyholders at ages 1 to 74 years; the standardized annual death rates for the quarter of a century averaged 12.9 per 100,000. This disease accounted for 1.4 percent of the total mortality in the 25-year period, and at the end of the period covered it was the ninth cause in the order of the number of deaths.

The distribution of the death rate according to age, sex, and color for the entire 25-year period, and separately for the years 1911 to 1915 and 1931 to 1935, is shown in Table 10. The feature of particular interest in these figures is that there has been a distinct change in the contour of the curve of age distribution in the course of the period under review. At the beginning the highest rates were observed in the teens, and the rates fell off at the higher ages. In the last quinquennium the rates in the teens are exceeded by those at the advanced ages.

Not only is the mortality from appendicitis, in general, higher among males than among females, but owing to the differential trends of the death rates by sex, to be discussed presently, the disparity has increased markedly in the period covered by this report. In 1911 to 1915 the death rate of white males for ages 1 to 74 combined exceeded that of white females by 28 percent; in 1931 to 1935 the excess was 45 percent.

The death rates from appendicitis between 1911 and 1919 ranged around 11 or 12 per 100,000, and then rose to a somewhat higher level; from 1921 to 1931 the mortality ran about 13 or 14 per 100,000. The closing years of the 25-year series showed a consistently falling death rate. The appendicitis mortality in the last five-year period was, nevertheless, 15 percent above that for the initial quinquennium of the period under review. Analyzing the data by color and sex, at ages 1 to 74, it is found that the largest percent increase between these quinquennia, 20 percent, was registered among white males. The smallest percent increase, 6 percent, occurred among white females. A rise of nearly 20 percent in the death rate appears also for colored persons. The stand-

TABLE 10
APPENDICITIS

Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000						PERCENT CHANGE 1931-1935 SINCE 1911-1915	
	MALES			FEMALES			Males	Females
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915		

WHITE

1 to 74*	14.8	15.5	12.9	10.9	10.7	10.1	+ 20.2	+ 5.9
1 to 4	9.0	12.7	5.0	7.4	10.7	4.8	+154.0	+122.9
5 to 9	11.7	11.5	11.0	10.8	11.1	10.0	+ 4.5	+ 11.0
10 to 14	14.8	14.0	15.4	11.2	9.1	12.6	— 9.1	— 27.8
15 to 19	17.0	15.3	17.7	11.7	9.2	12.5	— 13.6	— 26.4
20 to 24	15.5	13.6	14.8	9.8	7.2	10.3	— 8.1	— 30.1
25 to 34	14.3	13.6	13.6	9.9	8.3	10.7	0.0	— 22.4
35 to 44	15.4	16.5	12.5	10.5	9.9	8.7	+ 32.0	+ 13.8
45 to 54	17.8	20.6	11.7	13.3	14.5	11.3	+ 76.1	+ 28.3
55 to 64	18.5	22.2	12.7	14.1	18.6	9.6	+ 74.8	+ 93.8
65 to 74	18.5	27.1	13.9	13.8	19.0	10.2	+ 95.0	+ 86.3

COLORED

1 to 74*	15.3	16.1	13.6	13.8	13.3	11.1	+ 18.4	+ 19.8
1 to 4	4.7	3.8	5.4	4.3	4.3	0.8	— 29.6	+437.5
5 to 9	11.7	11.5	9.4	9.8	9.5	6.2	+ 22.3	+ 53.2
10 to 14	16.1	15.7	16.6	12.5	13.1	8.7	— 5.4	+ 50.6
15 to 19	18.4	17.2	20.0	18.2	16.3	18.8	— 14.0	— 13.3
20 to 24	16.0	15.7	14.5	16.1	12.7	15.7	+ 8.3	— 19.1
25 to 34	15.4	16.3	12.8	17.5	15.6	13.4	+ 27.3	+ 16.4
35 to 44	17.7	21.7	14.4	17.2	14.6	14.8	+ 50.7	— 1.4
45 to 54	18.7	20.8	16.2	13.2	15.9	9.9	+ 28.4	+ 60.6
55 to 64	18.9	24.7	13.5	12.4	14.3	8.5	+ 83.0	+ 68.2
65 to 74	17.3	14.1	12.3	10.7	18.8	7.3	+ 14.6	+157.5

*Standardized for age.

ardized annual death rates by color and sex at ages 1 to 74, are shown in Appendix Table C.

The increase in the recorded mortality among white persons occurred largely among children and among adults at ages 35 years and over. The death rates for white children at ages 1 to 4 in the

period 1931 to 1935 were considerably more than twice those in 1911 to 1915. It is apparent from Table 10 that in adolescence and early adult life, however, the rates show a decrease, more especially among females. The decrease in the death rate for white males ranged between 8 and 14 percent, depending upon age; for white females the decline was as much as 22 to 30 percent. At ages 35 and beyond the appendicitis death rate has increased markedly, and it is generally true that the older the age, the greater the rise in the mortality.

We are inclined to the belief that a large part of the recorded increase in the mortality among children may be merely an indication of greater precision of diagnosis, with a consequent rise in the number of deaths ascribed to appendicitis. The high incidence formerly of diarrhea and enteritis suggests that food infections of the kind prevailing years ago may have frequently obscured the diagnosis of acute appendicitis in children.

Much of the decrease among adolescents and young adults represents a true improvement in mortality and serves as an index of the greater knowledge of the pathology of the disease, of increased hospital facilities, and improved surgical technique. Certainly there have been immense advances in surgical technique since 1911. There has been also a wider appreciation on the part of general practitioners of the importance of early diagnosis and of the virtually riskless operations in uncomplicated cases, with an increased willingness of patients, particularly women, to consult physicians and to follow their advice. These factors have tended to lower the mortality in certain age groups.

We believe that, as among the young children, the increases recorded at the adult ages are more apparent than real and are due, in large part, to greater precision in reporting appendicitis when present with other concurrent conditions as, for example, intestinal obstruction, biliary calculi, and diseases of the liver. In accordance with accepted statistical practice, appendicitis takes priority over most abdominal conditions in the assignment of causes of death. It must be evident, therefore, that any improvement in the reporting of causes of death will bring out statements of appendicitis on an increasing number of death certificates.

The case fatality of acute appendicitis is usually very low in cases treated before complications set in; if treatment is delayed, the risk of death rises rapidly. In cases which have progressed to acute diffuse peritonitis, the chances of recovery are greatly diminished. Appendicitis is of sufficient importance to warrant

a national program for a reduction of the number of cases reaching the surgeons at the stage of diffuse peritonitis. In certain cities, notably Philadelphia, well-considered plans for the reduction of mortality in acute appendicitis already have been instituted. The public is being informed of the dangers of delay in seeking medical advice and of the danger of using laxatives in the presence of abdominal pain. For the greater success of this program, it is important that the campaign of education be continuous and adopted by health authorities throughout the United States.

HERNIA

From 1911 to 1935 the total number of deaths due to hernia among the Industrial policyholders of the Metropolitan Life Insurance Company was 12,728; the standardized annual death rates at ages 1 to 74 years averaged 4.2 per 100,000 lives exposed.

Mortality rates from hernia are fairly high after age 45, and are at a maximum among elderly people. Before age 35 the death rate is negligible, except among colored men. From 35 upward the mortality incidence increases sharply in all four color and sex groups. The average death rate among colored males was 40 percent higher than that among white males in the period 1931 to 1935. On the other hand, the death rate of colored females was lower by 28 percent than that of white female policyholders.

Death from hernia is generally more frequent among males than among females. Among white persons, however, the sex difference is small, while among the colored the contrast is strikingly great. The difference amounted to 11 percent among white policyholders during 1931 to 1935, but among the colored the mortality rate of males was more than twice that of females. The average death rates by age, sex, and color for the 25-year period as a whole, and for the first and last five years of that period, are presented in Table 11.

Over the entire 25 years of this study the annual death rate from hernia has fluctuated within the narrow range of from 3.5 to 5.2 per 100,000. The general trend, however, has been downward. The greatest improvement in the death rate from this cause took place among white persons; the mortality rate during the five years 1931 to 1935 for white females was 3.6 per 100,000 as against 5.0 during the years 1911 to 1915; the corresponding figures for white males were 4.0 and 4.5. The colored male and female groups each recorded a smaller decrease. Among colored policyholders there have actually been increases at some of the higher age levels.

The fluctuation of the death rate from hernia seems to show some correlation with the cycles of industrial activity. During 1917 and 1918, years of increased activity and heavy physical work in manufacturing plants, there was a noticeable increase in the mortality from hernia among working people. The standardized annual death rates from the disease, by sex and color, appear in Appendix Table C.

TABLE 11

HERNIA

Averages of Annual Death Rates per 100,000

By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
WHITE						
1 to 74*.....	4.3	4.0	4.5	4.2	3.6	5.0
1 to 4.....	0.8	0.6	1.3	0.2	0.1	0.2
5 to 9.....	0.2	0.1	0.4	0.1	†	0.0
10 to 14.....	0.1	0.1	0.3	†	†	†
15 to 19.....	0.3	0.2	0.3	0.1	0.1	0.1
20 to 24.....	0.7	0.4	1.0	0.2	0.2	0.2
25 to 34.....	1.2	1.2	1.3	0.7	0.6	0.9
35 to 44.....	3.1	2.8	3.9	3.2	2.6	4.4
45 to 54.....	8.0	8.4	8.6	10.1	8.1	13.5
55 to 64.....	20.1	19.7	20.8	22.0	18.7	25.3
65 to 74.....	42.1	37.8	39.3	37.9	34.9	42.0
COLORED						
1 to 74*.....	5.4	5.6	6.0	2.5	2.6	2.8
1 to 4.....	2.5	1.4	3.9	0.6	0.9	0.8
5 to 9.....	0.4	0.5	0.8	0.1	0.0	0.0
10 to 14.....	0.3	0.8	0.0	0.1	0.2	0.4
15 to 19.....	0.8	0.8	1.6	0.3	0.3	0.4
20 to 24.....	2.1	1.7	2.8	0.4	0.5	1.0
25 to 34.....	2.7	3.4	4.6	0.9	0.6	1.2
35 to 44.....	4.9	6.2	2.9	3.5	3.2	4.7
45 to 54.....	9.9	11.2	8.1	6.6	6.0	9.8
55 to 64.....	21.9	22.0	28.2	10.1	9.0	8.3
65 to 74.....	41.9	37.4	40.6	16.0	22.4	10.0

†Less than 0.05.

*Standardized for age.

INTESTINAL OBSTRUCTION

During the 14 years for which comparable data are available, 1922 to 1935,⁷ there was among the Industrial policyholders of the Metropolitan Life Insurance Company a total of 10,393 deaths from intestinal obstruction. The annual mortality rates at ages 1 to 74, standardized for color, sex, and age, averaged 4.4 per 100,000 lives exposed. The death rate showed no definite upward or downward trend until 1932. Beginning with that year the death rates have been consistently lower than in any of the earlier years. This improvement in mortality was due to a decrease in the death rates among males only; both white and colored females experienced substantially the same rate of mortality at the end of the 14-year period as at its beginning.

The recorded death rate from intestinal obstruction probably has been affected by two opposing influences. On the one hand, in recent years an increasing proportion of cases has undoubtedly received surgical attention early in the course of the condition, resulting in a lower number of fatalities. Furthermore, improved technique in abdominal and pelvic surgery has probably produced a smaller percentage of patients with postoperative adhesions. On the other hand, there has been an increase in recent years in the actual number of abdominal and pelvic operations performed. This situation increases the potential number of cases of intestinal adhesions regardless of improved technique in the surgery.

It has been demonstrated repeatedly that the outstanding factor responsible for the high case fatality rate among patients with intestinal obstruction is delay in the application of surgical treatment. The importance of the time element is well illustrated in data published by McIver⁸ based on the experience of the Massachusetts General Hospital for the period 1918 to 1927. In 36 cases operated upon within 24 hours of the onset of symptoms the mortality rate was 17 percent, in 37 cases in which surgical treatment was delayed from 24 to 48 hours the mortality was 35 percent, but among 76 cases treated surgically after 48 hours or more a case fatality rate of 60 percent was recorded.

⁷In accordance with the 1920 revision of the International List of Causes of Death, the present title includes deaths certified as due to intestinal adhesions. Prior to 1922, deaths from intestinal adhesions were classified, without segregation, under "Other diseases of the intestines." Hence, comparable data for intestinal obstruction in this experience are available only for the period beginning with 1922.

⁸McIVER, MONROE A. "Acute Intestinal Obstruction," *Archives of Surgery*, Vol. 25, December 1932, page 1116.

Intestinal obstruction is primarily a condition of advanced age, although deaths from this cause are relatively frequent also in early childhood. From the high frequency at the beginning of life, the mortality rate declines very quickly to a minimum in childhood and thereafter increases continuously with advancing age. Each of the color and sex groups displays a very similar age incidence in the death rate. The averages of the annual death rates for the 14-year period as a whole, and for the years 1922 to 1926 and 1931 to 1935, by age groups, are presented in Table 12. Standardized annual death rates at ages 1 to 74 are shown in Appendix Table C.

TABLE 12
INTESTINAL OBSTRUCTION
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1922 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1922 to 1935	1931 to 1935	1922 to 1926	1922 to 1935	1931 to 1935	1922 to 1926
WHITE						
1 to 74*.....	3.9	3.6	4.1	4.1	3.9	4.3
1 to 4.....	4.4	4.0	4.5	2.8	2.5	3.1
5 to 9.....	1.8	1.7	1.9	1.1	1.1	1.1
10 to 14.....	1.0	1.0	1.1	0.6	0.5	0.6
15 to 19.....	1.6	1.4	1.8	0.9	0.9	1.0
20 to 24.....	1.6	1.2	1.8	1.8	1.3	2.0
25 to 34.....	2.1	2.2	1.8	3.6	3.5	4.0
35 to 44.....	3.6	3.0	4.0	5.5	5.4	5.9
45 to 54.....	6.2	5.6	7.0	7.0	6.9	7.0
55 to 64.....	11.9	11.9	12.6	11.6	10.9	11.2
65 to 74.....	21.4	20.2	20.4	20.3	20.1	20.5
COLORED						
1 to 74*.....	7.1	6.7	7.4	9.1	9.0	9.0
1 to 4.....	6.0	4.8	5.9	4.4	2.6	7.5
5 to 9.....	1.5	1.5	1.9	2.0	1.0	2.8
10 to 14.....	1.6	1.5	1.5	1.2	1.2	1.4
15 to 19.....	2.9	1.4	3.8	3.1	2.8	4.4
20 to 24.....	3.9	2.8	4.5	7.4	6.3	7.2
25 to 34.....	4.7	4.6	5.2	9.9	9.3	9.3
35 to 44.....	7.7	7.3	8.3	15.6	16.0	14.1
45 to 54.....	14.1	15.4	12.0	16.5	18.0	16.7
55 to 64.....	18.8	22.0	16.4	19.7	21.9	17.0
65 to 74.....	35.3	29.4	47.5	23.8	27.1	20.4

*Standardized for age.

Colored policyholders experienced a considerably higher mortality from intestinal obstruction than did white persons. The death rate of colored males during 1931 to 1935 exceeded that of white males by 86 percent; colored females recorded a death rate more than twice that of white females. This contrast between colored and white persons of both sexes is in evidence at almost all age periods. From the data at hand it is not possible to determine whether the much higher mortality among the colored is due to a higher case incidence or to a greater case fatality rate, or to both.

The distribution of deaths from this cause by sex varies markedly according to age. In the ages 20 to 54, which include the main childbearing ages, the mortality during the quinquennium 1931 to 1935 was from 8 to 80 percent higher for females than for males among white persons. On the other hand, at ages under 20 the death rate for white boys averaged more than $1\frac{1}{2}$ times that for white girls; at ages 55 and over the mortality was essentially the same for the two sexes.

The knowledge available concerning intestinal obstruction indicates, as has been suggested in a previous paragraph, that mortality from this cause can be most effectively reduced by bringing patients to the surgeon with the least possible delay. Although this is common knowledge among physicians, no organized effort has yet been exerted to acquaint the general public with the danger of procrastination. Doctors, health officers, and public health workers have here a practically untilled field for life conservation.

CIRRHOSIS OF THE LIVER

The mortality from cirrhosis of the liver among the Industrial policyholders of the Metropolitan Life Insurance Company decreased greatly during the 25 years covered by this review. From a death rate of approximately 20 per 100,000 in the first three years of this experience, the mortality fell gradually to 15.8 in 1917, and then dropped abruptly for three years to 7.5 in 1920. From 1921 to 1935 the death rate remained fairly stationary. As a result of these changes, the average level of the death rate during the most recent five years of this experience is less than half that in the years 1911 to 1915. The standardized annual death rates for the entire 25-year period averaged 11.0 per 100,000, and altogether 28,369 policyholders died from this cause during that time.

Improvement in mortality has occurred among all four color and sex groups of Industrial policyholders. The greatest improvement occurred among males, among whom the death rate declined some 60 percent between 1911 to 1915 and 1931 to 1935. The recent death rates among white women averaged 56 percent below the early period; and even colored females, the group to show the least improvement, experienced a recent death rate 46 percent lower than the average of the earliest quinquennium. In general, the improvements in mortality during 25 years have been somewhat greater between ages 25 and 44 than in later life. The 25-year series of standardized annual death rates is presented in Appendix Table C.

Deaths from cirrhosis of the liver are much more frequent among men than among women. During the years 1931 to 1935 the death rate at ages 1 to 74 among white men was $2\frac{1}{3}$ times as great as among white women; colored men recorded a death rate $1\frac{1}{2}$ times that for colored women.

White men recorded a death rate 44 percent higher than colored men during the years 1931 to 1935; but among white women the mortality from this disease is much the same as among colored women. Cirrhosis of the liver rarely causes death during childhood and adolescence. Beginning at about the 25th year of life, however, the death rates become numerically important and increase rapidly with advancing age, the maximum mortality being reported among the oldest policyholders. The average death rates, by age groups, for the 25-year period as a whole, and for the first and last quinquennia of that period, are shown in Table 13.

TABLE 13
CIRRHOSIS OF THE LIVER
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 25 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES			PERCENT DECLINE 1931-1935 SINCE 1911-1915	
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915	Males	Females
WHITE								
1 to 74*	15.9	11.5	28.7	6.6	4.9	11.2	59.9	56.3
25 to 34	4.8	3.3	11.3	2.2	1.7	4.7	70.8	63.8
35 to 44	19.8	11.9	42.9	8.4	5.4	17.5	72.3	69.1
45 to 54	46.7	31.1	91.7	16.6	13.1	30.0	66.1	56.3
55 to 64	73.2	58.5	117.6	28.1	21.8	43.2	50.3	49.5
65 to 74	101.4	80.2	150.1	50.4	36.4	75.2	46.6	51.6
COLORED								
1 to 74*	12.4	8.0	20.3	6.9	5.2	9.6	60.6	45.8
25 to 34	6.0	4.7	11.7	3.5	3.1	5.2	59.8	40.4
35 to 44	15.8	9.2	31.2	8.1	6.6	11.6	70.5	43.1
45 to 54	32.9	22.2	49.4	16.8	13.0	23.9	55.1	45.6
55 to 64	52.7	32.9	69.3	25.0	19.2	28.7	52.5	33.1
65 to 74	77.0	54.3	132.6	45.0	31.2	68.4	59.0	54.4

*Standardized for age.

There has been considerable discussion regarding the relation of alcohol to cirrhosis of the liver. Evidence that a causal relation exists, at any rate in a certain proportion of cases, seems to be presented in the time series of death rates from alcoholism and from cirrhosis of the liver in the calendar period here under discussion. For, when in 1918-1920 the death rate from alcoholism exhibited a sharp decline, that from cirrhosis of the liver also dropped very materially. It is true, however, that in later years, when the death rate from alcoholism moved upward again, that from cirrhosis of the liver showed only a relatively slight rise.

BILIARY CALCULI

In the 25 years of the present review there were 10,414 deaths from biliary calculi among the Industrial policyholders of the Metropolitan Life Insurance Company. The standardized annual death rates over the period averaged 3.0 per 100,000 at ages 1 to 74 years.

The mortality from biliary calculi varies markedly according to age, sex, and color. Deaths from this disease are infrequent below the age of 35, but beginning with adult life the death toll increases rapidly, reaching its highest level at old age. The progressive rise in the death rate with advancing age is definitely more marked among the females than among the males. Among white males the mortality rises from a rate of less than one per 100,000 in the ages under 35, to a rate of 11.1 in the age period 65 to 74; among white females the rise is from 2.6 per 100,000 at ages 25 to 34, to 29.5 at 65 to 74 years. At ages 1 to 74 combined, the death rate for white males is 1.5 per 100,000 as compared with 4.9 for white females. It is quite probable that the higher mortality in females is due, in part at least, to childbearing.

The differences in mortality between white and colored persons are as striking as the sex differences within each race. In the quinquennium 1931 to 1935 the death rate among white women was almost three times that recorded for colored women. Among men the difference is not quite so great. The death rates by color, sex, and age for the 25-year period as a whole, and for the initial and final quinquennia, are presented in Table 14.

Practically no change in the mortality rate from this cause has occurred since 1911, considering all the policyholders together, white and colored, male and female, old and young. The average rate for all persons combined was 3.0 per 100,000 in the five years 1911 to 1915, and 3.1 in the period 1931 to 1935. However, for specific age groups marked changes in mortality have taken place, some for the better, some for the worse. Among white women there has been a 15 percent improvement at ages 55 to 64; on the other hand, a slight increase took place at 45 to 54, and a considerably greater increase at ages 25 to 44. Among white men deaths from this disease have become relatively more frequent, the average rate for all men in the broad age group 45 to 74 having increased by 25 percent between the two periods 1911 to 1915 and

TABLE 14
BILIARY CALCULI

Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 20 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000						PERCENT CHANGE 1931-1935 SINCE 1911-1915	
	MALES			FEMALES			Males	Females
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915		
WHITE								
1 to 74*	1.4	1.5	1.3	4.9	4.9	4.8	+ 15.4	+ 2.1
45 to 74*	5.8	6.5	5.2	19.3	18.8	19.9	+ 25.0	— 5.5
20 to 24	0.1	0.1	0.1	0.5	0.3	0.4	0.0	— 25.0
25 to 34	0.4	0.5	0.4	2.3	2.6	1.6	+ 25.0	+ 62.5
35 to 44	1.4	1.5	1.5	5.9	6.3	5.4	0.0	+ 16.7
45 to 54	3.5	4.0	3.3	13.3	13.3	12.9	+ 21.2	+ 3.1
55 to 64	6.5	7.8	6.2	22.4	21.2	24.8	+ 25.8	— 14.5
65 to 74	10.6	11.1	8.7	30.0	29.5	29.8	+ 27.6	— 1.0
COLORED								
1 to 74*	0.7	0.7	1.2	1.9	1.7	2.0	— 41.7	— 15.0
45 to 74*	2.6	2.8	3.8	6.8	6.0	6.1	— 26.3	— 1.6
20 to 24	0.3	0.0	0.8	0.5	0.2	1.3	— 100.0	— 84.6
25 to 34	0.5	0.4	1.0	1.4	1.2	1.5	— 60.0	— 20.0
35 to 44	0.8	0.4	1.4	2.8	2.1	3.6	— 71.4	— 41.7
45 to 54	1.8	1.4	3.1	5.1	4.0	4.5	— 54.8	— 11.1
55 to 64	3.0	3.4	3.6	7.2	7.6	7.0	— 5.6	+ 8.6
65 to 74	3.9	5.4	6.1	10.6	8.8	8.9	— 11.5	— 1.1

*Standardized for age.

1931 to 1935. The increase in the mortality among white men has been more than enough to offset the improvement experienced by the other groups. It is interesting to note that but for the higher mortality from biliary calculi among white men, the combined rate for all policyholders together would show a decrease instead of a slight increase over the 25-year period. The standardized annual death rates by color and sex appear in Appendix Table C.

CHAPTER XII

EXTERNAL CAUSES OF DEATH

EXTERNAL CAUSES AS A GROUP	403
SUICIDE	407
HOMICIDE	420
ACCIDENTAL AND UNSPECIFIED VIOLENCE	431
Automobile Accidents	443
Railroad Accidents	457
Streetcar Accidents	461
Traumatism by Other Vehicles	465
Traumatism by Fall	468
Drowning	475
Burns (Conflagration Excepted)	480
Conflagration	486
Traumatism by Firearms	490
Traumatism in Mines and Quarries	494
Traumatism by Machines	497
Electricity (Lightning Excepted)	500
Absorption of Poisonous Gas	504
Poisoning by Food	509
Other Acute Accidental Poisonings	512
Excessive Heat	517



EXTERNAL CAUSES OF DEATH AS A GROUP

The title "External Causes" designates one of the major divisions of the International List of Causes of Death. It is a rather loose class heading designed to include, in a broad way, deaths in which the agency of injury was a physical force or a chemical substance originating outside the body. The title thus embraces three such different groupings as (a) deaths in which suicide or attempted suicide was *reported*; (b) deaths in which homicide or attempted homicide was *reported*; and (c) all other deaths from external causes. This last negatively defined class is referred to as "accidental and unspecified violence." It includes, in addition to those deaths ordinarily reported as "accidental," deaths from violence of unspecified nature, deaths from the casualties of war, legal executions, deaths of civilians at the hands of belligerent forces, deaths from riot or civil commotion, and from deprivation of food or water. On the other hand, it does not include deaths from chronic poisonings. Similarly, deaths in which septicemia or erysipelas is reported as the terminal condition to injury, in all except the graver injuries sufficient in themselves to cause death, are assigned outside the external cause group. Tetanus is preferred to any accidental injury, except war wounds, when both appear on the death certificate.

Although suicide, homicide, and accidents for the most part grow out of widely different elements in human behavior, the three groups are interrelated. In the first place, there is a characteristic common to each of these broad classes—in each, death follows injury by some means or agency external to the human body. Another point, and an important one, is that death from violence the nature of which is not known, is classified under the accident title. As a result of this practice prescribed by the International List of Causes of Death, a number of deaths from suicide and from homicide which cannot definitely be identified as such, are included with deaths from accidents. This overlapping in the classification of violent deaths practically necessitates the presentation of the record for the group as a whole. Moreover, a common denominator for the three classes of violence is a certain disregard for the sanctity of human life which is characteristic of American ways.

However, in discussing the factors common to suicide, homicide, and accidents, it would be a serious mistake to overstate the extent

of organic unity among them. Each broad class of violent deaths has a complex of physiological, psychological, and environmental factors peculiar to itself. For this reason, we are deliberately brief in discussing external causes of death as an aggregate. In this mortality investigation not only are suicide, homicide, and accidents considered separately, but the accident record is further discussed under 16 subdivisions. For each of the broad classes and subclasses is presented a detailed statement of this 25-year insurance experience, showing the color, sex, and age characteristics, as well as the trend of the mortality. The few paragraphs which follow sketch the interrelation of the three classes of violence, after which we turn to the individual groups.

For the quarter century under survey, a total of 280,671 deaths from external causes, 8.8 percent of the deaths from all causes, was recorded in this insurance experience. Of this number, 201,729 were deaths of males, indicating that individuals of this sex are the chief victims of violent deaths. As will be seen later, an excess male over female mortality obtains in each of the three classes of violence. On the score of age and color, there are no characteristics common to the three types which are worthy of note. Accidental and unspecified violence was the predominating factor for this group of causes, accounting for 77.1 percent of the deaths. Suicide was responsible for 11.2 percent of the deaths from external causes, homicide for 8.4 percent, and wounds of war for 3.3 percent. Table 1 shows the relative importance of the classes of violence.

TABLE 1
EXTERNAL CAUSES OF DEATH BY CLASS OF VIOLENCE
Number of Deaths and Death Rates* per 100,000
Total Persons. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

CLASS OF VIOLENCE	Number of Deaths	PERCENT OF TOTAL DEATHS		Death Rate* per 100,000
		All Causes	External Causes	
TOTAL EXTERNAL VIOLENCE..	280,671	8.8	100.0	92.3
Suicide.....	31,309	1.0	11.2	11.5
Homicide.....	23,469	0.7	8.4	6.1
Accidental and unspecified violence.....	216,531	6.8	77.1	70.8
Wounds of war.....	9,362	0.3	3.3	3.9

*Standardized for color, sex, and age.

External causes of death increased in importance in the registers of mortality during the 25-year period, from 8.0 percent of all deaths in 1911 to 1915, to 8.9 percent of all causes in 1931 to 1935. This was due largely to the rise of the accident factor from 6.3 percent in 1911 to 1915, to 6.9 percent of all deaths in the last quinquennium of the period under review, although suicides and homicides also increased as items in the total mortality picture. This comparison of the first and last five-year periods indicates the general movement of the mortality from external causes over the 25-year period. It is apparent, however, from Table 2, which

TABLE 2
EXTERNAL CAUSES OF DEATH
Percent Each Class of Violence of All Causes of Death
and of Total External Violence. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

CLASS OF VIOLENCE	1931 to 1935	1926 to 1930	1921 to 1925	1916 to 1920	1911 to 1915
PERCENT OF DEATHS FROM ALL CAUSES					
TOTAL EXTERNAL VIOLENCE.....	8.9	9.2	8.9	8.6	8.0
Suicide.....	1.2	1.0	0.9	0.7	1.1
Homicide.....	0.8	0.8	0.8	0.6	0.6
Accidental and unspecified violence.....	6.9	7.4	7.2	5.9	6.3
Wounds of war.....	†	†	†	1.4	†
PERCENT OF DEATHS FROM EXTERNAL CAUSES					
TOTAL EXTERNAL VIOLENCE.....	100.0	100.0	100.0	100.0	100.0
Suicide.....	13.8	11.0	9.8	7.9	13.8
Homicide.....	8.8	8.9	9.4	6.8	7.7
Accidental and unspecified violence.....	77.4	80.1	80.7	69.1	78.1
Wounds of war.....	†	†	0.1	16.2	0.4
AVERAGES OF ANNUAL DEATH RATES* PER 100,000					
TOTAL EXTERNAL VIOLENCE.....	78.5	86.7	82.2	111.0	103.3
Suicide.....	11.8	10.8	9.2	9.8	16.0
Homicide.....	6.1	6.0	6.3	6.0	6.1
Accidental and unspecified violence.....	60.6	69.9	66.6	76.1	80.8
Wounds of war.....	†	†	0.1	19.1	0.4

*Standardized for color, sex, and age. †Less than 0.05.

displays the data by quinquennial periods, that the figures do not follow a continuous course, but vary from period to period. One point of interest in this connection is that violent deaths reached their maximum relative importance in 1926 to 1930, when they constituted 9.2 percent of all deaths in this experience.

It should be noted, however, that this increase in relative importance for each class of violence has resulted not from a greater prevalence of violent deaths, but rather from a decline in the incidence of many of the more important diseases causing death during the period. As a matter of fact, the standardized death rate from external causes in this insurance experience dropped from 103.3 per 100,000 in 1911 to 1915, to 78.5 per 100,000 in 1931 to 1935, reflecting mainly the decline in accident mortality.

War deaths were of considerable importance in the quinquennium 1916 to 1920, when the death rate from wounds of war was 19.1 per 100,000. These deaths include not only citizens of the United States and Canada in 1917 and 1918, but also those policyholders in the armies and navies of other participating countries over the duration of the World War since 1914. Deaths from wounds of war were not tabulated separately in this experience prior to 1915, and such deaths which occurred in the latter half of 1914 are included under the accident title.

SUICIDE¹

Each year about 20,000 people in the United States kill themselves. If present conditions of mortality continue to prevail, out of 1,000 white males born, 18 will eventually take their own lives; for white females the chances, at birth, of eventually committing suicide are five per 1,000. Among Metropolitan Industrial policyholders, ages 1 to 74 years combined, the standardized suicide rate in 1935 was 10.6 per 100,000; during the whole 25-year period discussed in this book it averaged 11.5. This figure shows at once that suicide is not a leading cause of death. It does represent, however, a heavy toll and a very real social wastage, much of which undoubtedly can be prevented. In dealing with suicide we are considering a complex phenomenon, the frequency of which is influenced by three factors: all manner of extraneous situations over which the individual has no control; the group attitudes which prevail in the particular society in which a person lives; and the character and temperament of the one who takes his own life. In the last analysis, it is an action indicative of a badly integrated personality—one unable to withstand the ordinary strains and stresses of life. It is, on the whole, the end result of personal maladjustments and frustrations which can often be avoided were the individual in question helped, before it is too late, to solve his conflicts in a more constructive fashion.

Mortality by Age, Sex, and Color

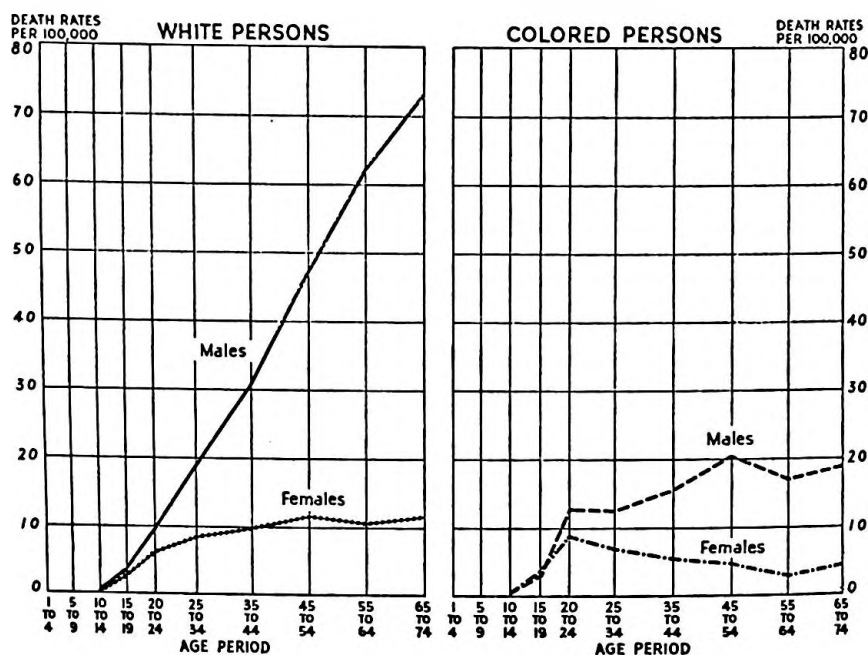
The male and female rates of white policyholders differ greatly, as can be seen from Table 3 and Chart I. For the group as a whole, proportionately $3\frac{1}{2}$ times as many men as women commit suicide. The ratio increases with advancing age. During the years 1931 to 1935, among white men aged 20 to 24, suicide was about $2\frac{1}{2}$ times as frequent as among those aged 15 to 19. The rate continues to rise sharply in each succeeding age group. Between ages 55 and 64—those years during which so many men are beginning to think of retiring from active business and enjoying the fruits of their labor—the suicide rate was 62.6 per 100,000. Among those aged 65 to 74 years, 73.1 out of every 100,000 living, voluntarily terminated their lives. The rate among white girls of 15 to

¹ "Suicide" includes only those cases in which the fact of suicide or attempted suicide is clearly shown. The number is generally underestimated, for many self-inflicted deaths are never classified as such in official death registration statistics. Since a stigma is still attached to suicide, relatives and friends often attempt to conceal the real cause of death. Frequently, too, those bent on suicide will contrive to make the death appear accidental. On the other hand, a few homicides, because of the murderer's cleverness, will be registered as suicides.

CHART I SUICIDE

**Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years**

Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935



19 years (2.5) though somewhat lower, does not differ greatly from that of young men of the same age (3.5). The rate increases with advancing age, reaching a peak of 11.7 in the age group 65 to 74, which is, however, less than one sixth of the corresponding male rate.

The situation among the colored is somewhat different. Their mortality from suicide is much lower than that of the whites. In the relatively unimportant early age periods, however, the colored rate is sometimes slightly higher than the white; but after age 25 the relationship is reversed. With advancing age the difference between the rates of the two races becomes greater and greater. For example, in the age group 45 to 54 years the white male rate is 47.4, as compared with 20.4 per 100,000 for colored males in the period 1931 to 1935. In the following decade of life the figures are respectively, 62.6 and 17.1; in the next they are 73.1 and 18.8. The maximum frequency of suicide among Negro men is at ages 45 to 54. Among females the rates for the colored are slightly higher

TABLE 3
SUICIDE

Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 10 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000						PERCENT CHANGE 1931-1935 SINCE 1911-1915	
	MALES			FEMALES			MALES	FEMALES
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915		
WHITE								
1 to 74*.....	18.9	19.3	27.2	5.6	5.6	7.1	-29.0	-21.1
10 to 14.....	0.5	0.6	0.5	0.2	0.1	0.3	+20.0	-66.7
15 to 19.....	3.9	3.5	5.5	4.3	2.5	7.8	-36.4	-67.9
20 to 24.....	12.2	9.2	20.7	6.7	6.0	9.1	-55.6	-34.1
25 to 34.....	19.8	19.0	30.5	8.5	8.2	11.2	-37.7	-26.8
35 to 44.....	31.1	30.7	45.7	9.0	9.8	11.1	-32.8	-11.7
45 to 54.....	44.3	47.4	62.9	10.0	11.4	10.7	-24.6	+ 6.5
55 to 64.....	57.7	62.6	78.9	9.8	10.6	10.2	-20.7	+ 3.9
65 to 74.....	65.4	73.1	82.5	10.5	11.7	10.7	-11.4	+ 9.3
COLORED								
1 to 74*.....	8.1	9.4	9.7	3.5	3.9	4.5	- 3.1	-13.3
10 to 14.....	0.4	0.3	0.7	0.7	0.3	0.7	-57.1	-57.1
15 to 19.....	4.1	3.0	5.4	4.8	3.6	5.3	-44.4	-32.1
20 to 24.....	11.8	12.9	15.9	8.2	8.7	12.5	-18.9	-30.4
25 to 34.....	12.3	12.6	15.9	6.3	7.0	8.1	-20.8	-13.6
35 to 44.....	13.6	15.7	16.8	4.4	5.6	6.3	- 6.5	-11.1
45 to 54.....	14.1	20.4	12.8	3.2	4.6	2.9	+59.4	+58.6
55 to 64.....	13.9	17.1	18.8	2.6	2.8	1.7	- 9.0	+64.7
65 to 74.....	13.8	18.8	8.2	1.8	4.2	1.5	+129.3	+180.0

*Standardized for age.

than for the whites in ages under 25. A rather striking difference between white and colored suicide mortality is the decided decline in the death rate among colored women after age 25. This is not so among the whites, where the death rate continues to rise, although very slightly, until the end of life.

One of the outstanding facts about suicide is its relative concentration in the older ages of life, especially among white men. Contrary to prevailing opinion, suicide as a social problem increases consistently with advancing years. In general it results from the

weariness, disillusionment, and hopelessness of the later years of life, rather than from the disappointments of youth. More than half of all the suicides in the United States occur among persons 45 years of age and over, although this group constitutes only a little more than one fifth of the total population. Very rarely do children or adolescents kill themselves. The records of the Metropolitan Life Insurance Company during the 25-year period show a suicide rate in the group of white boys, ages 10 to 14 years, of only 0.5 per 100,000; among white girls the rate was 0.2. Boys 15 to 19 showed a rate of 3.9 and girls of the same ages, one of 4.3. Not only are these rates very low, but, except in the youngest group of boys, they have declined substantially during the quarter century under consideration.

In no other age group, either among males or females, has there been anything like the improvement shown for this group of adolescent white girls. In the early years of this experience the rate for girls ages 15 to 19 was higher than that for males; this was the only period of life in which the female mortality exceeded that for males among whites. But so substantial has the decline been that the earlier positions have been reversed, as we have seen. The year 1923 divides the series; from 1911 to 1923 suicide in adolescence was more common among girls than boys, with the single exception of the year 1921; but during the years following 1923, in this group as in all others, suicide has been more frequently a masculine reaction. This difference in the sex incidence of suicide is a well-known fact which our statistics bring out very clearly.

Trend of Mortality

When we look at the suicide rates of those insured in the Metropolitan Life Insurance Company, we find that the 25-year period is roughly divided into two parts by the year 1920, when the rate was exceedingly low. In 1911 the standardized rate among Industrial policyholders for ages 1 to 74 years combined was 16.5 per 100,000, which, with the single exception of 1913 (when the rate reached 17.0), was the highest on record. In fact, during all the early years of the series the rate remained high, never falling below 15 per 100,000 until after 1915. Then there came a very material drop and the war years witnessed the suicide rate falling still lower. This decline continued until 1920, which saw the lowest suicide rate on record (7.3). After that the rate went up, remaining around nine per 100,000 through the year 1925; between 1925 and 1932 the mortality resumed its rise. Since the latter year, however,

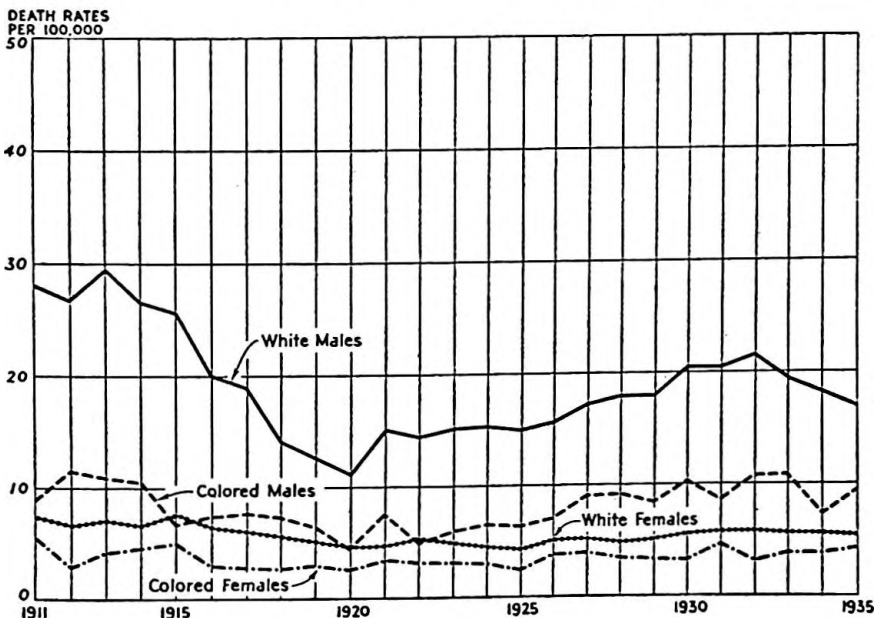
the downward trend has been pronounced. But in spite of the serious upward trend in suicide up to 1932, the rate nevertheless remained considerably lower than it had been in the early years of this investigation. The standardized annual death rates appear in Appendix Table C.

Among both white and colored policyholders, suicide rates were lower in the last five years of the study than in the first five. As Table 3 shows, the decline amounted to 29.0 percent for white males, 21.1 percent for white females, 3.1 percent for colored males, and 13.3 percent for colored females. Among white male policyholders there has been a decrease for practically every age group; among white females there has likewise been a decrease at the early ages of life, but starting at age 45, the suicide mortality has increased somewhat. The rate among colored males has declined very little and this decline has had no even distribution according to age. Among colored females as among the whites, the decline has been at the early ages of life; after age 45 the mortality has increased.

CHART II SUICIDE

Standardized Annual Death Rates per 100,000
By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



Suicide in the Industrial and in the General Population Compared

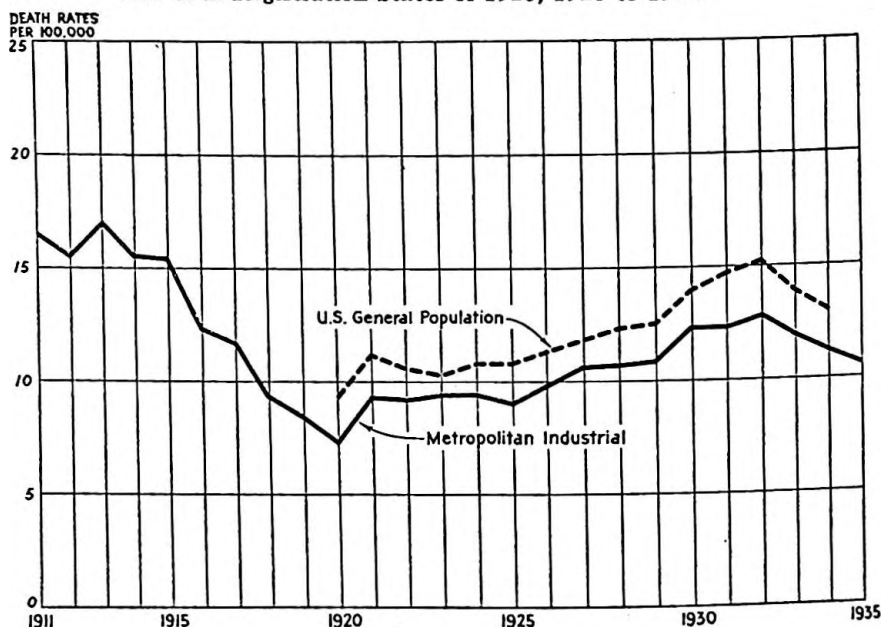
Accurate estimates of population by color, sex, and age are not available for the expanding United States Death Registration Area for the period 1911 to 1919, and for that reason comparison of the suicide mortality among Metropolitan Industrial policyholders with that for the general population is not warranted for these years. Comparable data for the two experiences are available, however, for the years 1920 to 1934. As is to be expected, the suicide rates of the general population exhibit the same general trend as do those of the Industrial policyholders. This fact is displayed graphically in Chart III.

Comparing white and colored rates in the Registration Area during the years 1930 to 1934, we find the standardized death rate among white males, 23.4 per 100,000, was approximately $2\frac{3}{4}$ times the colored male rate, 8.7. Among Industrial policyholders of the Metropolitan Life Insurance Company, however, the difference between colored and white suicide rates for those years

CHART III SUICIDE

Standardized Annual Death Rates per 100,000
Total Persons. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935
and U. S. Registration States of 1920, 1920 to 1934



was not so great. The white male rate was lower among the insured than among the general population, but for colored males the reverse was true.

Suicide in the United States and in Foreign Countries

The infinite variety, throughout the world, in traditions and customs, religious practices, social attitudes, climatic conditions, and other factors influencing human conduct, is reflected in great differences in suicide frequency from country to country. The United States, with its rate of 16.1 per 100,000, occupies a middle position between the minimum rate of 3.4 per 100,000 found in the Irish Free State during the period 1930 to 1934 and the maximum of about 40 in Austria. Incidentally, the power of religious affiliations in inhibiting suicidal impulses is seen very clearly in the case of Ireland. Northern Protestant Ireland has a rate of 5.2 per 100,000, which, though one of the lowest rates in Europe, is considerably higher than that of Southern Catholic Ireland (the Irish Free State), 3.4 per 100,000. Rates lower than those in the United States are found in England and Wales, New Zealand, Canada, Scotland, Norway, Australia, Italy, the Netherlands, and Spain. Denmark, Finland, and France have somewhat higher rates. And the highest rates of all are found in Japan and in the European countries with large Germanic populations.

Methods of Suicide

The methods commonly used by persons committing suicide are rather limited in diversity, although there are isolated records of very unusual and spectacular means that have occasionally been employed. Among the Industrial policyholders of the Metropolitan Life Insurance Company, firearms and poisons were the most frequent agents used during the years 1911 to 1935. About half of all the suicides reported used one of these methods—shooting accounting for 25.7 percent and poisoning for 23.6 percent of the deaths. Not far behind came asphyxiation and hanging. These four agencies were used by 83 percent of all the suicides; the remaining 17 percent resorted to drowning, cutting or stabbing, jumping from high places, crushing, and miscellaneous methods. During the whole series of years covered by our study, these four remained the most important means, but there was a shift in their rank and in their importance relative to the total number of suicides. During the years 1911 to 1915 they accounted for 87

percent of the total suicides, but during the years 1931 to 1935 they represented only 83 percent. One notable difference has been a decrease in the use of poison—more than one third of all the suicides used this means during the years 1911 to 1915, as contrasted with approximately one fifth of the total (19.4 percent) in the later period. Firearms as an agency of death have gained in popularity, increasing from 23 percent of the total in the earlier period, to 27 percent in the later. A striking feature has been the growing use of firearms among women suicides; the proportion of white women using this agency rose from 8.5 percent in 1911 to 1915, to 12.2 percent in 1931 to 1935.

The methods of self-destruction vary with age and sex. Among white men firearms are the most frequent agency employed at almost every age period. At the earlier ages, poison is the second most important method, but after age 45 both asphyxiation and hanging supersede poisoning. Among white women, on the other hand, the use of poison easily leads and accounts for more than a third of all the suicides. In the 10 to 24 year group, poisoning accounts for 56 percent of the total suicides, and among those 25 to 44 years old, 38 percent. In the two older groups of women asphyxiation heads the list.

Among the colored, males used firearms far more frequently than any other method of suicide during the whole period, 45 percent of the deaths being due to that agent. The next means in importance was poison, which accounted for 16 percent of the deaths. Nine percent of the deaths were caused by hanging; asphyxiation and cutting or piercing instruments each contributed about 8 percent. Colored females used poison predominantly, half the suicides being caused in that way. Another 16 percent used firearms, a more common method than among white females. More than 9 percent drowned themselves, 7 percent jumped from high places, and 8 percent used asphyxiation.

Several factors enter into the method of suicide that any given individual will choose. Undoubtedly accessibility is very important and the person determined to die is apt to use the most convenient means available at the moment. That is why it is often impossible to prevent suicide; for even when poison and firearms are difficult to procure, the victim can always jump from a height, cut himself with a piece of glass, bump his head against a wall, strangle himself, or drown in a few inches of water in a bathtub. Suggestion is another factor in suicide that cannot be overlooked. An unusual and spectacular method, especially if it has received a good deal of

publicity, will sometimes start an epidemic in which a series of people use the same means of death. But on the whole, it is safe to assume that nobody will follow such an example unless he had already contemplated suicide, and was actually thinking seriously of destroying himself. More important than either availability or suggestion, therefore, is the existence of psychological factors that determine not only whether a given person will kill himself, but also the method he will use. In general, it seems to be rather clear that the mental economy of the suicide is such that he will go to great lengths to kill himself in some particular manner that for some personal reason offers him the greatest psychic satisfaction.

Suicide and Economic Conditions

The question is frequently raised regarding the extent to which the prevalence of suicide is affected by the ups and downs of general business conditions. The mortality experience of the Metropolitan Industrial policyholders over the period 1911 to 1935 furnishes pertinent data. In Chart IV are charted the annual changes in the standardized suicide rate among insured white males, ages 1 to 74, compared with the corresponding annual changes in a general business index. That there is a general parallelism between the two curves is apparent to the eye. A statistical measure of this parallelism is the coefficient of correlation between the changes in the suicide rate and the corresponding changes in the business index. For white males the coefficient of correlation is significant and figures out to $-.45 \pm .16$. In the other color and sex groups there is no significant correspondence between the two series in the quarter century under review. Among white females the coefficient of correlation is found to be $-.18 \pm .20$, and for both colored males and colored females, $-.28 \pm .19$.

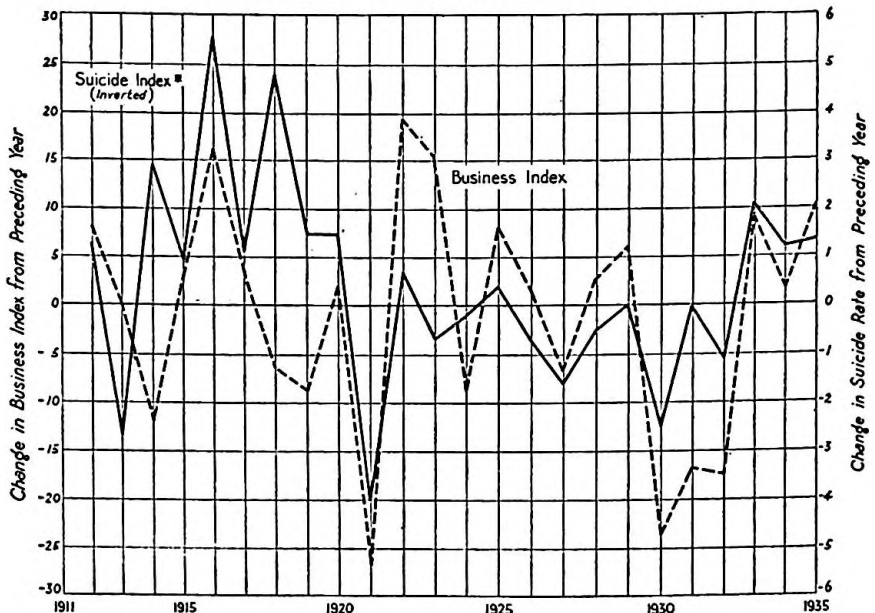
This relation between the suicide rate and the business index is of such interest that a separate study based on the statistics of ten large cities of the Middle Atlantic States² may with advantage here be cited. This series extends only over the years 1910 to 1931, but in one respect is more detailed than that based on the experience of the Metropolitan Life Insurance Company, namely, in that the data are given for each month separately. The stretch of years from 1910 to 1931 breaks naturally into two distinct periods, the first running from 1910 to 1921, the second from 1921 to 1931. Each of these has a distinct and marked trend, the first downward at a rate of about 3 percent per annum of the average rate during

²The 10 cities studied were New York, Albany, Buffalo, Rochester, and Syracuse; Newark, Jersey City, and Paterson; Philadelphia and Scranton.

the period, the second upward about 4 percent per year. In accordance with customary statistical procedure, deviations were computed of the death rates from the rates expected on the basis of long-time trends, which had been corrected for seasonal variations. The results were expressed in terms of the standard deviation about the trend line. Similarly prepared data on general business conditions were then used for comparison. Chart V graphically compares the two series of deviations from the corresponding trend lines. In the long waves there seems to be a general tendency for below-normal suicide rates to occur in times of above-normal business conditions.

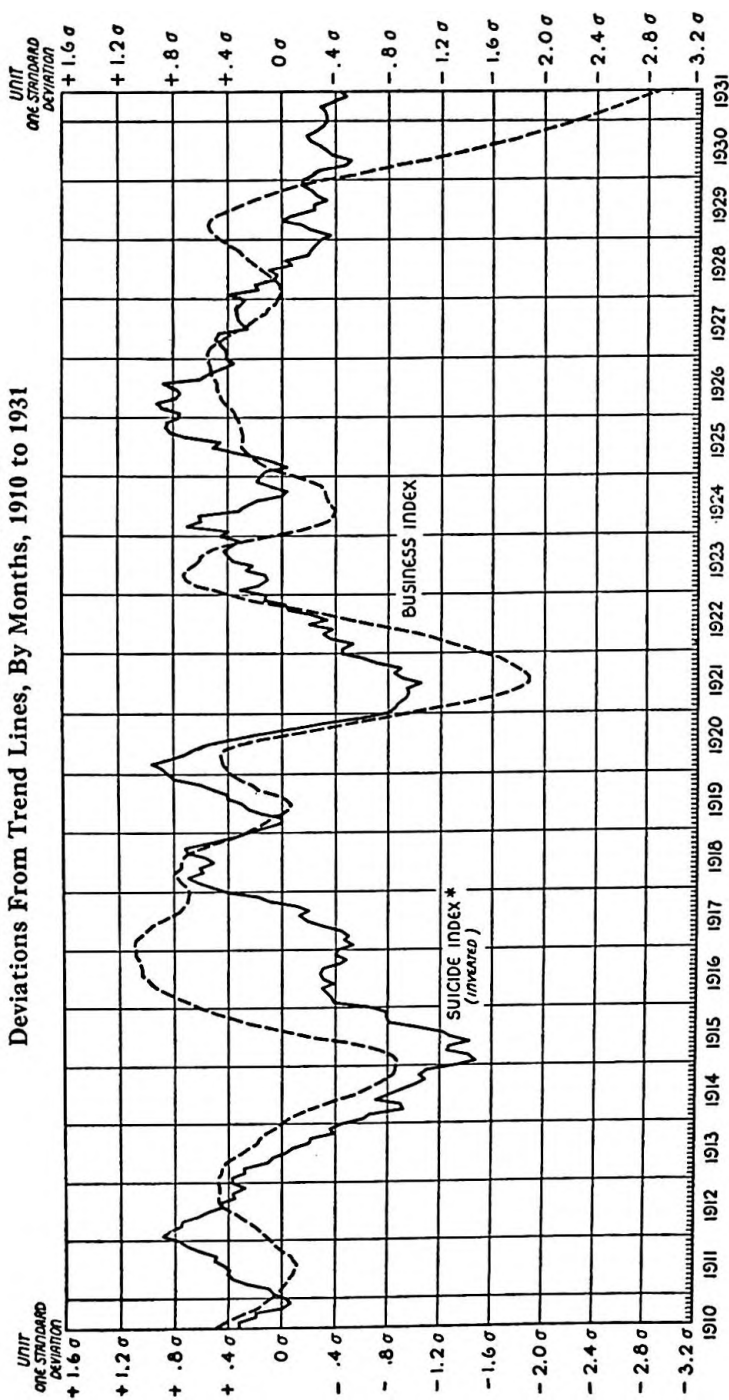
The coefficient of correlation between the monthly business index and the monthly suicide index during the period of years 1910 to 1931 is found to be $-.47 \pm .05$. When calculated on the basis of annual data it is somewhat higher, $-.55 \pm .15$. It is seen that from 1910 until the middle of 1913, when business conditions were about normal and showed comparatively little change, the suicide rate was continuously below the average. In the middle of 1913, coincident with the severe depression in business, the suicide rate

CHART IV
SUICIDE AND BUSINESS CONDITIONS
1911 to 1935



*Based on suicide rates among white males, ages 1 to 74 years, insured in the Industrial Department of the Metropolitan Life Insurance Company.

CHART V
SUICIDE AND BUSINESS CONDITIONS
Deviations From Trend Lines, By Months, 1910 to 1931



* Based on death rates in ten cities of the Middle Atlantic Region
Reprinted from *To Be or Not To Be*, by Duolin and Bunzel. New York. Harrison Smith and Robert Haas. 1933. Page 103.

swept rapidly up, reaching its peak in the memorable winter of 1914-1915. From this point it receded, at first slowly and then with greater rapidity through 1915 and 1916. The year of our entrance into the war showed a further decline in the suicide rate which continued through 1918. In the late summer of 1918 there was a feeling that economic conditions were unstable and business began to decline. This depression, which was further accelerated by the signing of the armistice and the consequent wholesale cancelation of war orders, was marked by a perceptible increase in the suicide rate. The country, however, quickly recovered from the short period of gloom. Toward the end of 1919 and during the first few months of the following year there was an expansion in business. This general prosperity was reflected in the very low suicide rate of 1920, the lowest figure recorded since the beginning of the century in practically all parts of the United States. But before that year was over there began a rapid decline which was immediately reflected in the suicide rate; suicide mortality increased, paralleling with almost uncanny exactness the steady decline in business.

From early 1923 to late 1924 parallelism between the suicide rate and the business index breaks down. But from the beginning of 1925 to August 1928 the suicide index was almost uniformly below normal, in conformity with the behavior of the business index. From this point until the middle of 1931 the two indices do not show close correspondence. From the spring of 1928 until early in the summer of 1929 the business index rose. Suicide, however, did not drop, but continued the increase which began in 1926. A rapid decline in the business index set in during 1929 and continued precipitously downward throughout 1930. During this period the suicide index continued its upward trend, although not by any means steeply enough to parallel the decline in business.

Complexity of the Suicide Problem

Nothing shows better than the preceding discussion of the relationship between suicide rates and economic conditions the great complexity of the suicide problem. When we have any factor so intricately bound up with all manner of social and personal considerations, it becomes almost impossible to speak with any finality about one causal factor. Suicide rates in the last analysis are affected by the external conditions that influence individuals, such as poverty, unemployment, hunger, and other

deprivations. Ill health, mental abnormality, physical suffering, and handicaps often lead men to thoughts of self-destruction. The loss of honor, prestige, and love, as well as failure, with its accompanying feeling of inadequacy, contribute to the same result. Social pressure—the customs, laws, and traditions of a community which disapproves of suicide—on the other hand exerts a very real check on suicide frequency. But all these external circumstances merely act as inhibiting or encouraging forces; rarely does any one of them alone drive a person to action unless he is already harassed by a serious emotional conflict. Consequently any attempt to lower the suicide rate must place its emphasis on the endeavor to help individuals solve their personal difficulties and adapt themselves more readily to the world in which they live. When people acquire the ability to cope successfully with the demands of life; when they obtain satisfaction from their work and in their human relationships; in short, when they attain emotional maturity and learn to accept the varied vicissitudes of fortune—joy and sorrow, pleasure and pain, victory and defeat—as integral parts of human experience, only then will suicide be reduced to a minimum.

HOMICIDE

Homicide is a general term used to denote a death that is due to one human being killing another. But the matter of definition is not a simple one because of the conflicts between the practices followed in compiling criminal statistics and vital statistics. Homicide is not necessarily unlawful: it may be either excusable or justifiable and, therefore, within the law; or it may be felonious—murder or manslaughter. Included in the first category are cases in which an officer of the law, while discharging his duties, kills a man; or those in which one man kills another in self-defense. Such persons are not regarded as guilty of any crime and they are not reported in criminal statistics. Vital statistics, on the other hand, list all such deaths as homicides. At the same time, accidental deaths due to negligence appear in the criminal records, but are never regarded as homicides in vital statistics. In an automobile fatality, for example, the death is considered accidental even if it is due to the rank carelessness of the motorist or to his willful disobedience of traffic laws. In this study we are interested in the vital statistics and not the legal classification of homicide.

In 1934 there were more than 12,000 homicides in the United States, which gives a death rate of 9.5 per 100,000 population. This is a shocking record and places the country in the unenviable position of being the most lawless nation in the world. In striking contrast is the Netherlands, which has the lowest homicide rate in Europe—0.4 per 100,000 for the five-year period 1930 to 1934. Our rate was 23 times as high. The homicide rate in the United States was 19 times that of England and Wales, where the official figure averaged 0.5 per 100,000 population. In no part of the British Empire did the rate approach that of the United States; even Canada, with a fairly similar environment and historical background, had a rate only one sixth of ours. Our figure was four times as high as that of Italy, about $4\frac{1}{2}$ times that of Belgium or Germany, and five times that of Switzerland.

Turning now to the United States and the experience of the Metropolitan Life Insurance Company, we find that during the 25 years 1911 to 1935, there were 23,469 homicides among the Industrial policyholders. The standardized rates averaged 6.1 per 100,000 persons insured. The mortality rate has remained almost constant in the period covered by this study. The highest rate, 6.8, was reached in 1931, and the lowest, 5.3, in 1920.

Mortality by Age, Sex, and Color

The records of the Metropolitan Life Insurance Company show that the standardized homicide rate for the Industrial policyholders aged 1 to 74 years, during the period 1911 to 1935, averaged 6.4 per 100,000 for white males, 1.9 for white females, 46.5 for colored males, and 12.5 for colored females. Table 4 and Chart VI show the rates according to color, sex, and age.

Age Among white males the peak in the homicide rate (12.0 per 100,000) is reached in the 25 to 34 year group. But it is also over 10 in the succeeding age period, 35 to 44 years; it is, moreover, 9.3 in the 45 to 54 year group, and 9.0 in the 20 to 24 year class. In other words, there is a substantial death rate from homicide in the ages between 20 and 54 years. Among colored males the rate is high in these same years, and, in addition, it is also high in the age period 15 to 19. Homicide is at a minimum in the years below 15 in all sex and color groups.

TABLE 4
HOMICIDE

Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years

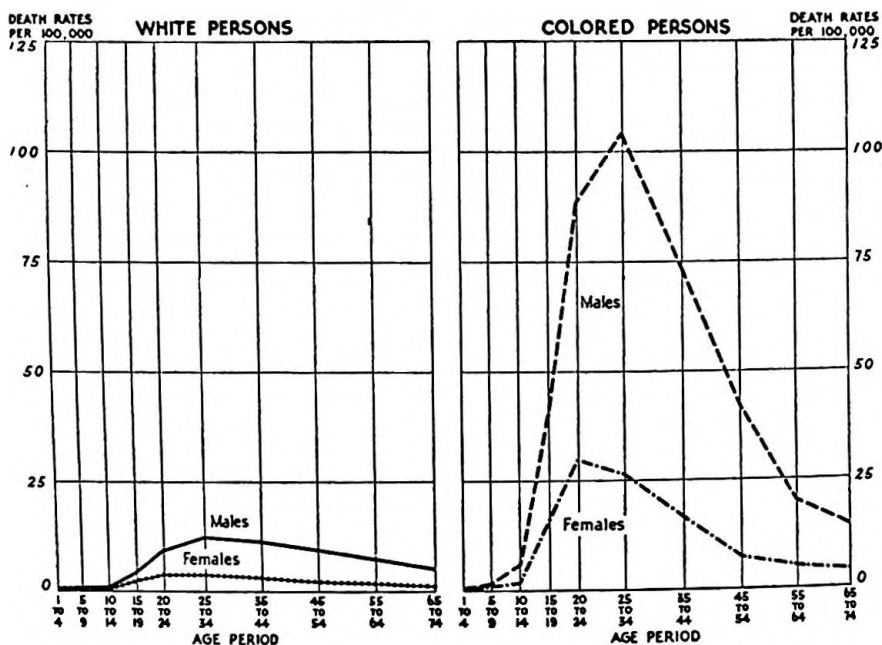
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000				PERCENTAGE			
	WHITE		COLORED		MALE OF FEMALE RATE		COLORED OF WHITE RATE	
	Males	Females	Males	Females	White	Colored	Males	Females
1 to 74* . . .	6.4	1.9	46.5	12.5	337	372	727	658
15 to 44* . . .	9.4	2.9	80.2	22.2	324	361	853	766
45 to 74* . . .	7.7	1.4	29.7	5.4	550	550	386	386
1 to 4	0.8	0.6	0.9	0.7	133	129	113	117
5 to 9	0.6	0.5	1.5	1.0	120	150	250	200
10 to 14	0.6	0.4	5.4	1.5	150	360	900	375
15 to 19	3.9	2.0	39.8	15.8	195	252	1,021	790
20 to 24	9.0	3.4	88.0	29.6	265	297	978	871
25 to 34	12.0	3.2	104.4	26.4	375	395	870	825
35 to 44	10.8	2.8	74.9	16.2	386	462	694	579
45 to 54	9.3	1.7	42.1	6.6	547	638	453	388
55 to 64	6.9	1.2	20.1	4.6	575	437	291	383
65 to 74	4.9	1.0	13.8	3.6	490	383	282	360

*Standardized for age.

CHART VI HOMICIDE

**Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years**
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



Among women the homicide rate reaches its highest point a few years earlier than among men—namely, 20 to 24 years. It is then 3.4 per 100,000 among white women, as compared with 3.2 in the next age group, 25 to 34 years. It remains relatively high (2.8) at ages 35 to 44 years, and also at ages 15 to 19 (2.0). The same age distribution occurs among colored women, though, of course, the figures are much higher.

Sex Among both white and colored persons, the frequency of homicide among males was about $3\frac{1}{2}$ times that among females. At all ages of life among the whites, the death rates of males were higher, the excess increasing regularly from age to age until the maximum of 5.8 male deaths for each female death was reached in the age period 55 to 64.

Color The most striking feature of Table 4 is the excessively high death rate among the colored policyholders. During the 25-year period, an average of about seven times as many colored

as white persons per unit of population were slain. Among males, the ratio of colored to white deaths was a little higher; among females, somewhat lower. In the age period of highest homicide mortality among both white and colored males, 25 to 34 years, there were 104.4 deaths per 100,000 colored males, as against 12.0 deaths per 100,000 white males, or a ratio of colored to white male mortality of 8.7 to 1. The greatest disparity occurs in adolescence, when over 10 times as many colored as white youths are slain.

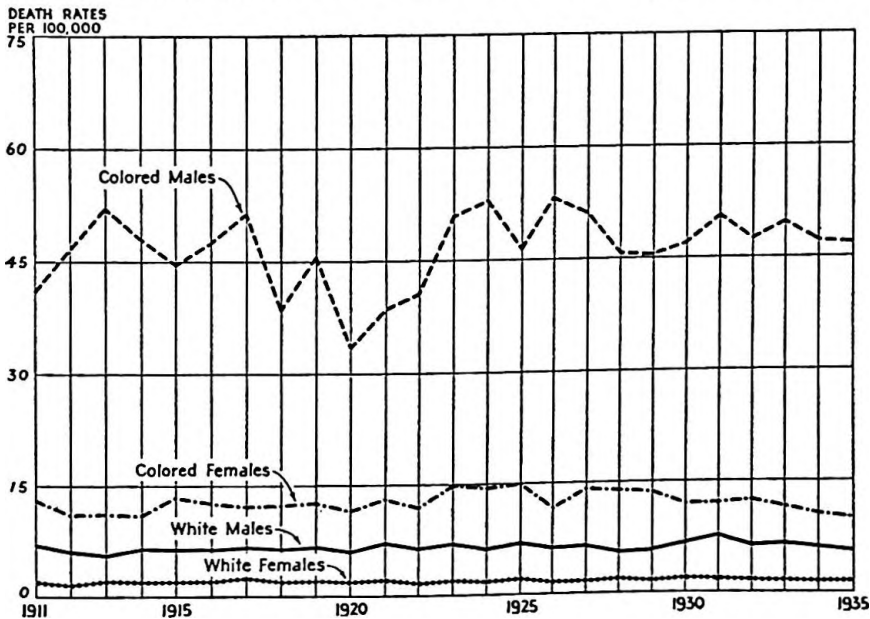
It is of interest to note further that in this insurance experience for 1931 to 1935, homicide was one of the leading causes of death among colored women between the ages of 15 and 34 years, and among colored males between the ages of 15 and 54. In the ages between 20 and 34 years, homicide as a cause of mortality among colored males was exceeded only by tuberculosis. Moreover, it ranked seventh in importance as a cause of death among white males ages 20 to 24 years. At no age period was homicide one of the 10 leading causes of death among white females.

CHART VII

HOMICIDE

Standardized Annual Death Rates per 100,000
By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



Trend of Mortality

In none of the color and sex groups of our experience has there been any strong tendency for the death rate from homicide to increase or decrease. This fact is very evident from the curves in Chart VII. Among colored persons, however, the year-to-year differences in mortality were greater than among whites. Among colored males, for example, the death rate ranged from a minimum of 33.5 per 100,000 in 1920, to a maximum of 53.2 in 1926, as compared with a low point among white males of 5.5 in both 1913 and 1928, and a high point of 7.6 in 1931. The standardized annual death rates by color, sex, and broad age periods, appear in Appendix Table C.

If war and variations in business activity have any effect on the number of homicides, it is difficult to trace their influence in our death rates. There is a general impression that murder and manslaughter increased during the period in which the manufacture and sale of alcoholic beverages were prohibited by law. Our data offer little support to that belief. In the 14 years of the national prohibition era, the homicide rates of neither white males nor colored males exceed those of the nine preprohibition years.

Trends of Mortality in the Insured and in the General Population Compared

When we consider the trend in the Registration States of 1920 for the years 1920 to 1934, we find that except for the year 1920, when the rate was very low (6.4 per 100,000), there has been very little change; in this respect the experience among the Metropolitan Industrial policyholders parallels that of the country as a whole. The range was from this low point of 6.4 in 1920 to a high point of 8.0 in 1931. Chart VIII presents the trend picture.

Geographic Distribution of Homicide

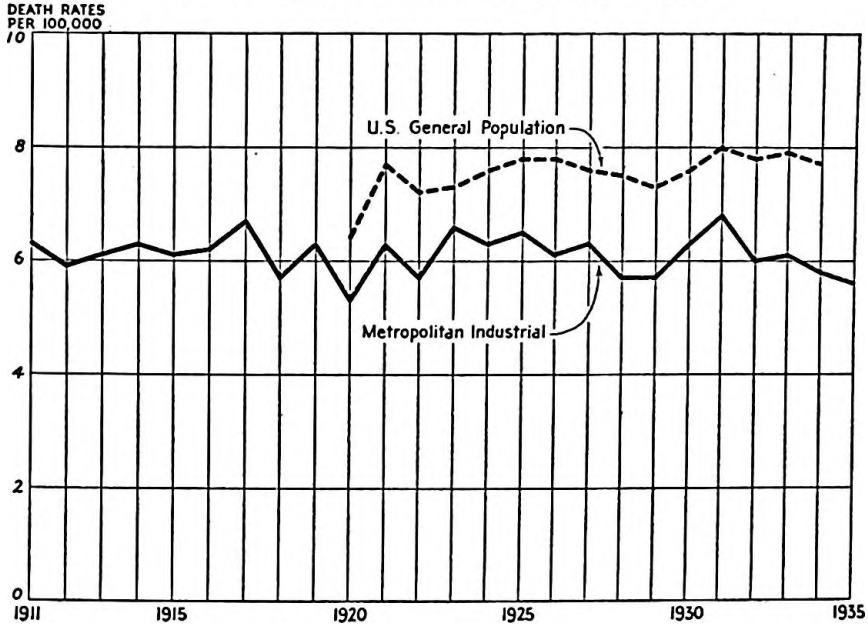
Geography plays an important role in homicide, and it is no secret that our Southern States have long had the worst record. In the three years 1929 to 1931 the homicide rate for the United States as a whole was 8.8 per 100,000 population, whereas the rate for the South was almost twice as high. The rate was also higher than average in the Rocky Mountain States. It was lower than the average in all the other areas of the country. The best record of all was found in the New England States, where the rate was only 2.0. Among individual States, Vermont, with a rate of 1.3, made the best showing of all; and in Maine, New Hampshire, and

CHART VIII

HOMICIDE

Standardized Annual Death Rates per 100,000

Total Persons. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935
and U. S. Registration States of 1920, 1920 to 1934

Massachusetts rates fell under 2. Florida showed the highest rate, 26.4 per 100,000; Mississippi and Alabama had rates higher than 20; and Georgia, Tennessee, and Louisiana were not far below that mark—in other words, almost 10 times as high as New England. Table 5 shows the homicide rate, by States and color, for the period 1929 to 1931; Chart IX presents these data pictorially.

The excessive frequency of homicide in the South is due chiefly to the large percentage of Negroes. It is interesting to note, however, that the highest colored rates are found not in the South, but in the Middle West, with an average rate well above 60 per 100,000. The worst record is in Missouri, closely followed by Ohio, Illinois, and Michigan—all with colored rates of 65 or more per 100,000. However, the homicide rates are more than 60 in four Southern States and 37 for the South as a whole. On the other hand, the colored rate in New England is only about a third that for the entire country. Lower than average colored rates are found also in the Pacific, Rocky Mountain, and Middle Atlantic States. Among the whites, the rate in the South is 8.5, as compared with 5.5 for the

TABLE 5

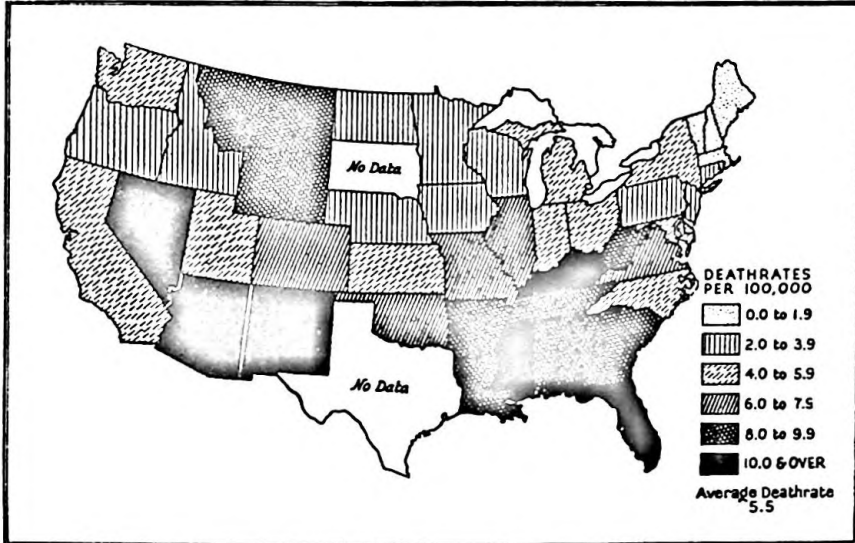
HOMICIDE

Death Rates per 100,000 Population in U. S. Registration States of 1929
By States and Color. 1929 to 1931

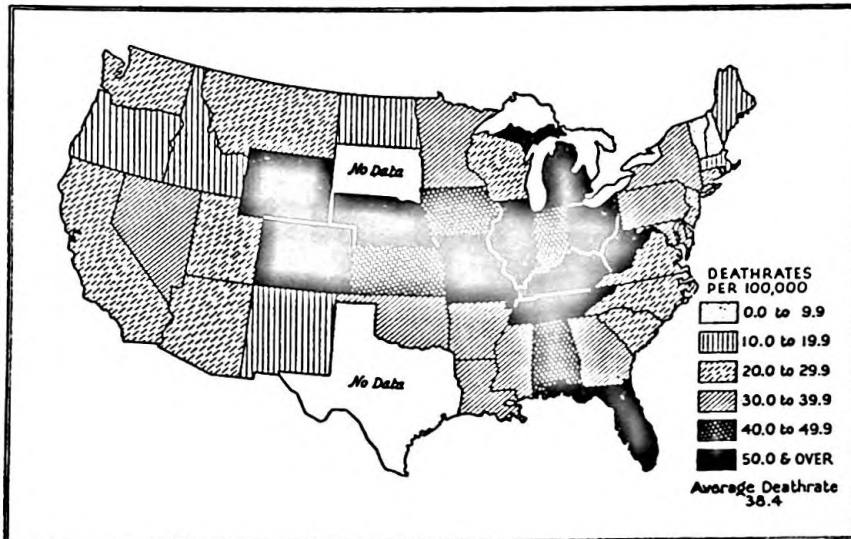
STATE	DEATH RATES PER 100,000			STATE	DEATH RATES PER 100,000		
	Total	White	Colored		Total	White	Colored
U. S. REG. STATES	8.8	5.5	38.4	SOUTH ATLANTIC (Cont.)			
NEW ENGLAND...	2.0	1.8	13.8	Virginia.....	11.8	6.7	25.7
Maine.....	1.4	1.3	14.9	West Virginia..	12.5	8.9	62.5
New Hampshire..	1.5	1.5	0.0	North Carolina..	10.6	5.7	22.4
Vermont.....	1.3	1.3	0.0	South Carolina..	14.3	8.0	21.8
Massachusetts...	1.8	1.7	10.6	Georgia.....	19.6	8.9	38.0
Rhode Island...	2.2	2.1	9.5	Florida.....	26.4	12.3	60.2
Connecticut....	2.9	2.5	21.9	EAST SOUTH CENTRAL.....	19.6	10.4	44.6
MIDDLE ATLANTIC	5.4	4.2	33.5	Kentucky.....	16.9	12.1	67.4
New York.....	5.8	4.8	33.8	Tennessee.....	18.7	9.2	61.3
New Jersey.....	5.0	3.7	28.5	Alabama.....	20.6	9.6	40.4
Pennsylvania...	5.1	3.6	35.7	Mississippi....	23.1	10.5	35.6
EAST NORTH CENTRAL.....	7.8	5.6	63.4	WEST SOUTH CENTRAL.....	14.7	8.3	34.8
Ohio.....	8.8	5.9	67.2	Arkansas.....	15.6	8.6	35.5
Indiana.....	6.6	5.2	47.3	Louisiana.....	18.3	8.7	34.6
Illinois.....	9.9	7.3	66.8	Oklahoma.....	10.8	7.9	33.9
Michigan.....	6.9	4.7	65.0	MOUNTAIN.....	9.0	8.4	24.5
Wisconsin.....	3.0	2.8	29.1	Montana.....	10.0	9.4	26.2
WEST NORTH CENTRAL.....	5.7	4.0	61.1	Idaho.....	3.4	3.3	10.8
Minnesota.....	3.0	2.7	35.8	Wyoming.....	9.1	8.1	61.6
Iowa.....	2.8	2.4	47.6	Colorado.....	8.5	7.8	50.9
Missouri.....	10.7	6.6	72.2	Nevada.....	17.6	16.5	30.6
North Dakota...	2.2	2.1	11.1	Utah.....	5.0	4.7	25.4
Nebraska.....	3.4	2.7	55.7	Arizona.....	13.2	11.8	22.1
Kansas.....	6.3	4.9	44.3	New Mexico...	13.8	14.1	10.3
SOUTH ATLANTIC	14.4	7.4	32.2	PACIFIC.....	5.9	5.3	20.7
Delaware.....	8.5	4.0	36.7	Washington....	4.9	4.4	23.1
Maryland.....	8.5	4.1	30.1	Oregon.....	3.8	3.5	19.7
District of Columbia.....	13.9	6.8	32.7	California.....	6.5	5.8	20.4

CHART IX
GEOGRAPHIC DISTRIBUTION OF HOMICIDE
United States, 1929 - 1931

WHITE PERSONS



COLORED PERSONS



country as a whole. In a Southern group comprising Kentucky, Tennessee, Alabama, and Mississippi the rate is almost double that of the entire country. This high white rate combined with a relatively high colored rate gives the South its unenviable position.

Homicide in Urban and Rural Areas Compared

Since the beginning of the century Federal statistics have shown a consistently higher homicide rate in urban than in rural areas. The ratio of the urban to the rural rate was 2 to 1 in 1900 and 1.3 to 1 in 1933. Among the white population the urban rate was only slightly higher than that of the rural in 1933; among the colored population it was more than double. Several observers have pointed out that especially brutal and atrocious crimes have taken place in the country. It would seem to be true that a large proportion of these murders and manslaughters are crimes of passion. In the city, economic incentives are probably more important. Many urban murders arise from gangsterism and racketeering of various kinds and are connected with attacks on property. Unfortunately, data are not available to settle this question conclusively.

Methods of Homicide

When we come to a consideration of the methods that are used in homicide, we find a relatively simple story. In the United States about two thirds of all homicides result from the use of firearms. For the country as a whole, during the years 1930 to 1933, 67 percent of all the homicides were due to firearms; 16 percent to the use of cutting or piercing instruments, and the remaining 17 percent were divided among other means of inflicting death. All the spectacular and all the bizarre murders that one reads about form a relatively small percentage of the total number. Methods of homicide, moreover, have not changed greatly in the past quarter of a century.

In the rural areas of the United States the use of firearms is even more extensive than in the country as a whole. During the years 1930 to 1933, 72 percent of all rural homicides were caused by firearms; 12 percent by cutting or piercing instruments; and 16 percent by other means. In urban sections the comparative figures were 63, 18, and 19. Among the Industrial policyholders of the Metropolitan, in the years 1930 to 1932, 64 percent of the homicides were caused by firearms, 18 percent by cutting or piercing instruments, and 18 percent by all other means. At every age

and for all groups, shooting was the predominant method used. Although the figures varied somewhat, the methods used were in the same order of importance in each sex.

In view of the importance of firearms as a means of homicide, it seems logical to restrict their use, if we are to make any headway in reducing the homicide rate. In suicide, controlling the sale of weapons would not solve the problem because the person with a strong death impulse can always find a way to gratify the desire to die. Homicide, on the other hand, is often entirely unpremeditated. Many murders committed during attempts at robbery would not have occurred if panic and fear of discovery had not led the law-breaker to draw his gun. Prohibiting the sale of firearms so far as possible, limiting strictly the number of permits given, and penalizing severely the person found carrying a gun without a permit would be relatively simple measures for reducing the number of murders. The ease with which guns can be bought in the United States is an open scandal. So long as we continue to tolerate the traffic in firearms we shall pay the price in a shockingly high incidence of homicide.

How Can We Curb Homicide?

Not for a moment, however, must it be supposed that merely restricting the use of firearms will go far in controlling our homicide rate. The problem is far too complex to admit of any such easy solution. Those who have special axes to grind urge some particular method as a cure-all. They claim that if we could clean out our slums, or create wholesome recreational facilities for our boys and girls, or clear up emotional difficulties, or eradicate the demoralization of unemployment and lack of occupational skill, or prevent political graft and eliminate gangsterism—the result would be a reduction in the rate of homicide. There is much to be said for each of these measures; but no one of them alone is sufficient to alter the situation radically, although all of them would influence it.

The most serious obstacle to effective action in lowering the homicide rate is the absence of reliable data regarding the slayer. At the present time we are working in the dark; we know practically nothing about the composition of our criminal class. We cannot picture with any clarity the type of man who kills, his constitutional make-up, his hereditary endowment, the racial background from which he springs, and the family patterns that, in early childhood, shaped his character. We do not understand the influences of environment, or whether he has been able to

benefit from the educational and vocational opportunities that a democracy offers. Treatment will continue to remain a makeshift until we are able to evaluate personality more definitely and to recognize the physical, mental, and social factors that cause warping and regression. We must then seek to devise methods to rectify their ill effects and to control the forces which mold human nature and society. It is clear that community facilities dealing with delinquency will have to be better organized and sounder techniques must be instituted for the care of problem children and adolescents. The gaps in our knowledge are so great that further investigation is urgently needed.

ACCIDENTAL AND UNSPECIFIED VIOLENCE

The destruction of human life in the United States by injuries sustained in preventable home, occupational, and public accidents is one of the most deplorable aspects of the mortality record of our country. The United States records more fatal accidents in relation to the size of its population than does any other nation, with the possible exception of Chile. In 1934, the most recent year for which data are available, more than 100,000 persons in this country were killed in accidents of one kind or another. These deaths constituted 7.2 percent of all persons who died that year and occurred at the rate of 80 persons for each 100,000 of population. In Canada, where conditions of life closely resemble those in the United States, a death rate of 49.7 per 100,000 was reported in 1934, or almost 40 percent below that for the United States. The death rate in this country was almost twice that for England and Wales, or New Zealand; more than double that for Italy, Denmark, or Belgium. An even greater disparity exists between the American rates and those for some of the other European countries.

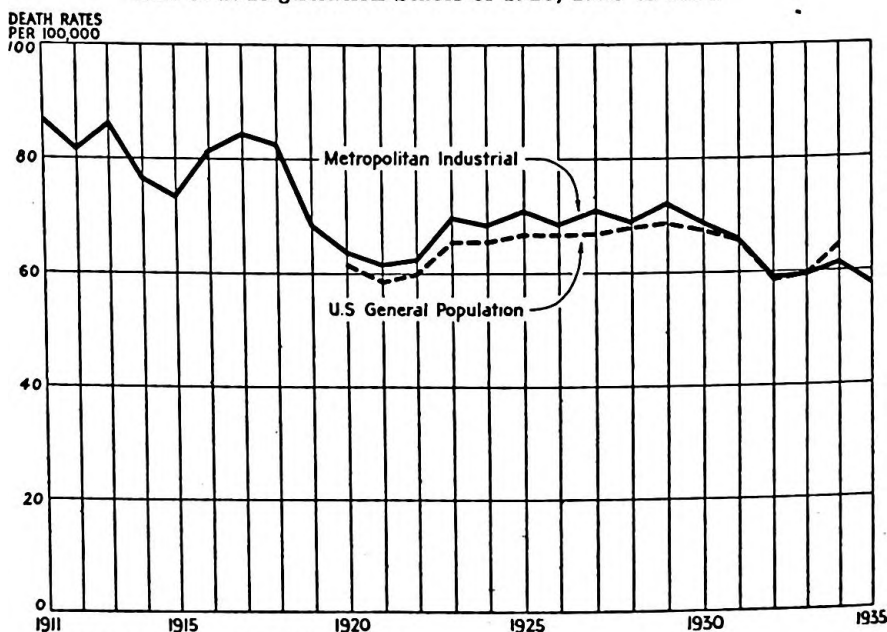
Special conditions of life and of industry in the United States go a long way to explain the unfavorable position of this country among the nations of the world. The United States possesses a much larger number of automobiles and far more railroad mileage than does any other country. It is a highly industrialized nation, with industry mechanized to an extraordinary extent. Tall apartment dwellings and office buildings characterize its cities. Their construction and maintenance undoubtedly present special hazards. All these and many other factors must be taken into consideration in comparing national accident statistics. Possibly these special conditions account for our excessive mortality as compared with other countries. Whether Americans are more reckless than the peoples of other nations, as is so frequently asserted, and consequently suffer a loss of life disproportionate to the hazards to which they are exposed, must remain a matter of opinion in the absence of adequate statistical data on which to base a judgment. It will hardly be disputed, however, that the attitude of Americans towards safety is far from what it should be, and that we pay a high price for carelessness and recklessness.

Particular interest attaches to the accident record of Industrial policyholders, for in the past it has been in the industrial population that the greatest toll has been taken. Over the period 1920 to 1934 the average standardized death rate (ages 1 to 74 years) for Industrial policyholders of the Metropolitan Life Insurance Company exceeded the rate for the population of the Registration States of 1920 by 2.9 percent. From Chart X it will be seen that year after year until 1933 the death rates for insured persons exceed those for the general population. In 1933 and 1934, however, the rates for the general population were the higher. The chart shows also that the trends for the two experiences are parallel. This correspondence gives added significance to our trend data covering a period of 25 years, since the findings for policyholders may be said to be typical of the country as a whole.

During the quarter century 1911 to 1935 a total of 216,531³ deaths at ages 1 to 74 in this insurance experience were allocated

CHART X
ACCIDENTAL AND UNSPECIFIED VIOLENCE*
 Standardized Annual Death Rates per 100,000
 Total Persons. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935
 and U. S. Registration States of 1920, 1920 to 1934



*Excludes deaths from wounds of war.

³Does not include 9,362 deaths from wounds of war recorded in this insurance experience for the period of 1915 to 1935.

to one or another of the accident titles. This number constituted 6.8 percent of the deaths from all causes. The standardized annual death rates for the 25 years averaged 70.8 per 100,000 persons exposed. For the period as a whole, accidents as a cause of death ranked fourth in importance among males and seventh in order among females. Moreover, accidents have grown in importance as an item in the mortality picture. For the period 1911 to 1915 accidental and unspecified violence constituted 6.3 percent of the deaths from all causes; by 1926 to 1930 the proportion had increased to 7.4 percent, but in 1931 to 1935, owing to a marked decline in the accident rates during these depression years, the proportion dropped to 6.9 percent.

In each of the four color-sex groups accidental and unspecified violence ranks among the leading causes of death throughout the span of life. Among white males at present accidents actually outrank every other cause of death in the important age range 5 to 24 years. In the following 20 years of life, 25 to 44, accidents are second only to tuberculosis in this insurance mortality record. Even at the older ages, among white male policyholders, accidents rank fifth or sixth in numerical importance among the causes of death.

Mortality by Age, Sex, and Color

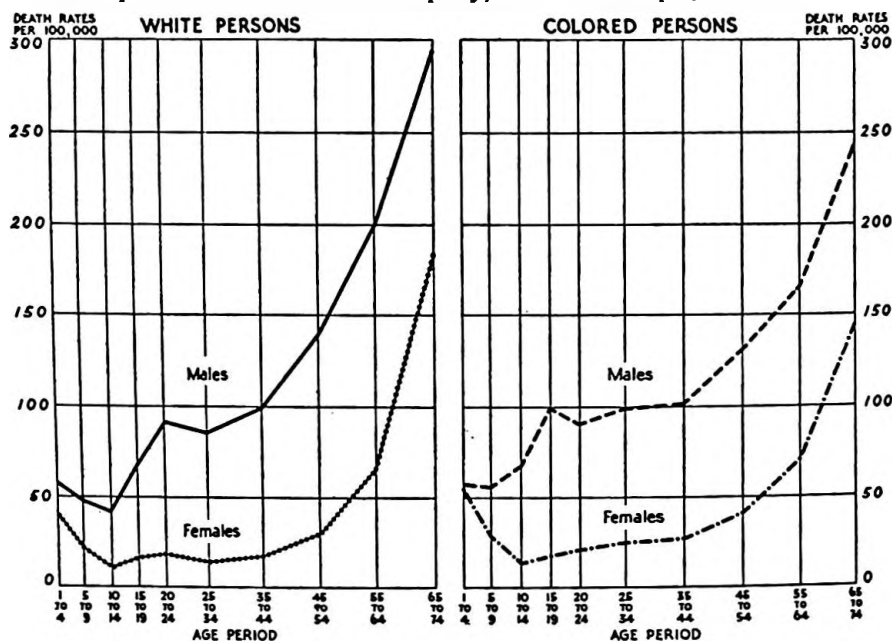
Age The age curve of the accident death rate is at its lowest point in late childhood and reaches its highest levels at the oldest ages. There are, however, differences in the age picture when considered by sex. Among white males the accident death rate decreases during the school years, then rises sharply during the teens and early twenties, and after a small decline at ages 25 to 34 increases rapidly with advancing age. The contour of the age curve of colored males is, in general, similar to that of white males, except that the first peak is reached five years earlier. Among females, on the other hand, the death rate reaches a minimum at ages 10 to 14 and varies but little from that period to ages 35 to 44. At the later years of life the mortality among females, like that for males, increases rapidly with advancing age. The attention of the reader is directed to the relatively high rates among girls, both white and colored, at ages 1 to 4. Chart XI shows graphically the age curve of accident mortality by color and sex among Metropolitan Industrial policyholders for the period 1931 to 1935; Table 6 presents the death rates.

CHART XI ACCIDENTAL AND UNSPECIFIED VIOLENCE*

Averages of Annual Death Rates per 100,000

By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935



*Excludes deaths from wounds of war.

Sex

Few causes of death show so high a ratio of male to female mortality as accidents do. For the five-year period 1931 to 1935 the death rate among males exceeded that among females by 225 percent for white policyholders and by 187 percent for the colored. In both cases the rate for males is higher than that for females at every age period, the greatest difference in mortality being recorded at the working period of life. The higher male rate results, for the most part, from a greater spirit of adventurousness and from exposure to occupational hazards. For those means of accidental injury which arise largely out of or in the course of employment (machinery, mines and quarries, electricity) the mortality for females is negligible. Accidents incidental to transportation and those resulting from sports and recreation also show a marked excess male death rate. Only one accidental means of injury, burns, shows an excess female mortality.

Color

In the recent five-year period the death rate from accidents among colored policyholders, in the aggregate, exceeded that for the white by 5 percent among males and 19 per-

TABLE 6
ACCIDENTAL AND UNSPECIFIED VIOLENCE†

Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000						PERCENT CHANGE 1931-1935 SINCE 1911-1915	
	MALES			FEMALES			MALES	FEMALES
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915		
WHITE								
1 to 74*.....	110.3	93.6	127.9	32.8	28.8	36.3	-26.8	-20.7
1 to 4.....	79.5	55.7	99.8	61.2	40.5	76.4	-44.2	-47.0
5 to 9.....	65.0	47.4	66.5	29.5	21.1	28.5	-28.7	-26.0
10 to 14.....	58.8	41.5	65.7	14.0	10.5	14.1	-36.8	-25.5
15 to 19.....	83.5	68.7	87.0	17.3	16.9	17.0	-21.0	- 0.6
20 to 24.....	95.4	91.1	100.2	16.8	18.0	17.4	- 9.1	+ 3.4
25 to 34.....	96.6	85.6	116.4	15.4	14.8	15.8	-26.5	- 6.3
35 to 44.....	121.8	98.1	157.8	19.3	16.8	20.3	-37.8	-17.2
45 to 54.....	162.4	139.5	195.4	32.5	30.4	38.2	-28.6	-20.4
55 to 64.....	219.4	200.4	249.9	69.6	68.4	77.6	-19.8	-11.9
65 to 74.....	312.3	295.6	343.3	186.5	183.9	213.7	-13.9	-13.9
COLORED								
1 to 74*.....	113.6	98.4	123.0	40.8	34.3	44.4	-20.0	-22.7
1 to 4.....	99.6	57.5	130.6	92.0	56.8	122.4	-56.0	-53.6
5 to 9.....	67.2	56.1	66.4	43.8	28.2	47.3	-15.5	-40.4
10 to 14.....	86.9	67.6	85.8	17.5	13.6	21.8	-21.2	-37.6
15 to 19.....	119.8	99.9	135.1	21.3	17.0	15.7	-26.1	+ 8.3
20 to 24.....	103.8	90.8	111.8	23.2	21.1	25.3	-18.8	-16.6
25 to 34.....	102.7	98.8	115.3	24.4	24.8	22.9	-14.3	+ 8.3
35 to 44.....	114.8	101.0	122.9	27.6	26.4	30.4	-17.8	-13.2
45 to 54.....	141.9	130.1	140.4	38.0	40.2	41.4	- 7.3	- 2.9
55 to 64.....	176.9	164.9	189.4	69.4	70.2	60.2	-12.9	+16.6
65 to 74.....	252.4	242.0	268.4	159.1	144.4	172.2	- 9.8	-16.1

*Standardized for age. †Excludes deaths from wounds of war.

cent among females. The color ratio varies distinctly, however, with age. As regards males the colored registered a higher mortality than the whites at virtually all age groups under 45, but thereafter the reverse was true; for females the colored rate was greater in every age period except 65 to 74. The differences in the accident death rates for white and colored persons undoubtedly reflect differences in the economic position, geographic distribution, and occupational distribution of the races.

Trend of Mortality

Over the 25-year period 1911 to 1935 the general trend of the mortality from accidents among Metropolitan Industrial policyholders has been downward, but the decline has not been continuous nor as marked as for the mortality as a whole. The curve of the accident death rate fluctuated, in a general way, with the curve of employment and of business activity. The drop in mortality between 1913 and 1915 was consistent with a decrease in industrial activity. Beginning with 1916, acceleration of productivity incidental to the World War brought with it a sharp increase in accident fatalities. In the years immediately following the close of hostilities, a period of economic readjustment, the mortality dropped sharply, reaching a low point in 1921, a year of industrial depression. With the renewal of business activity in 1922 and 1923 the accident rate rose and continued gradually upward through 1929. In the three years 1930 through 1932 the trend of the accident death rate, reflecting widespread unemployment, showed a definite downward movement. With an increase in business activity in 1933 and 1934 the mortality rose somewhat. In 1935, however, the death rate from accidents fell to 57.5 per 100,000, the lowest point to be reached in this quarter century of experience. For the five-year period 1931 to 1935 the mortality from accidents among these policyholders was 25 per cent lower than that for the quinquennium 1911 to 1915. The annual data appear in Appendix Table C.

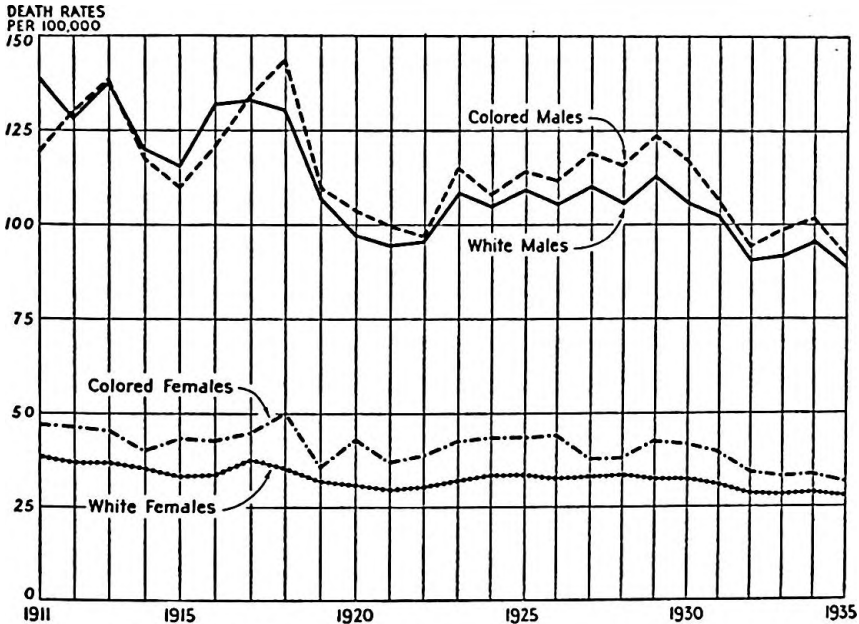
The course of the accident death rate in each color and sex group paralleled that for the aggregate at ages 1 to 74 combined. Chart XII displays graphically the time series in each of the four groups. The wide fluctuations characterizing the rates for males are approximately repeated on a greatly diminished scale in the trend for females.

The influence of the business cycle on the trend of the accident death rate is evident only at the working period of life. Among children and adolescents, whose activities are conditioned not by industry but by the home and the school, the mortality picture is totally different from that among adults. At the pre-school ages 1 to 4 years, the death rate in each color-sex group exhibited a decisive and continuous decline over the entire 25-year period. This conservation of child life undoubtedly reflects generally improved living conditions and the better care of children during this period. Similarly, among boys and girls of school age,

CHART XII ACCIDENTAL AND UNSPECIFIED VIOLENCE*

Standardized Annual Death Rates per 100,000
By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



*Excludes deaths from wounds of war.

5 to 14 years, the accident rate fell during the greater part of the 25-year period, actually reversing a rising tendency manifested in the early years of the study. Among white boys at these ages, for example, the death rate rose from 64.8 per 100,000 in 1911 to 77.2 in 1918, and then declined to 39.5 in 1935. The decline undoubtedly has been due in part to safety education, which, in recent years, has had a definite place in the course of study of many schools.

The wide fluctuations of the annual death rates at the various age groups, as well as at ages 1 to 74 combined, make it inadvisable to calculate trends for either the 25-year period as a whole or for any substantial part of it. We have, however, computed the percent change in the death rates from accidents, by age, between the first and the last quinquennium of the 25-year period. The figures are shown in Table 6. Practically the entire age range has benefited from the lessened toll of fatal accidents. Among males, both white and colored, declines are evident at each age period.

Moreover, among white females, an improvement in mortality is recorded at each age period except 20 to 24. Colored females, likewise, showed decreases at most age periods.

Origin of Hazard

Information regarding origin of hazard or type of activity in which the deceased was engaged at the time of the fatal injury, was secured for 90 percent of the deaths from accidental and unspecified violence among Metropolitan Industrial policyholders, ages 1 to 74, for the period 1926 to 1935. From these returns it appears that 61.4 percent of the accidents occurred in public places, *i. e.*, on public streets, highways, and other public facilities; 23.8 percent occurred at home, and 14.8 percent were occupational in character. Marked differences, however, are evident in each sex and at the several ages. Among males, public accidents were predominant at every period of life except the preschool years, at which half of the deaths were of public and half of home origin. At the main working ages of life, 15 to 64, 28 percent of the accidental deaths among males resulted from occupational injuries. Among females, as might be expected, home accidents were far more important than among males, whereas the occupational factor was practically negligible.

In order to evaluate the effects of widespread unemployment during the years 1931 to 1935 on the origin of hazard of accidental deaths, comparative data are shown for the periods 1926 to 1930 and 1931 to 1935. The outstanding change is the decreased importance of occupational fatalities from 17.2 percent of the deaths of specified origin in 1926 to 1930, to 12.1 percent in 1931 to 1935. Each broad age group recorded a lower proportion of occupational deaths in relation to the total. The lessened importance of occupational deaths in recent years has necessarily resulted in an increased percentage of home and public accidents. Table 7 shows the origin of hazard data for the decade 1926 to 1935 and for the constituent five-year periods.

Means of Injury

The greatest interest must always attach to the figures for the specific means of injury, for it is upon these data that accident prevention campaigns must be based. Such figures serve to concentrate the forces of accident prevention where they can accomplish the greatest saving of lives.

TABLE 7
ACCIDENTAL AND UNSPECIFIED VIOLENCE†
Percentage Distribution of Deaths by Origin of Hazard for all Means of Injury Combined
By Sex and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Department, 1926 to 1935

Age Period Years	TOTAL PERSONS							MALES							FEMALES						
	Origin of Hazard Specified				Total Num- ber of Deaths			Origin of Hazard Specified				Total Num- ber of Deaths			Origin of Hazard Specified				Total Num- ber of Deaths		
	Num- ber of Deaths	Percentage Distribution			Total	Home	Public	Num- ber of Deaths	Total	Home	Public	Num- ber of Deaths	Total	Home	Public	Num- ber of Deaths	Total	Home	Public		
		Occupational																			
		Percentage Distribution																			
1926 TO 1935																					
1 to 74	102,238	92,142	100.0	23.8	61.4	14.8	71,487	64,832	100.0	15.5	63.9	20.6	30,751	27,310	100.0	43.4	55.6	1.0			
1 to 4	8,823	7,787	100.0	54.3	45.7	0.4	5,062	4,476	100.0	49.7	50.3	0.0	3,761	3,311	100.0	60.6	39.4	0.1			
5 to 14	16,012	14,617	100.0	13.7	85.9	0.4	11,729	10,737	100.0	9.4	90.1	0.5	4,283	3,880	100.0	25.5	74.4	0.1			
15 to 64	66,247	59,862	100.0	18.7	60.0	21.3	49,305	44,760	100.0	12.3	59.7	28.0	16,942	15,102	100.0	37.9	60.5	1.6			
65 to 74	11,156	9,876	100.0	45.3	46.6	8.1	5,391	4,859	100.0	27.4	56.7	15.9	5,765	5,017	100.0	62.6	36.8	0.6			
1931 TO 1935																					
1 to 74	46,443	44,063	100.0	25.1	62.8	12.1	32,140	30,620	100.0	16.6	66.4	17.0	14,303	13,443	100.0	44.4	54.6	1.0			
1 to 4	3,272	3,064	100.0	52.7	47.3	0.3	1,909	1,784	100.0	48.3	51.7	0.0	1,363	1,280	100.0	58.8	41.2	0.0			
5 to 14	6,595	6,315	100.0	14.5	85.2	0.3	4,896	4,715	100.0	10.1	89.5	0.4	1,699	1,600	100.0	27.5	72.5	0.0			
15 to 64	30,617	29,084	100.0	20.1	62.8	17.1	22,524	21,459	100.0	13.7	63.7	22.6	8,093	7,625	100.0	38.0	60.4	1.6			
65 to 74	5,959	5,600	100.0	47.9	45.6	6.5	2,811	2,662	100.0	30.1	56.8	13.1	3,148	2,938	100.0	64.1	35.4	0.5			
1926 TO 1930																					
1 to 74	55,795	48,079	100.0	22.6	60.2	17.2	39,347	34,212	100.0	14.5	61.7	23.8	16,448	13,867	100.0	42.4	56.5	1.1			
1 to 4	5,551	4,723	100.0	55.4	44.6	0.5	3,153	2,692	100.0	50.7	49.3	0.0	2,398	2,031	100.0	61.7	38.3	0.1			
5 to 14	9,417	8,302	100.0	13.0	86.5	0.5	6,833	6,022	100.0	8.8	90.6	0.6	2,584	2,280	100.0	24.1	75.8	0.1			
15 to 64	35,630	30,778	100.0	17.4	57.2	25.4	26,781	23,301	100.0	10.9	56.1	33.0	8,849	7,477	100.0	37.7	60.6	1.7			
65 to 74	5,197	4,276	100.0	41.9	47.8	10.3	2,580	2,197	100.0	24.1	56.5	19.4	2,617	2,079	100.0	60.7	38.6	0.7			

†Excludes deaths from wounds of war.

For the period 1911 to 1935 approximately two thirds of the mortality from accidental and unspecified violence in this insurance experience was due to five means of injury. As shown in Table 8, automobile accidents ranked first, accounting for 24.3 percent of the deaths from accidents. Important also were accidental falls, which were responsible for 14.6 percent of the total. Drowning, next in order, comprised 11.8 percent of the mortality from all accidents. Burns and railroad accidents followed in importance.

A marked change, however, has taken place in the relative importance of certain means of injury over the 25-year period. Traumatism by automobiles constituted only 5.6 percent of the mortality from accidents in the period 1911 to 1915, but accounted for 36.8 percent of the total for the years 1931 to 1935. At the same time the relative importance of railroad accidents, burns, and drownings, among others, decreased. These changes in the accident picture resulted from the sharp increase in the death rate from automobile accidents, while all the other important means of accidental injury registered substantial declines in mortality. Between the quinquennia 1911 to 1915 and 1931 to 1935 the death rate from automobile accidents increased 443.9 percent; in contrast, the rate declined 45.1 percent for drownings, 60.7 percent for burns, and 69.0 percent for railroad accidents. Even falls, which increased in *relative* importance over the 25-year period, actually showed a decline of 28.7 percent in death rate. We shall discuss these movements of mortality in much fuller detail in the sections which follow.

Origin of Hazard and Principal Means of Injury

In and about the home, during the period 1926 to 1935, 39.3 percent of the accident mortality was due to falls, 24.5 percent to burns, and 12.5 percent to absorption of poisonous gas. Of the fatal accidents in public activities, automobiles were responsible for 57.4 percent and drownings for 16.8 percent. In industry, as in the home, falls were the leading means of injury, accounting for 15.2 percent of the occupational deaths; automobile accidents, traumatism in mines and quarries, traumatism by machines, and railroad accidents followed closely in order of importance. Table 9 shows for each origin of hazard class the number and proportion of deaths for the principal means of injury. The "unspecified" column shows the number of additional deaths which would have been recorded under the specified headings if information regarding the origin of hazard had been available.

TABLE 8
ACCIDENTAL AND UNSPECIFIED VIOLENCE
Averages of Annual Death Rate† per 100,000 for Specified Means of Injury
and Percent Each Means of Total Accidental Deaths. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

MEANS OF INJURY	DEATH RATE† PER 100,000					PERCENT CHANGE 1931-1935 SINCE 1911-1915	PERCENT OF ALL ACCIDENTAL DEATHS		
	1911 to 1935	1931 to 1935	1926 to 1930	1921 to 1925	1916 to 1920	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
	70.8	60.6	69.9	66.6	76.1	80.8	100.0	100.0	100.0
ACCIDENTAL AND UNSPECIFIED VIOLENCE*	0.7	0.3	0.5	0.6	0.8	1.2	—	75.0	—
Poisoning by food.....	1.7	1.1	1.4	1.6	1.9	2.4	2.4	1.8	3.1
Other acute accidental poisonings (gas excepted)†	1.1	1.0	1.2	1.1	1.0	1.2	1.6	1.6	1.5
Conflagration.....	6.4	3.5	5.0	6.2	8.4	8.9	9.5	6.2	12.1
Burns (conflagration excepted).....	8.2	6.2	7.0	7.5	8.9	11.3	11.8	10.3	15.3
Drowning.....	1.7	1.4	1.6	1.8	2.1	1.8	2.8	2.3	2.7
Traumatism by firearms.....	11.2	10.7	9.9	8.7	11.5	15.0	14.6	18.3	16.7
Traumatism by fall.....	1.4	1.0	1.5	1.4	1.6	1.5	1.8	1.4	1.8
Traumatism in mines and quarries.....	1.7	1.1	1.6	1.6	2.2	1.9	2.2	1.6	2.3
Traumatism by machines.....	6.2	3.1	4.6	4.9	8.2	10.0	7.5	4.9	11.8
Railroad accidents.....	2.2	0.9	1.5	2.0	2.9	3.6	2.7	1.5	4.2
Streetcar accidents.....	14.7	22.3	21.1	15.7	10.2	4.1	24.3	36.8	5.6
Automobile accidents.....	2.0	1.0	1.2	1.7	2.7	3.5	2.5	1.6	4.4
Traumatism by other vehicles.....	1.4	0.9	0.7	1.0	1.7	2.8	1.6	1.5	3.0
Excessive heat.....	0.9	0.5	0.9	1.0	1.1	0.9	1.1	0.7	1.1
Electricity (lightning excepted).....	9.3	5.6	10.2	9.8	10.9	10.7	12.6	8.8	12.8
Other accidental and unspecified violence‡.									

*Excludes deaths from wounds of war. †Standardized for color, sex, and age. ‡Includes deaths from poisoning by venomous animals for the period 1911 to 1921. †Includes deaths from absorption of poisonous gas for the period 1922 to 1935, see page 505.

TABLE 9
ACCIDENTAL AND UNSPECIFIED VIOLENCE
Number and Percent of Deaths by Means of
Injury and Origin of Hazard. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Department, 1926 to 1935

MEANS OF INJURY	NUMBER OF DEATHS					PERCENTAGE BY MEANS OF INJURY				
	Total Accidents	Domestic	Public	Occupational	Un-specified	Total Accidents	Domestic	Public	Occupational	Un-specified
ACCIDENTAL AND UNSPECIFIED VIOLENCE*	102,238	21,905	56,600	13,637	10,096	100.0	100.0	100.0	100.0	100.0
Poisoning by food.....	810	287	15	.....	508	0.8	1.3	†	.....	5.0
Other acute accidental poisonings (gas ex- cepted).....	1,995	1,055	81	20	839	2.0	4.8	0.1	0.1	8.3
Conflagration.....	1,758	1,373	116	216	53	1.7	6.3	0.2	1.6	0.5
Burns (conflagration excepted).....	7,459	5,362	418	639	1,040	7.3	24.5	0.7	4.7	10.3
Absorption of poisonous gas.....	3,344	2,730	137	202	275	3.3	12.5	0.2	1.5	2.7
Drowning.....	10,679	195	9,508	702	274	10.4	0.9	16.8	5.1	2.7
Traumatism by firearms.....	2,552	794	751	42	965	2.5	3.6	1.3	0.3	9.6
Traumatism by fall.....	15,918	8,617	3,617	2,066	1,618	15.6	39.3	6.4	15.2	16.0
Traumatism in mines and quarries.....	1,789	.....	161	1,625	3	1.8	.....	0.3	11.9	†
Traumatism by machines.....	1,951	80	167	1,617	87	1.9	0.4	0.3	11.9	0.9
Railroad accidents.....	5,647	.....	4,243	1,396	8	5.5	.....	7.5	10.2	0.1
Streetcar accidents.....	1,790	1	1,620	168	1	1.8	†	2.9	1.2	†
Automobile accidents.....	34,264	2	32,504	1,750	8	33.5	†	57.4	12.8	0.1
Traumatism by other vehicles.....	1,676	7	1,176	487	6	1.6	†	2.1	3.6	0.1
Excessive heat.....	1,261	142	273	159	687	1.2	0.6	0.5	1.2	6.8
Electricity (lightning excepted).....	961	79	156	632	94	0.9	0.4	0.3	4.6	0.9
Other accidental and unspecified violence.....	8,384	1,181	1,657	1,916	3,630	8.2	5.4	3.0	14.1	36.0

*Excludes deaths from wounds of war. †Less than 0.05.

AUTOMOBILE ACCIDENTS

At the beginning of the century there were but a few thousand automobiles on our streets and highways; by 1935 this number had increased to 26,225,000, of which more than 22,500,000 were passenger cars. Possession of this vast number of motor cars by the families and business organizations of the nation has had a profound effect on the life habits of our people. A source of pleasure, healthful recreation, and efficient transport, the automobile in many ways has contributed to the nation's health and well-being. But unfortunately, it has not come to us as an un-mixed blessing.

Year after year an ever mounting toll of fatal and disabling injuries has kept pace with the growing use of automobiles. The number of men, women, and children killed in automobile accidents (excluding collisions between automobiles and heavier vehicles) has increased from about 2,100 in 1911, to 34,000 in 1934, while the number suffering either severe or temporary injuries incapacitating them for their daily tasks has risen from approximately 73,500 to more than a million a year. The roll of the dead in 1934 included 4,300 children under 15 years of age, 24,500 persons 15 to 64 years of age, most of whom carried heavy family responsibilities, and about 5,200 old people.

This wholesale slaughter is without parallel outside of war. No other country, in proportion to the size of its population, exhibits anything like as many deaths. Our automobile death rate, reckoned on a population basis, is more than twice as high as that for Canada or England. It is more than five times the rates for Italy or Germany. In fairness to ourselves, it must be stated that the automobile death rates for the several countries of the world, in the main, vary with the number of registered automobiles. Almost three fourths of the automobiles in operation throughout the world are owned in the United States. To some extent the rise in automobile fatalities has been compensated by a reduction in deaths from other types of vehicles which the automobile has displaced. Our unfavorable place among the nations may, therefore, be traced directly to our national wealth and efficiency. But mere possession of large numbers of automobiles is not the whole explanation. It is clear also that we use our vehicles rashly and badly, and pile up injuries and deaths far beyond a limit that would be reached if these vehicles were used

with care and thought. Hardly a home in this country has been left untouched by the effects of some tragic automobile accident for which carelessness or even recklessness was chiefly responsible. The unfavorable mental effect of these accidents on the families of the victims is not the least of the evils flowing from them.

Our automobile accident record, bluntly stated, has become nothing short of a national disgrace and calamity. Here is a problem of the first magnitude, if ever there was one, which cries out for solution. Actually, as will be brought out in the discussion of the death rates among Industrial policyholders of the Metropolitan Life Insurance Company, we must deal not with one, but with a number of intricate problems. A few of these are already apparently responding to control, while others are increasing in spite of all the efforts that have been made to solve them. The importance of the problem demands the closest study of all the statistical data available in order that the great efforts which unquestionably are being made to overcome the hazards of motor travel may be evaluated and directed into the most profitable channels.

Scope of the Survey

Throughout the period covered by this survey, accidental deaths have been classified according to international practice, which requires that deaths resulting from collision between vehicles be assigned to the heavier vehicle. For example, the death of a person killed in a grade-crossing collision between a railroad engine and an automobile is classified as a death in a railroad accident. In the same way a death in an automobile and streetcar collision is classified under the streetcar accidents. International practice also requires that death from automobile carbon monoxide poisoning be classified not as an automobile accident, but as death from poisonous gas. As a result of this procedure, a considerable number of deaths which should be regarded as properly chargeable to automobile accidents are not so included in this study.

Our detailed discussion of automobile accidents will be confined, then, to primary automobile accidents as classified by international practice. Beginning with 1925, a complete record was kept of deaths by type of accident. Primary automobile accidents, it was found, accounted for more than 90 percent of the motor car fatalities among Industrial policyholders. The mortality from each type of automobile accident will be discussed in a later section of this chapter.

Automobile accidents were by far the leading cause of accidental death for the period 1911 to 1935 as a whole. The 52,583 deaths charged to primary automobile accidents among Metropolitan Industrial policyholders, ages 1 to 74, were 66 percent greater than the number allocated to falls, the second leading cause of accidental death. These automobile fatalities comprised 24.3 percent of the mortality from all forms of accidents during the period. The standardized death rates averaged 14.7 per 100,000.

Mortality by Age, Sex, and Color

The average death rates from automobile accidents by age, sex, and color among these policyholders for the 25-year period and for the initial and final quinquennia of the series are presented in Table 10.

Age The differential rise in the death rate by age has been so pronounced over the 25-year period as to alter materially the contour of the age curve of automobile accidents. For the quinquennium 1911 to 1915 the mortality throughout life was quite low, with the maximum points occurring at age periods 5 to 9 years and 55 to 74. The outstanding characteristic of the age curve for the years 1931 to 1935 is the towering maximum at the older ages. But among white males in this recent period the death rate is also high at ages 20 to 24. Chart XIII portrays the age curve of the death rates for each color and sex group, for the years 1911 to 1915 and 1931 to 1935.

Sex The mortality from automobile accidents among males, both white and colored, is considerably greater than that for females. Throughout the 25-year period the death rates among both white and colored males were about three times the rates for females, and an excess male mortality was manifested at every age period.

Various factors are responsible for the higher death rate among males at the several ages. At the preschool ages, before children are allowed to play in the streets, the least excess is found. The natural daring of the male is reflected, however, in a substantially higher rate even at these ages. Boys of school age much more frequently than girls play in the roadway or hitch on vehicles, and in consequence they suffer much higher rates. In adult life men travel about in automobiles more than women do, partly on account of their occupation. In the age range 15 to 64 years,

TABLE 10
AUTOMOBILE ACCIDENTS

Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
WHITE						
1 to 74*.....	22.9	34.8	6.8	7.3	10.7	1.9
1 to 4.....	14.7	18.9	3.9	9.0	11.6	2.4
5 to 9.....	25.3	23.2	10.5	11.1	10.3	4.2
10 to 14.....	15.0	14.4	7.1	4.2	4.4	1.4
15 to 19.....	15.8	25.1	4.3	5.5	9.4	1.2
20 to 24.....	22.7	43.4	4.7	5.3	9.9	1.3
25 to 34.....	19.0	34.9	5.0	4.1	7.2	0.9
35 to 44.....	19.7	31.2	6.3	4.8	7.6	1.3
45 to 54.....	27.5	45.3	7.4	7.8	12.9	1.7
55 to 64.....	42.4	69.5	12.3	14.1	22.3	3.4
65 to 74.....	65.8	106.3	15.4	23.1	37.4	3.6
COLORED						
1 to 74*.....	19.9	33.3	3.8	6.2	10.4	1.1
1 to 4.....	11.9	11.6	3.1	6.7	10.9	0.8
5 to 9.....	23.3	25.4	8.1	8.4	8.4	2.3
10 to 14.....	15.3	14.9	4.5	2.1	3.2	1.5
15 to 19.....	13.8	25.6	3.4	4.0	7.1	0.3
20 to 24.....	16.6	32.0	1.6	4.4	6.9	0.3
25 to 34.....	17.4	36.0	2.6	5.3	9.6	0.4
35 to 44.....	18.5	34.2	2.9	5.8	11.1	0.2
45 to 54.....	23.6	46.7	2.4	6.5	14.0	1.6
55 to 64.....	36.2	67.0	6.5	12.0	19.2	2.7
65 to 74.....	51.4	89.0	6.1	17.5	34.9	4.4

*Standardized for age.

10.5 percent of the automobile fatalities among insured males during the years 1926 to 1935 arose out of or in the course of employment. Occupational fatalities among women are, of course, few in number.

Color The mortality among white persons for the 25-year period as a whole was greater than that for colored policyholders. The disparity in death rates has been diminishing, however, and in recent years the mortality for white and for colored

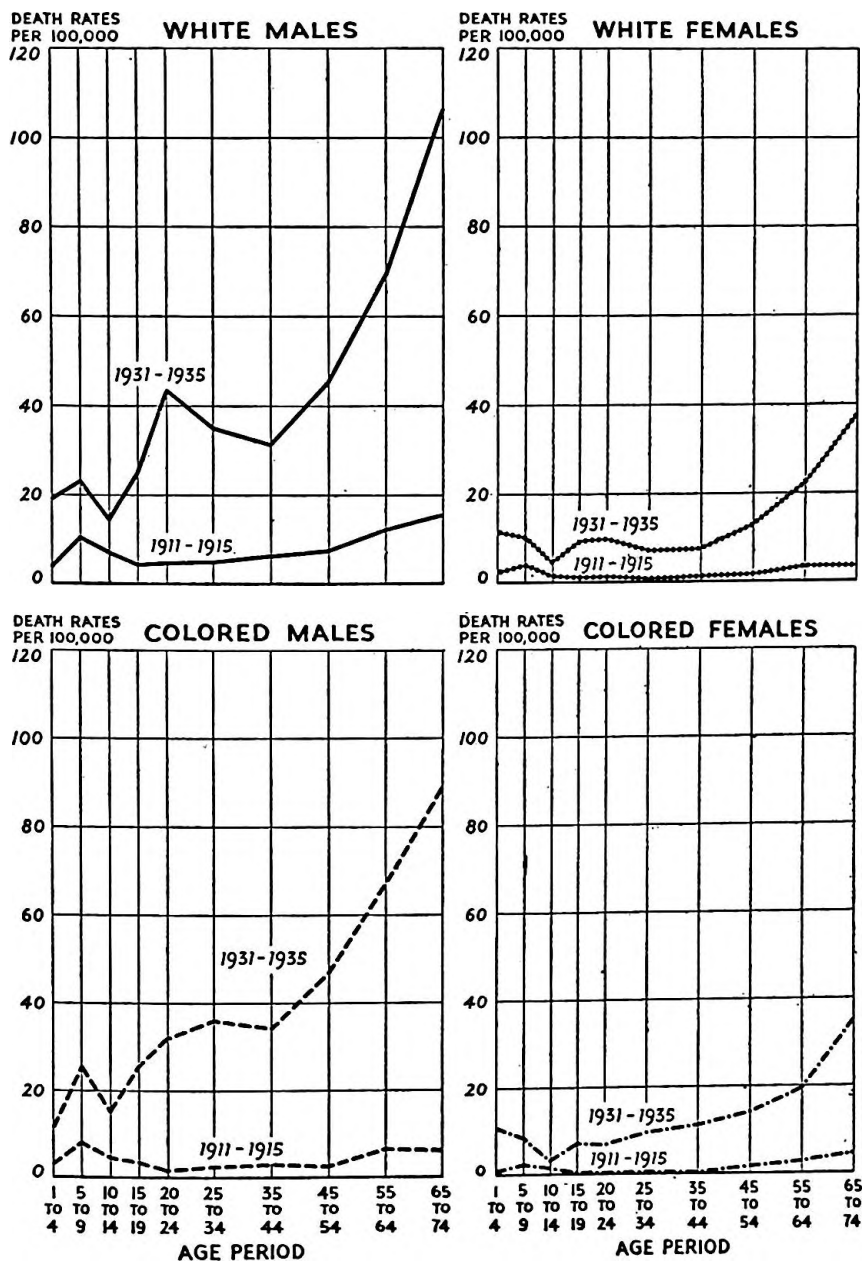
CHART XIII

AUTOMOBILE ACCIDENTS

Averages of Annual Death Rates per 100,000

By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Department
1931 to 1935 and 1911 to 1915



is virtually on the same level. Among males, in the aggregate, the excess white mortality was 79 percent for the period 1911 to 1915, and only 5 percent for the years 1931 to 1935; among females the corresponding figures were 73 percent and 3 percent. The same tendency is evident for the various age groups. In the early quinquennium the death rate among white males exceeded that for the colored at every age period; for the years 1931 to 1935, however, the mortality among colored males was actually higher than that for the white at ages 5 to 19 and 25 to 54 years.

Trend of Mortality

In this quarter century of insurance experience the trend of mortality from automobile accidents was sharply upward. The standardized death rate for Industrial policyholders (ages 1 to 74 years) in 1935, 22.3 per 100,000, was just short of 10 times the rate of 2.4 per 100,000 in 1911. No other cause of death in the years under review has increased in such proportion.

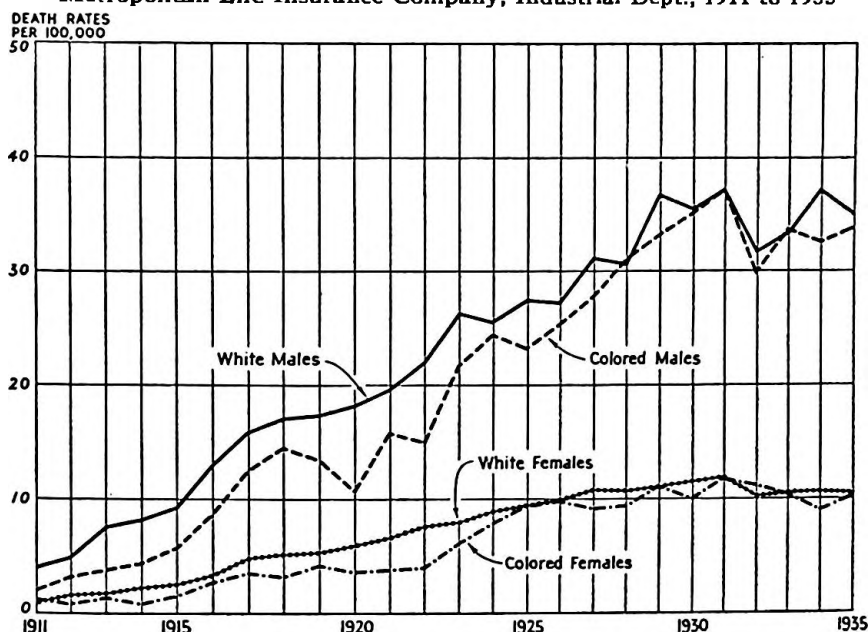
The situation undoubtedly would be even worse than it is, were it not that the steady rise in the number of automobiles on the road was interrupted in the closing years of the period under review. In fact, there was an actual decrease in motor vehicle registration in the United States for the three years 1931 to 1933, after which period the registration rose again. The recent mortality from automobile accidents in this experience clearly reflects this fluctuation in the number of motor vehicles in operation.

It is apparent from Chart XIV that the advance in mortality for the period as a whole was not equally rapid for each of the color and sex groups. The rates for males, both white and colored, increased by larger increments than those for females. Similarly the upward trend for colored policyholders is somewhat steeper than that for the white, but on the whole the curves for both run fairly parallel. The standardized annual death rates by color, sex, and broad age periods for the years 1911 to 1935 are presented in Appendix Table C.

Distinctly different tendencies are found to exist also in the trends of the death rates at the several ages. In marked and happy contrast to the situation at all ages combined, the automobile hazard among children is being brought under control. At ages 1 to 14 years the death rate from automobile accidents has exhibited no definite increase in the past 15 years; in fact, it has declined steadily since 1929. The rate in 1935, 12.1 per

CHART XIV
AUTOMOBILE ACCIDENTS
Standardized Annual Death Rates per 100,000
By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



100,000, was the lowest in this age group since 1917. This improvement in mortality takes on particular importance in the light of the fact that there were more than four times as many automobiles in operation in 1935 as in 1918, when the death rate among the insured children was 13.7 per 100,000.

Beyond the childhood ages, however, the outlook is far from encouraging. In the important age range 15 to 54, there is as yet no sign of a halt in the upward march of the death rate. As Chart XV shows, beginning with 1929 the mortality at the main working ages of life has exceeded that for children, and the disparity in mortality between these groups seems to be widening. The most unfavorable aspect of the automobile accident problem, of course, is at the older ages. Clearly the aged pedestrian is unable to cope with modern traffic conditions.

Factors in the Trend of Automobile Accidents

The increasing death rate from automobile accidents between 1911 and 1935 has been due mainly to the steadily growing number of cars on the streets and highways. It could hardly be expected

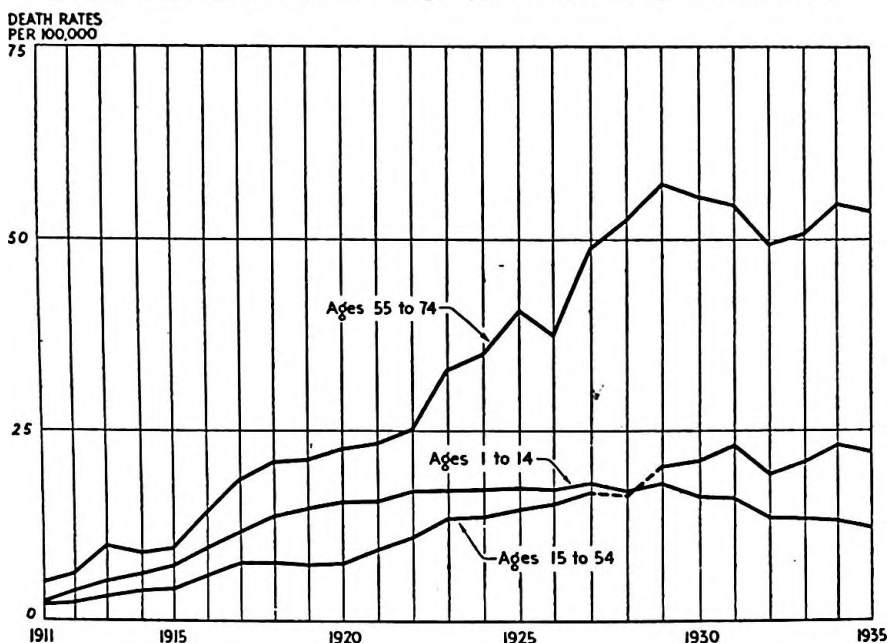
CHART XV

AUTOMOBILE ACCIDENTS

Standardized Annual Death Rates per 100,000

By Age. Total Persons. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



that an increase in the number of registered cars from 640,000 in 1911 to 26,225,000 in 1935 would have been accomplished without a substantial rise in the number of persons killed. Until about 1926 there was some satisfaction in the fact that the number of deaths each year per 100,000 cars on the road was declining, but since then this trend has been reversed.

It is difficult to determine what brought about this reversal, for the causes of automobile accidents are many. Every indication, however, points to greater speed of travel as the chief underlying cause. For one thing, the construction of a vast network of surfaced highways has resulted in much more traffic along country roads where speed is more or less unrestricted. The rural death rate, partly because of this increased traffic but undoubtedly also because of the greater speeds at which cars may be operated, has been rising at a much faster pace than the urban death rate. Even in cities where speed of travel is more or less controlled and the "jay-walking" pedestrian is a much more important factor in the automobile mortality than in the country, driving

too fast for conditions has been found to be the cause of a large number of accidents. The vast increase in pedestrian deaths at the older ages is evidence of the higher speeds at which cars are operated on city streets. Improvements in roadways and the advances made by automotive engineers in motor car construction, unfortunately, instead of bringing about a reduction in automobile fatalities, as might have been expected, have helped to increase them by affording an opportunity to indulge our mania for speed to the full.

Automobile Accidents in the Insured and in the General Population Compared

The upward trend in the automobile death rate for the general population has been sharper than that for the Industrial wage-earners and their families in the period 1920 to 1934. Unfortunately, comparable data for the two groups are not available for the earlier years. In 1920 the standardized death rate for insured persons, ages 1 to 74 years, exceeded that for the general population by 15 percent. The disparity in the mortality of the two experiences has been diminishing and in recent years the rates for the population at large actually exceeded those for the insured group. To a large extent the difference in the gradient of the trends can be explained by the difference in the character of the two populations: the Industrial policyholders are concentrated in urban areas, whereas a large part of the general population lives in rural districts. Thus the sharper upward trend in the rates for the general population reflects the relatively greater increase in rural than in urban fatal accidents which has taken place in recent years. Chart XVI portrays graphically the course of the rates for each population class.

Types of Automobile Accidents

Data on types of automobile accidents are of the greatest value to the safety engineer and others actively engaged in accident prevention campaigns. Such data have been recorded and tabulated in this insurance experience beginning with 1925. In our analysis of this phase of the mortality from automobile accidents, we have included not only deaths in primary⁴ automobile accidents but also deaths in collisions between automobiles and railroad engines or streetcars, and deaths from automobile exhaust gas poisoning. Table 11 presents the crude death rates per 100,000

⁴See discussion, page 444.

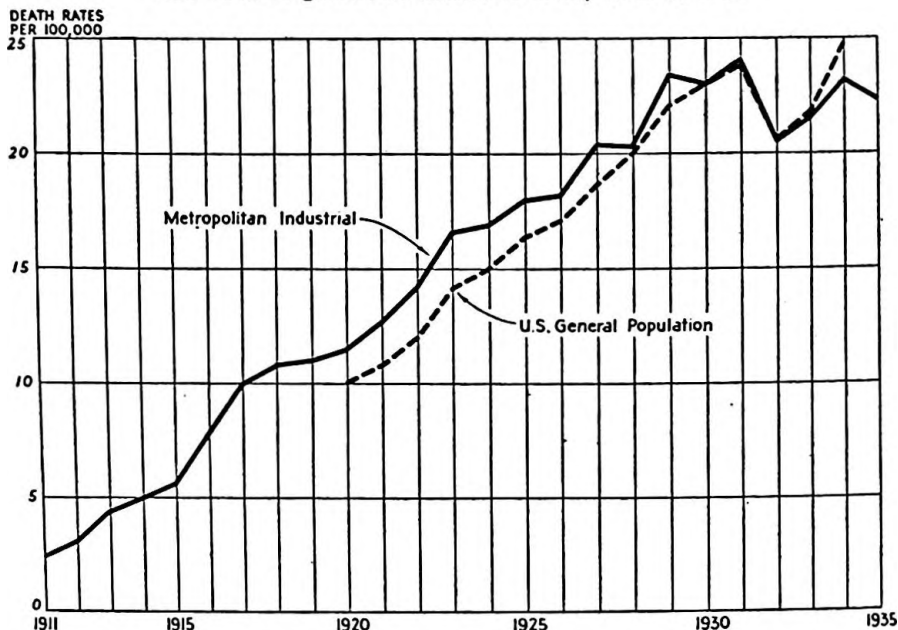
TABLE 11
AUTOMOBILE ACCIDENTS
Crude Death Rates per 100,000
By Type of Accident, Sex, and Age
Ages 1 to 14 and 15 to 74 Years
 Metropolitan Life Insurance Company, Industrial Department, 1925 and 1935

TYPE OF ACCIDENT; AGE PERIOD	MALES				FEMALES			
	Death Rates per 100,000		Percent Change since 1925	Percent of All Automobile Accidents	Death Rates per 100,000		Percent Change since 1925	Percent of All Automobile Accidents
	1935	1925			1935	1925		
AGES 1 TO 14 YEARS								
ALL AUTOMOBILE ACCIDENTS	16.5	25.2	— 34.5	100.0	7.8	11.0	— 29.1	100.0
	16.3	24.7	— 34.0	98.7	7.6	10.6	— 28.3	96.6
Primary Automobile Accidents*								
Collision with pedestrian.....	12.4	19.1	— 35.1	74.7	5.9	8.4	— 29.8	75.2
Collision with vehicle.....	2.6	2.3	+ 13.0	16.0	1.2	0.6	+100.0	15.0
Railroad train.....	0.2	0.3	— 33.3	1.3	0.3	0.2	+ 50.0	3.4
Streetcar.....	.....	0.1	\$	.....	.....	0.2	\$	.....
Other automobile.....	0.8	0.3	+166.7	4.9	0.6	0.2	+200.0	8.3
Bicycle.....	0.8	0.7	+ 14.3	4.7	0.2	.....	\$	1.9
Motorcycle.....	†	.....	\$	0.2	.....	.....	.....	.....
Other vehicle.....	0.8	0.8	†	4.9	0.1	.....	.....	1.4
Collision with fixed object.....	0.2	0.2	†	1.1	†	0.1	.....	0.5
Noncollision accident.....	1.1	1.4	— 21.4	6.7	0.5	0.5	.....	6.3
Asphyxiation by exhaust gas.....	.....	.....	.....	.....	.....	.....	.....	.....
Other noncollision accidents.....	1.1	1.4	— 21.4	6.7	0.5	0.5	.....	6.3
Type of accident not specified.....	0.3	2.2	— 86.4	1.5	0.2	1.4	— 85.7	3.0
				8.7				12.3

AGES 15 TO 74 YEARS ALL AUTOMOBILE ACCIDENTS.....	46.2	29.1	+ 58.8	100.0	100.0	12.7	9.8	+ 29.6	100.0	100.0
	42.9	26.4	+ 62.5	92.8	90.7	12.1	9.0	+ 34.4	95.4	92.5
Primary Automobile Accidents*										
Collision with pedestrian.....	19.1	10.1	+ 89.1	41.3	34.5	5.3	4.2	+ 26.2	41.4	42.6
Collision with vehicle.....	13.5	5.8	+ 132.8	29.3	19.9	4.0	1.6	+ 150.0	31.8	16.7
Railroad train.....	1.9	1.7	+ 11.8	4.0	5.7	0.5	0.5	†	3.9	5.2
Streetcar.....	0.6	0.9	- 33.3	1.3	3.2	†	0.2	§	0.1	2.3
Other automobile.....	9.3	2.1	+ 342.9	20.2	7.1	3.4	0.7	+ 385.7	26.4	7.5
Bicycle.....	0.6	0.2	+ 200.0	1.2	0.7	†	.....	§	0.4	.....
Motorcycle.....	0.8	0.6	+ 33.3	1.7	1.9	0.1	†	§	0.5	0.3
Other vehicle.....	0.4	0.4	†	0.9	1.3	0.1	0.1	†	0.5	1.4
Collision with fixed object.....	5.3	1.8	+ 194.4	11.5	6.1	1.4	0.3	+ 366.7	11.0	3.3
Noncollision accident.....	6.7	5.9	+ 13.6	14.5	20.3	1.6	1.8	- 11.1	12.3	18.5
Asphyxiation by exhaust gas.....	0.9	0.1	+ 800.0	1.9	0.4	0.1	.....	§	0.6	.....
Other noncollision accidents.....	5.8	5.8	†	12.6	19.9	1.5	1.8	- 16.7	11.7	18.5
Type of accident not specified.....	1.6	5.5	- 70.9	3.4	19.2	0.5	1.9	- 73.7	3.5	18.9

* Does not include collisions with heavier vehicles (railroad trains and streetcars) or asphyxiation by exhaust gas. † Less than 0.05 per 100,000. ‡ No change in rate. § Percentage not calculated.

CHART XVI
AUTOMOBILE ACCIDENTS
Standardized Annual Death Rates per 100,000
Total Persons. Ages 1 to 74 Years
 Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935
 and U. S. Registration States of 1920, 1920 to 1934



from automobile accidents, according to type, by sex and broad age periods among Metropolitan Industrial policyholders for the years 1925 and 1935.

In childhood three fourths of the deaths result from automobiles striking pedestrians. Collisions between vehicles account for about 15 percent of the deaths. Noteworthy among boys is the comparatively large number of deaths due to the riding of bicycles, sleds, and other vehicles in the roadway. Among adults, as among children, the largest number of deaths are caused by automobiles striking pedestrians; more than 40 percent of the fatalities in each sex are chargeable to this type of accident. Collisions between vehicles account for approximately 30 percent of the deaths. Noncollision accidents and collisions with fixed objects each account for about 12 percent of the deaths. While the proportionate distribution of the deaths for the major types of accident is quite similar for males and females, the actual death rates for adult males in 1935 were more than triple the female rates for practically every type of accident.

A rising death rate for each important type of accident is in evidence for both men and women between 1925 and 1935. In accidents involving collisions between vehicles and collisions with fixed objects, the female rate has been increasing faster than the male rate. A greater proportionate increase in the number of women drivers may possibly account for this difference.

Prevention of Automobile Accidents

The responsibility for the vast and growing toll of automobile accidents cannot be laid to inertia on the part of State and Federal authorities or of others whose direct responsibility it has been to safeguard the life and limb of the people. No campaign in the interest of health or safety has been waged with greater zeal than that which has been carried on to reduce automobile accidents. Well-trained safety engineers, highway construction engineers, and automotive engineers have devoted their time and energies toward making better machines and safer roadways. City streets and county highways the country over have been dotted with traffic lights and warning signs at danger points; grade crossings have been eliminated in large numbers. True it is that some spots have been entirely neglected, but these are mostly in isolated places. Numerous laws and regulations have been enacted in the interest of safety. A vast program of education has been carried on by the National Safety Council, the American Red Cross, State bureaus, insurance companies, police departments, chambers of commerce, and other organizations. The public press almost daily has drawn attention to the seriousness of the situation. And yet the death rate, as we have seen, has gone up out of proportion even to the added number of cars.

This does not imply that what has been done has been of no avail. It is hard to imagine what the situation would be had the campaign been carried on with less vigor. Real success has followed the intensive efforts to protect child life. The present program should be continued, and where efforts have been weak they should be strengthened. Something more, however, is needed. We should know more about the causes of accidents, particularly the basic physiological and psychological causes. The accident-prone, for whatever reason, should be denied licenses to drive. All motor cars should be inspected at regular intervals, and those with mechanical defects kept off the roads. Above all, we must somehow or other implant the safety idea in all drivers, for it is the recklessness of the average driver which causes the

bulk of the deaths. The mania for speed must be cured, by education preferably, but by rigid enforcement of the laws and severe punishment for infractions if that is the only solution. Motor car manufacturers are aiding by placing less emphasis on speed and greater emphasis on safety in their sales propaganda.

The automobile accident problem is one which affects the entire country and, therefore, a program of prevention to be effective must be national in scope. It is, of course, true that the actual administration of traffic safety must be in the hands of State and local officials. But the organization and coordination of the safety program, as a whole, should be under the sponsorship of the national government. There is an immense field for the coordination of effort to bring it about that a driver going from one State to another may not be confronted with a totally different series of codes and regulations. This entire campaign against death on the streets and highways is one of the major tasks concerning the welfare of the American people, and it merits the direct supervision of a Cabinet officer.

RAILROAD ACCIDENTS

Fatalities arising out of railroad accidents were an important element in the accident mortality toll in the United States throughout the period under survey. According to the United States Interstate Commerce Commission, 180,123⁵ persons met death in railroad accidents during the 24 years 1911 to 1934. Of this number 47,976 were employees on duty, 4,407 were passengers, and 127,740 were classified as "other persons," *i.e.*, trespassers, persons killed at grade crossings, etc. This number of deaths, furthermore, should be increased by about 8 percent to include deaths that occurred more than 24 hours after injury.

Railroad accidents ranked fifth in importance as a means of fatal injury among the Industrial policyholders of the Metropolitan Life Insurance Company during the 25-year period 1911 to 1935, having been the cause of 16,306 deaths, or 7.5 percent of all accident fatalities. The standardized death rates for the period averaged 6.2 per 100,000.

Mortality by Age, Sex, and Color

Age The mortality from railroad accidents is at a minimum in the childhood ages and reaches the highest points at the older ages. Among white males the rise in death rate is progressive with advancing age; in the recent quinquennium the rate ranged from 1.1 per 100,000 at ages 1 to 4, to 11.5 per 100,000 at 65 to 74. Among colored males, on the other hand, the death rate at ages 15 to 19 is at the same level as that for 65 to 74 years. The mortality among females is small, but the death rates indicate the same general age characteristics as among white males. These facts are apparent from Table 12.

Sex Because of occupational differences, the disparity in the death rates of the two sexes is very great. During the recent five years, 1931 to 1935, the rate among white males was nearly seven times as great as that among white females. In the initial years under survey the ratio was 17 to 1. The death rates for males exceed those for females at every age period. Among white persons the excess male over female mortality is at a maximum at the working ages of life.

Railroad accidents in the recent quinquennium accounted for 5.9 percent of the fatal accidents among males, but for only 2.6

⁵A small percentage of these deaths were suicides.

TABLE 12
RAILROAD ACCIDENTS
 Averages of Annual Death Rates per 100,000
 By Color, Sex, and Age. Ages 1 to 74 Years
 Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000						PERCENT CHANGE 1931-1935 SINCE 1911-1915	
	MALES			FEMALES			Males	Females
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915		
WHITE								
1 to 74*.....	11.6	5.5	19.9	1.2	0.8	1.2	-72.4	-33.3
1 to 4.....	1.3	1.1	1.5	0.7	0.5	0.7	-26.7	-28.6
5 to 9.....	2.7	1.3	3.8	0.8	0.6	0.8	-65.8	-25.0
10 to 14.....	3.8	1.9	6.2	0.6	0.4	0.6	-69.4	-33.3
15 to 19.....	9.6	4.3	15.2	1.2	0.9	1.2	-71.7	-25.0
20 to 24.....	13.6	5.5	25.5	1.0	0.7	0.7	-78.4	0.0
25 to 34.....	15.1	6.0	27.8	1.0	0.7	0.9	-78.4	-22.2
35 to 44.....	15.7	8.1	27.8	1.1	0.7	0.5	-70.9	+40.0
45 to 54.....	17.3	10.0	28.2	1.6	0.9	1.8	-64.5	-50.0
55 to 64.....	21.5	11.1	37.2	2.6	1.4	3.7	-70.2	-62.2
65 to 74.....	26.0	11.5	39.5	3.3	1.8	4.3	-70.9	-58.1
COLORED								
1 to 74*.....	11.1	7.1	16.2	1.2	0.8	1.4	-56.2	-42.9
1 to 4.....	0.2	0.0	0.8	0.2	0.4	0.0	-100.0	†
5 to 9.....	2.2	1.9	3.9	0.8	0.5	0.4	-51.3	+25.0
10 to 14.....	4.4	2.2	6.9	0.5	0.5	0.8	-68.1	-37.5
15 to 19.....	15.2	11.8	20.2	0.8	0.8	1.1	-41.6	-27.3
20 to 24.....	15.9	8.4	25.1	1.1	0.9	0.9	-66.5	0.0
25 to 34.....	12.8	8.9	20.8	1.3	0.7	1.5	-57.2	-53.3
35 to 44.....	14.3	8.4	20.0	1.7	1.3	2.6	-58.0	-50.0
45 to 54.....	15.9	10.8	18.3	1.5	0.5	1.7	-41.0	-70.6
55 to 64.....	17.8	9.5	27.4	2.3	0.9	2.7	-65.3	-66.7
65 to 74.....	19.8	11.6	26.6	4.0	2.4	2.9	-56.4	-17.2

*Standardized for age. †Not computed.

percent among females. In these years, 57.2 percent of the fatal railroad accidents among females were the result of collisions with automobiles; among males one fifth of the railroad accidents were of this type.

Color In the last quinquennium colored males registered a higher death rate than white males, reversing the experience of the early years. In 1931 to 1935 the mortality among colored males, 7.1 per 100,000, exceeded that for white males,

5.5 per 100,000, by 29 percent; in 1911 to 1915 the rate among white males was the greater by 23 percent. Analyzing the data by age, it is found that in recent years fatal railroad accidents were relatively more frequent among colored males than among the white at every age period except 55 to 64. At ages 15 to 19, the colored male rate was $2\frac{3}{4}$ times that for the corresponding white group. Trespassing on railroad property rather than occupational exposure may account for this unfavorable feature of the Negro mortality at these ages. Among females the mortality is relatively low, and color makes no difference in the death rates at ages 1 to 74.

Trend of Mortality

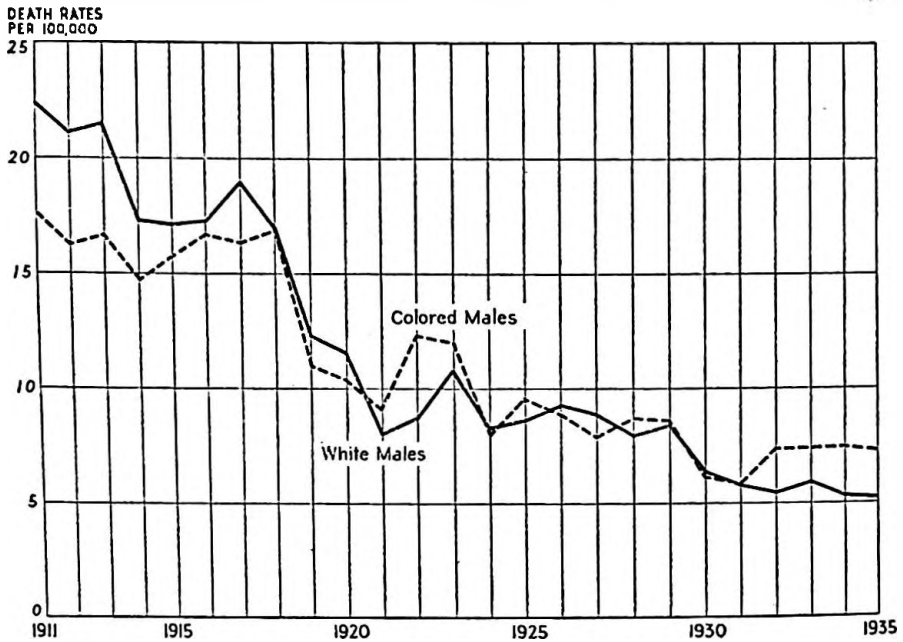
Intensive safety work on the part of the roads, improved equipment, elimination of grade crossings, increasing safety-consciousness of personnel and public, fortunately, have wrought a progressive improvement in the record in the United States. In 1934, the latest year for which Federal information is available, the number of deaths (5,020) was less than half that for 1911 (10,396). Employees and passengers alike have benefited by the greater safety. Whereas in 1934 nearly 12,000,000 passengers were carried for every one that was killed, in 1911 less than 4,000,000 were carried for each person killed. One in each 1,862 employees in service was killed in 1934; but one employee in each 458 was killed in 1911. The number of trespassers killed also showed a decrease.

This marked improvement in the accident record of the railroads of the United States is reflected in the Industrial mortality experience. In the insured group at ages 1 to 74 the death rate declined 69 percent between the quinquennia 1911 to 1915 and 1931 to 1935. As Table 12 shows, each race and sex group shared in the improvement. Among white males the decline amounted to 72.4 percent; among white females, 33.3 percent; among colored males, 56.2 percent; and among colored females, 42.9 percent. Among males, both white and colored, substantial decreases were registered at every age period. The diminished number of occupational railroad accidents has played an important part in the decline in male mortality. In 1912 occupational railroad accidents among white male policyholders 15 years of age and over resulted in 9.9 deaths per 100,000, whereas in 1935 the rate was but 1.9 per 100,000, a reduction of 80.8 percent. Among females, also, large decreases in death rates are in evidence for practically the entire age range.

CHART XVII RAILROAD ACCIDENTS

Standardized Annual Death Rates per 100,000 Males
By Color. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



The decline in railroad fatalities, great as it has been, would have been even more marked were it not for the increasing frequency of train and automobile collisions at grade crossings. Deaths in such collisions, in accordance with international statistical practice, are assigned to railroad accidents. In the closing years of the period under survey, such accidents accounted for about one quarter of the railroad fatalities in this experience.

Death rates by color and sex for each year of the 25-year period 1911 to 1935 appear in Appendix Table C; the time series for males are presented graphically in Chart XVII.

Origin of Hazard

It is clear from Appendix Table D that during the period 1926 to 1935, one quarter of the deaths from railroad accidents were classified as arising out of or in the course of employment. Among males 15 to 64 years of age, one third of the railroad fatalities were of occupational origin. These include not only deaths of railroad employees but also of truck drivers, salesmen, and other persons gainfully employed on vehicles which collided with trains.

STREETCAR ACCIDENTS⁶

At present, streetcars are much less important as a means of fatal accidental injury than they were prior to the widespread development of automobile and motorbus transportation. Nevertheless, in 1934 they were responsible for almost 900 deaths in the United States. During the 25-year period 1911 to 1935, streetcar accidents resulted in the death of 5,766 Industrial policyholders of the Metropolitan Life Insurance Company; the average standardized death rate for the period was 2.2 per 100,000. Annual death rates appear in Appendix Table C.

Analysis of insurance death claim records for recent years shows that at ages 1 to 74 more than 90 percent of the deaths ascribed to streetcar accidents are nonoccupational in character. About half the total number of those killed in streetcar accidents were pedestrians. More than one quarter of the persons killed were drivers or passengers of automobiles colliding with streetcars. The remainder were occupants of streetcars or of vehicles other than automobiles. In childhood and past age 45, the vast majority of the fatalities occurred among pedestrians; between 15 and 44, among both males and females, automobile and streetcar collisions caused the largest number of deaths.

Mortality by Age, Sex, and Color

The average death rates by age, sex, and color for the entire 25 years and for the first and last five-year periods are given in Table 13.

Age Age plays a relatively important role in the mortality from streetcar accidents. The highest death rates are found among the older people. For the period 1931 to 1935, in each color and sex group, the rates were less than 1.0 per 100,000 at the ages below 25 years. Beyond this age the rates increased progressively with advancing age.

Sex Sex differences are striking. White males at ages 1 to 74 registered an average death rate in the recent quinquennium of 1.4 per 100,000, which was $3\frac{1}{2}$ times as high as the female rate. Somewhat the same sex ratio obtained among the colored.

⁶This title includes accidents on elevated and subway trains.

TABLE 13
STREETCAR ACCIDENTS†

Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
WHITE						
1 to 74*.....	3.7	1.4	6.3	0.9	0.4	1.2
1 to 4.....	1.7	0.3	3.3	1.3	0.3	2.5
5 to 9.....	1.7	0.4	4.0	0.8	0.1	1.6
10 to 14.....	1.4	0.2	2.8	0.3	0.1	0.6
15 to 19.....	1.7	0.6	2.7	0.4	0.2	0.5
20 to 24.....	2.1	0.9	2.9	0.4	0.2	0.3
25 to 34.....	3.0	1.5	4.9	1.9	0.3	0.2
35 to 44.....	4.7	1.6	8.0	0.6	0.3	0.6
45 to 54.....	6.5	2.4	11.3	1.2	0.6	1.5
55 to 64.....	10.0	4.3	15.6	2.5	1.4	3.5
65 to 74.....	13.7	7.7	22.4	4.0	3.0	5.1
COLORED						
1 to 74*.....	2.8	1.4	4.3	0.8	0.3	0.9
1 to 4.....	2.1	0.8	2.4	0.8	0.5	1.5
5 to 9.....	2.1	0.5	4.0	1.0	0.0	1.1
10 to 14.....	1.5	0.5	1.9	0.3	0.0	0.8
15 to 19.....	2.1	0.8	4.6	0.6	0.0	0.3
20 to 24.....	1.4	0.9	2.0	0.2	0.3	0.3
25 to 34.....	9.6	1.4	3.7	0.4	0.1	0.1
35 to 44.....	3.3	1.7	4.9	0.8	0.4	0.9
45 to 54.....	4.4	2.7	5.4	1.4	0.4	2.6
55 to 64.....	6.0	2.8	6.8	2.0	1.9	1.5
65 to 74.....	8.3	4.4	16.6	3.2	1.8	1.4

*Standardized for age. †Includes accidents on elevated and subway trains.

Color The color ratio of the mortality among males changed in the period under review. In the years 1911 to 1915 the death rate among white males was $1\frac{1}{2}$ times that for colored males. Owing to the more rapid decline in the mortality for white males over the quarter century, the rates for the two groups, 1.4 per 100,000, were identical in the period 1931 to 1935. The death rates for females are low and show no distinct difference in mortality by color.

Trend of Mortality

The death rates over the 25-year period have manifested a steady downward trend. Between the quinquennia 1911 to 1915 and 1931 to 1935 the drop in mortality was 75.0 percent. The decline in the mortality from streetcar accidents has been relatively greater than that for any of the other important means of injury. As can be seen from Table 14, each color and sex group shared in the decline. Improvement has been greatest, however, among white males.

At least three factors have been prominent in producing this downward trend. The increased use of automobiles during the past two decades has played a very important part. The use of buses and private automobiles has so decreased the demand for electric surface car transportation that many electric lines, urban and interurban, have been abandoned, and on others service has been curtailed. While the automobile has been, indirectly, an influence in lowering the number of streetcar accidents, it has not been wholly an influence for good in this respect. During the years 1931 to 1934 in the United States, more than one third of all streetcar fatalities, occupational and nonoccupational, were caused by collisions with automobiles. In urban communities such collisions constituted slightly more than one third of the total

TABLE 14
STREETCAR ACCIDENTS†

Five-Year Averages of Annual Death Rates* per 100,000
By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

YEARS	TOTAL PERSONS	WHITE		COLORED	
		Males	Females	Males	Females
1911 to 1935	2.2	3.7	0.9	2.8	0.8
1931 to 1935	0.9	1.4	0.4	1.4	0.3
1926 to 1930	1.5	2.5	0.6	1.8	0.7
1921 to 1925	2.0	3.2	0.9	2.7	1.0
1916 to 1920	2.9	5.0	1.2	3.7	1.2
1911 to 1915	3.6	6.3	1.2	4.3	0.9
Percent decline 1931-1935 since 1911-1915	75.0	77.8	66.7	67.4	66.7

*Standardized for age, and in the case of Total Persons, also for color and sex.

†Includes accidents on elevated and subway trains.

streetcar accidents, while in rural communities, in several recent years, these collisions approximately equaled in number other types of streetcar accidents.

The streetcar companies, by careful instruction to personnel, improvements in equipment, cooperation with safety organizations, and by active safety contests, have been responsible for a considerable portion of the decline. A third prominent factor in the reduction of fatalities, particularly of pedestrians and of drivers and passengers of automobiles, has been the great improvement in methods of handling traffic.

TRAUMATISM BY OTHER VEHICLES⁷

Under this title are included deaths resulting from accidents in air or land vehicles, exclusive of those in which automobiles, railroad trains, or streetcars are involved. Fatal accidents from horse-drawn vehicles, including deaths certified as "fall from wagon" or "run over by horse and wagon," until very recently comprised the largest part of the mortality charged to this residual title. Deaths from motorcycle accidents which in previous years ranked second in numerical importance, now outrank every other type included under this group. Bicycles and sleds likewise contributed a considerable number of deaths. With the rapid development of aviation, interest in the mortality from air transportation prompted the separate tabulation of these deaths beginning with the year 1923. For the five-year period 1923 to 1927 deaths from air transportation constituted 7.0 percent of the mortality charged to "other vehicles"; by 1931 to 1935 these deaths had increased to 17.5 percent of the total. This does not mean, however, that the mortality from air transportation had risen sharply. In fact, for this insured population, the crude death rate from aviation increased from 0.1 per 100,000 in 1923 to 0.3 in 1929, then declined slightly to 0.2 per 100,000 in 1935.

A total of 5,496 deaths in which "other vehicles" figured was recorded among Metropolitan Industrial policyholders, ages 1 to 74, for the quarter century 1911 to 1935; this number constituted 2.5 percent of all fatal accidents. The standardized annual death rates for the period averaged 2.0 per 100,000. The deaths were heavily concentrated among males.

Mortality by Age, Sex, and Color

Age Before discussing the age characteristics of the mortality, it is essential to note that there is a definite relation between the age of those killed in these accidents and the type of vehicle involved. Figures for 1935 in this insurance experience show that in the ages under 15 years, sleds, horse-drawn vehicles, and bicycles are the principal means of injury. During adolescence and early adult life, deaths from motorcycles and aircraft predominate. At the older ages, the majority of the deaths are due

⁷As defined here, the heading embraces deaths recorded under title 188 (d), (e), and (f) of the 1920 revision of the International List of Causes of Death.

to horse-drawn vehicles. In the light of these facts it is obvious that the relatively high death rates at the older ages, in the early years of the period under review, reflect the preponderance of horse-drawn vehicle accidents at that time. Similarly, the shift of the age of maximum mortality from the older ages to early adult life among white males, indicates the decrease in horse-drawn vehicle accidents and the increased relative importance of motorcycle and aviation accidents. Table 15 shows the death rates for the 25 years as a whole and for the years 1911 to 1915 and 1931 to 1935.

TABLE 15
TRAUMATISM BY OTHER VEHICLES
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
WHITE						
1 to 74*.....	3.7	1.9	6.3	0.5	0.2	1.0
1 to 4.....	2.3	0.7	4.9	1.2	0.4	3.3
5 to 9.....	2.9	1.1	6.2	0.7	0.3	1.8
10 to 14.....	2.1	1.2	2.8	0.4	0.2	0.5
15 to 19.....	2.9	2.0	3.2	0.4	0.4	0.5
20 to 24.....	4.2	4.0	3.8	0.3	0.3	0.5
25 to 34.....	3.5	2.1	5.8	0.2	0.2	0.3
35 to 44.....	3.9	1.3	7.5	0.2	†	0.4
45 to 54.....	4.9	1.7	10.2	0.4	0.1	1.0
55 to 64.....	6.5	2.4	11.7	0.6	0.3	0.9
65 to 74.....	9.0	3.3	16.5	1.5	0.6	3.5
COLORED						
1 to 74*.....	3.3	1.5	5.7	0.4	0.2	0.8
1 to 4.....	2.0	1.0	3.1	0.8	0.5	2.3
5 to 9.....	2.5	0.5	4.7	0.6	0.0	1.6
10 to 14.....	1.8	1.0	3.0	0.3	0.3	0.4
15 to 19.....	2.6	1.7	4.2	0.3	0.0	0.7
20 to 24.....	1.9	1.4	3.3	†	0.0	0.0
25 to 34.....	2.3	1.2	3.8	0.1	0.1	0.2
35 to 44.....	3.1	1.0	5.3	0.3	0.2	0.8
45 to 54.....	5.4	2.0	10.6	0.5	0.1	0.6
55 to 64.....	7.7	2.1	12.3	0.4	0.2	0.0
65 to 74.....	13.5	7.2	20.7	1.0	0.0	3.1

*Standardized for age. †Less than 0.05.

Sex Deaths among males constituted almost nine tenths of the total. In the recent five-year period the rate for males was about $9\frac{1}{2}$ times that for females among white policyholders and $7\frac{1}{2}$ times that for females among the colored. This excess is due chiefly to the greater occupational exposure and to the more extensive and careless use of the various vehicles in sport among males. Appendix Table D reveals that at ages 15 to 64 years 42.0 percent, and at ages 65 to 74 years 52.9 percent, of the male deaths arose out of or in the course of gainful employment.

Color The death rate for white policyholders is higher than that for the colored. For the five-year period 1931 to 1935, the mortality among white males was 1.9 per 100,000, and that for colored males, 1.5 per 100,000.

Trend of Mortality

Throughout the 25-year period under review horse-drawn vehicles have been increasingly displaced by the automobile as a means of transportation. Largely as a result of this change the death rate from "other vehicles" has declined from 3.5 per 100,000 in 1911 to 1915, to 1.0 per 100,000 for the years 1931 to 1935, a drop of 71.4 percent. Table 16 briefly indicates the downward movement of the mortality. Appendix Table C presents the annual death rates for the 25 years by color and sex.

TABLE 16
TRAUMATISM BY OTHER VEHICLES
Five-Year Averages of Annual Death Rates* per 100,000
By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

YEARS	TOTAL PERSONS	WHITE		COLORED	
		Males	Females	Males	Females
1911 to 1935 . . .	2.0	3.7	0.5	3.3	0.4
1931 to 1935 . . .	1.0	1.9	0.2	1.5	0.2
1926 to 1930 . . .	1.2	2.3	0.3	2.3	0.2
1921 to 1925 . . .	1.7	3.2	0.3	3.1	0.3
1916 to 1920 . . .	2.7	5.0	0.6	4.0	0.4
1911 to 1915 . . .	3.5	6.3	1.0	5.7	0.8
Percent decline 1931-1935 since 1911-1915	71.4	69.8	80.0	73.7	75.0

*Standardized for age, and in the case of Total Persons, also for color and sex.

TRAUMATISM BY FALL⁸

Accidental falls are outranked only by automobile accidents as a means of fatal injury. Moreover, both in industry and in the home, that is, in all except public accidents, traumatism by fall was the leading means of accidental death in the closing decade of the period under review. In 1934 this cause of death claimed the lives of almost 21,000 persons in the United States—considerably more than the number that died from appendicitis, and almost three times as many persons as were accidentally drowned during that year. Although falls are an important means of fatal injury throughout the year, the largest number occur during the winter season, presumably because of the additional hazard created by the formation of ice on sidewalks and steps in a large part of the country. Fatal falls are much more frequent in industrial than in agricultural areas.

During the 25 years 1911 to 1935 a total of 31,593 deaths among Metropolitan Industrial policyholders was reported as due to accidental falls. These deaths comprised 14.6 percent of the mortality from all accidents and accounted for 1 percent of the deaths from all causes. The death rates at ages 1 to 74 averaged 11.2 per 100,000. The reader should bear in mind that this insurance experience does not reflect the extremely high mortality from falls in old age.

Mortality by Age, Sex, and Color

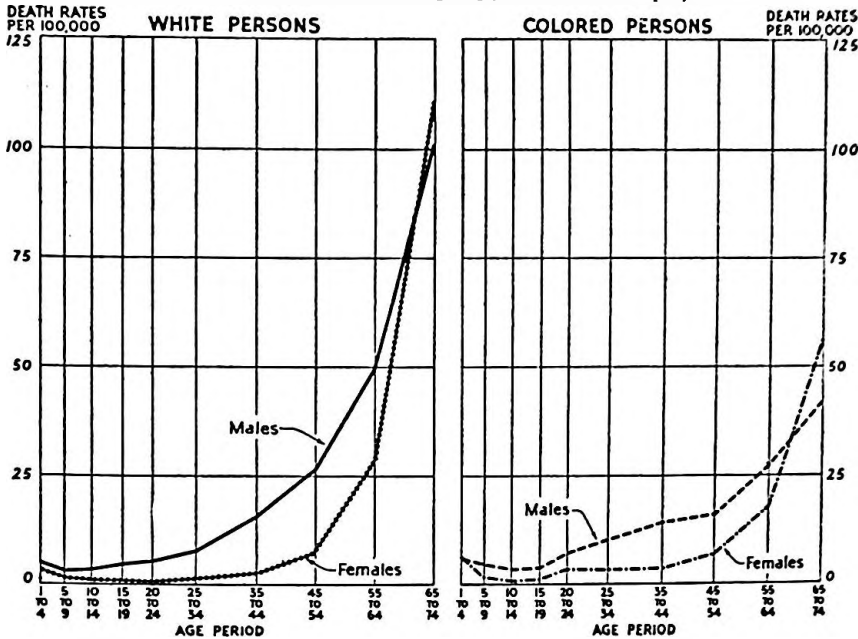
Age From its level at ages 1 to 4 the death rate drops to a minimum in late childhood or in adolescence, and then rises progressively with advancing age to a maximum at the older years of life. Among white males, in the recent quinquennium, the death rate increased gradually up to age 35; beyond this age the curve rose rapidly. Among white females the death rate remained fairly low in the ages under 55 years. Thereafter the rise in mortality with advancing age was so rapid that at 65 to 74 the rate for white females actually exceeded that for white males. As Chart XVIII and Table 17 show, the age curves for colored persons are similar to those for the whites, except for a less marked rise at the older ages.

⁸In accordance with the requirements of the International List, this title excludes falls from steam railroad trains, streetcars, automobiles, and other vehicles, as well as falls in mines and quarries, falls in elevator shafts, and falls in burning buildings.

CHART XVIII TRAUMATISM BY FALL

Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935



This insurance experience does not extend beyond age 74 and therefore does not give a complete picture of the age curve. In the general population of the United States at 75 years and over, the death rate for white males in 1934 was 301.4 per 100,000, over four times that at ages 65 to 74; among white females the rate was 577.6 per 100,000, a figure more than six times that at 65 to 74.

Sex Throughout the 25-year period under review the death rate from accidental falls among males exceeded that among females. In the recent quinquennium the excess amounted to 91 percent for white policyholders and 81 percent for the colored. Among white persons the mortality among males was greater than that among females at every age period except 65 to 74 years. In the age range 15 to 44 the rate among white males was more than five times that for white females.

The higher death rate among males probably results mainly from two sources: the hazards of occupation and the risks of sports and recreation. One quarter of the deaths from accidental falls

TABLE 17
TRAUMATISM BY FALL
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000						PERCENT CHANGE 1931-1935 SINCE 1911-1915	
	MALES			FEMALES			MALES	FEMALES
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915		
WHITE								
1 to 74*.....	16.2	14.5	22.5	7.1	7.6	8.7	-35.6	-12.6
1 to 4.....	7.6	4.7	11.1	5.2	3.5	7.7	-57.7	-54.5
5 to 9.....	4.3	2.9	5.6	1.8	1.5	2.3	-48.2	-34.8
10 to 14.....	3.9	3.4	4.7	0.9	0.9	1.2	-27.7	-25.0
15 to 19.....	5.2	4.7	6.4	0.7	1.0	1.0	-26.6	0.0
20 to 24.....	6.7	5.3	9.0	0.8	0.7	1.1	-41.1	-36.4
25 to 34.....	10.3	7.8	17.2	1.5	1.5	2.1	-54.7	-28.6
35 to 44.....	19.8	15.7	31.6	2.8	2.6	3.8	-50.3	-31.6
45 to 54.....	30.4	26.6	43.5	7.1	7.2	10.9	-38.9	-33.9
55 to 64.....	49.5	49.9	64.7	24.4	28.8	28.7	-22.9	+ 0.3
65 to 74.....	92.7	101.0	110.2	96.8	111.0	109.4	- 8.3	+ 1.5
COLORED								
1 to 74*.....	10.9	10.7	15.1	5.3	5.9	6.3	-29.1	- 6.3
1 to 4.....	10.5	5.9	17.9	6.8	6.2	9.5	-67.0	-34.7
5 to 9.....	4.4	4.7	6.6	1.8	1.8	1.7	-28.8	+ 5.9
10 to 14.....	4.1	3.5	4.2	1.5	0.8	1.8	-16.7	-55.6
15 to 19.....	4.6	3.8	5.5	1.8	1.0	1.4	-30.9	-28.6
20 to 24.....	5.3	7.1	7.0	2.0	3.4	1.9	+ 1.4	+78.9
25 to 34.....	8.0	10.2	9.0	2.5	3.3	2.6	+13.3	+26.9
35 to 44.....	13.5	14.1	17.0	3.2	3.5	2.8	-17.1	+25.0
45 to 54.....	18.2	15.9	19.9	5.8	6.6	6.1	-20.1	+ 8.2
55 to 64.....	26.9	27.1	43.0	15.3	17.8	16.7	-37.0	+ 6.6
65 to 74.....	41.6	41.8	58.2	46.2	56.1	65.7	-28.2	-14.6

*Standardized for age.

among males occur in the course of gainful employment, whereas among females the occupational factor is negligible. Similarly, boys engage in more dangerous games than girls and generally expose themselves to greater hazards. At the older ages, however, where the risks of occupation and sports are of little importance, women show a higher death rate.

Color White policyholders, in the aggregate, record higher rates than the colored. For the period 1931 to 1935 the excess white over colored mortality at ages 1 to 74 was 36 percent among males and 29 percent among females. The color ratio varied widely, however, with age. Among males the death rate for colored persons was higher than that for the white at almost every age period under 35; thereafter the reverse was true and the excess mortality among white policyholders increased steadily with advancing age. Among females the colored displayed a higher mortality at most age periods under age 45.

In discussing the comparative rates by color, it should be borne in mind that among white persons less than one eighth of the policies are in force in Southern States, whereas among the colored the proportion is about one third. The difference in death rates by color probably reflects, in part at least, the less hazardous conditions of working and living in the southern parts of the nation.

Trend of Mortality

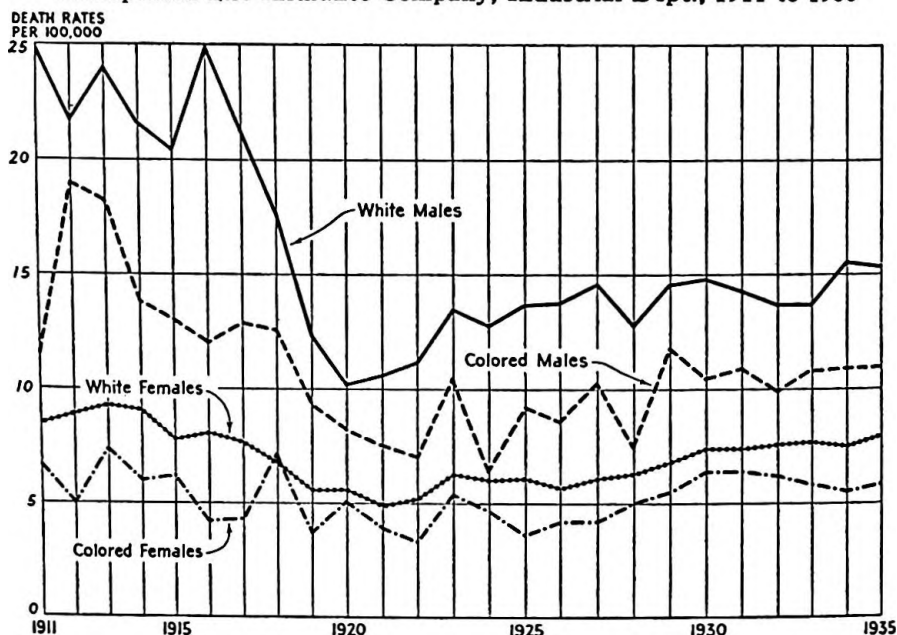
The mortality from accidental falls in this insurance experience was 28.7 percent lower in the period 1931 to 1935 than in 1911 to 1915. There has not been, however, a continuous downward trend over the 25-year period. Among white males aged 1 to 74, for example, the death rate fluctuated around an average of 22.9 per 100,000 in the period 1911 to 1916, then declined sharply during and immediately after the World War, reaching the minimum point of the series, 10.2 per 100,000, in 1920. Beginning with 1921 the trend was reversed and continued slightly upward through 1935, when a rate of 15.3 per 100,000 was recorded. Except for minor differences, each of the other color and sex groups show the same general trend characteristics as white males. These facts are illustrated in Chart XIX; the standardized annual death rates appear in Appendix Table C.

The improvement in mortality over the quarter century was not shared equally by the color-sex groups. White persons, in each sex, registered a greater drop than did the colored; males, in each race, recorded a more pronounced decline than females. Comparing the first with the last five years of the 25-year period, we find that the decrease was 35.6 percent among white males, 12.6 percent for white females, 29.1 percent among colored males, and 6.3 percent for colored females. Moreover, among white males, a material decline was registered at every age period. These facts are presented statistically in Table 17. The table does not reveal,

CHART XIX TRAUMATISM BY FALL

Standardized Annual Death Rates per 100,000
By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



however, that at ages under 15 the trend of the death rate has been downward for the 25-year period as a whole, while the death rates at the adult ages followed the trend described above for ages 1 to 74 years.

Origin of Hazard

Deaths from accidental fall are associated with all types of activity—domestic, public, and occupational. This fact is clearly demonstrated in a study of the mortality among Metropolitan Industrial policyholders for the period 1926 to 1935, in which information concerning the origin of hazard of accidental falls was secured for 90 percent of the cases. Of the deaths in which the nature of the hazard is known, 60.3 percent occurred in or about the home, 25.3 percent in public places, and 14.4 percent arose out of or in the course of employment. Marked sex and age differences, however, are evident.

Among males aged 1 to 74, 44.0 percent of the deaths were domestic, 31.5 percent public, and 24.5 percent occupational.

TABLE 18
 TRAUMATISM BY FALL
 Percentage of Deaths from Specified Agencies
 By Sex and Age. All Ages
 Metropolitan Life Insurance Company, Industrial Department, 1926 to 1935

SPECIFIC AGENCY	PERCENTAGE OF DEATHS IN SPECIFIED AGE PERIODS									
	ALL AGES		UNDER 5		5 TO 14		15 TO 64		65 AND OVER	
	Total	Males	Females	Males	Females	Males	Females	Males	Females	Males
ALL AGENCIES.....	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Balcony; porch.....	3.4	3.0	4.0	9.1	14.6	4.2	9.9	2.7	4.4	1.8
Bed.....	2.7	1.7	3.8	9.5	8.2	0.5	0.4	0.8	2.5	3.2
Building operations.....	1.0	1.8	.....	.....	.....	0.3	.....	2.5	.....	0.3
Chair.....	2.4	1.4	3.8	7.3	7.6	0.4	1.1	0.7	2.9	2.3
Fire escape.....	0.7	0.8	0.6	3.2	2.9	4.5	6.1	0.4	0.5	0.1
Floor.....	12.6	5.7	21.1	2.6	4.4	0.7	1.5	4.5	15.9	12.9
Hold of ship or on ship.....	0.6	1.1	*	.....	.....	0.1	0.4	1.5	*	0.2
Ladder.....	2.4	3.7	0.6	0.4	0.6	0.8	0.8	4.1	1.1	4.5
Roof.....	2.7	4.3	0.8	1.8	0.9	9.5	1.9	4.5	1.4	2.0
Stairs.....	26.3	24.0	29.2	13.4	11.7	5.9	15.2	24.7	34.5	31.9
Tree.....	1.3	2.2	0.1	0.2	0.3	12.3	1.9	1.5	0.1	1.0
Scaffold; staging.....	2.5	4.4	*	0.2	.....	.....	.....	5.9	0.1	2.3
Street (sidewalk, etc.).....	9.8	10.9	8.4	3.2	2.6	8.0	9.5	11.1	9.9	13.2
Window.....	5.9	6.2	5.6	21.5	24.9	3.8	6.8	6.2	7.9	2.8
Other specified falls.....	15.2	20.2	9.0	13.6	12.6	38.8	31.2	21.3	7.9	10.3
Type not specified.....	10.5	8.6	13.0	14.0	8.7	10.2	13.3	7.6	10.9	11.2

*Less than 0.05.

In the preschool ages 1 to 4 years, the greatest proportion of deaths from accidental falls occurs in or about the home. Reflecting the adventurous activity of school boys, falls in public places are responsible for almost two thirds of the mortality from this cause among males between the ages of 5 and 14. In the age range 15 to 64, of the deaths in which the origin of hazard was specified, 38.3 percent were domestic, 30.9 percent were occupational, and 30.8 percent public. At the older ages more than half the mortality, 59.2 percent, occurred in or about the home, 25.3 percent in public places, and 15.5 percent at work. Among females, throughout life, domestic falls predominate. The figures appear in Appendix Table D.

Specific Types of Falls

To throw additional light on the problem under discussion, we have analyzed our experience for the period 1926 to 1935 by specific types of falls. An outstanding finding in this study is that, for all ages combined, falls on stairs accounted for more than one quarter of the deaths from accidental falls. Table 18 presents the facts by sex and broad age periods.

Among males, in the aggregate, 24.0 percent of the fatalities from falls resulted from falls on stairs, 10.9 percent on the street, 6.2 percent out of windows, and 5.7 percent on floors. Among females 29.2 percent occurred on stairs, 21.1 percent on floors, and 8.4 percent on the street. Age is an important factor in the type of fatal accidental fall. In the preschool ages falls out of windows were responsible for 21.5 percent of the deaths among boys and for 24.9 percent among girls. Interesting is the fact that among males at ages 5 to 14 falls from trees accounted for 12.3 percent of the fatal falls. At the adult ages, in each sex, falls on stairs are the predominant source of mortality, but falls on floors and on streets are also important.

ACCIDENTAL DROWNING⁹

Accidental drowning exacts its greatest toll at the ages of childhood and adolescence, when feats of daring beyond the strength and ability of youth are so frequently attempted. The importance of water sports in the toll of drownings is apparent from the marked seasonal incidence of such deaths. More than half of all drownings in the United States occur during the vacation months—June, July, and August—and almost three fourths occur in the five months May to September.

Among Metropolitan Industrial policyholders drowning ranked third in numerical importance as a means of accidental death in the 25-year period 1911 to 1935. In the initial years of this experience drowning was outranked only by accidental falls, but the rapid increase in automobile fatalities has displaced drowning from second to third place among the means of fatal injury. During the 25 years drowning was charged with 25,646 deaths, or 11.8 percent of all fatal accidents in this experience; the standardized death rates among the weekly premium-paying policyholders, aged 1 to 74 years, averaged 8.2 per 100,000. Appendix Table C presents the standardized annual rates.

Mortality by Age, Sex, and Color

Age In the last five years of this investigation more than half of all deaths from accidental drowning occurred among males between the ages of 5 and 24 years. In this broad age range drowning is the second important cause of accidental death among white males. Among colored males it is the leading cause of accidental death between the ages of 10 and 19 years. As shown in Chart XX, the highest death rate among males in each race occurs at ages 15 to 19 years. In general, the age picture for females resembles that for males but the rates are much lower.

Sex Throughout life the rates for males are considerably higher than those for females. For the period 1931 to 1935 the death rate among white males was almost nine times that for white females; among the colored the ratio was 10 to 1. The greatest sex differences in mortality among white policyholders

⁹Under this heading are classified not only deaths by drowning which are known to be accidental, but also those which cannot be definitely identified as suicidal or homicidal. Deaths due to drowning in floods were classified under this title for the years 1911 to 1930; since then, in accordance with international practice, such deaths have been allocated to "other accidents".

TABLE 19
ACCIDENTAL DROWNING
 Averages of Annual Death Rates per 100,000
 By Color, Sex, and Age. Ages 1 to 74 Years
 Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000						PERCENT CHANGE 1931-1935 SINCE 1911-1915	
	MALES			FEMALES			MALES	FEMALES
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915		
WHITE								
1 to 74*.....	14.8	11.3	20.2	1.8	1.3	2.7	-44.1	-51.9
1 to 4.....	7.5	6.4	9.5	2.8	2.5	3.8	-32.6	-34.2
5 to 9.....	14.8	10.6	19.3	1.9	1.4	2.5	-45.1	-44.0
10 to 14.....	17.9	11.5	24.1	2.5	1.8	2.3	-52.3	-21.7
15 to 19.....	23.0	16.8	27.0	3.3	2.2	4.9	-37.8	-55.1
20 to 24.....	18.2	13.6	22.3	2.2	1.3	4.5	-39.0	-71.1
25 to 34.....	12.8	10.9	17.6	1.1	0.8	1.9	-38.1	-57.9
35 to 44.....	12.2	9.8	19.8	0.8	0.5	1.3	-50.5	-61.5
45 to 54.....	13.6	11.1	22.0	1.0	0.7	1.9	-49.5	-63.2
55 to 64.....	13.8	12.1	21.4	0.8	0.4	1.4	-43.5	-71.4
65 to 74.....	13.7	10.6	21.9	1.1	1.2	2.0	-51.6	-40.0
COLORED								
1 to 74*.....	17.8	14.0	23.0	1.5	1.4	2.1	-39.1	-33.3
1 to 4.....	3.4	3.1	6.1	1.5	2.1	2.3	-49.2	- 8.7
5 to 9.....	12.9	10.7	11.3	1.4	1.3	1.5	- 5.3	-13.3
10 to 14.....	36.0	30.7	36.4	2.0	2.4	3.0	-15.7	-20.0
15 to 19.....	42.3	33.2	51.1	2.9	2.8	1.7	-35.0	+64.7
20 to 24.....	23.4	17.7	30.4	1.4	0.7	2.6	-41.8	-73.1
25 to 34.....	15.2	10.7	25.3	1.1	1.2	1.5	-57.7	-20.0
35 to 44.....	9.6	7.7	15.1	1.1	0.6	2.3	-49.0	-73.9
45 to 54.....	10.5	7.1	16.4	1.1	0.3	2.6	-56.7	-88.5
55 to 64.....	7.5	6.3	12.3	1.3	1.2	2.1	-48.8	-42.9
65 to 74.....	8.5	6.9	14.5	0.8	0.6	1.6	-52.4	-62.5

*Standardized for age.

occur between the ages 35 and 64 years, when the male rates run between 16 and 30 times the female rates.

Color The death rate among colored males at ages 1 to 74 was $1\frac{1}{4}$ times that for white males. From Chart XX it is apparent, however, that the excess colored mortality obtains only at the age range 5 to 24 years. Among females the difference in rates by color, at ages 1 to 74, is small.

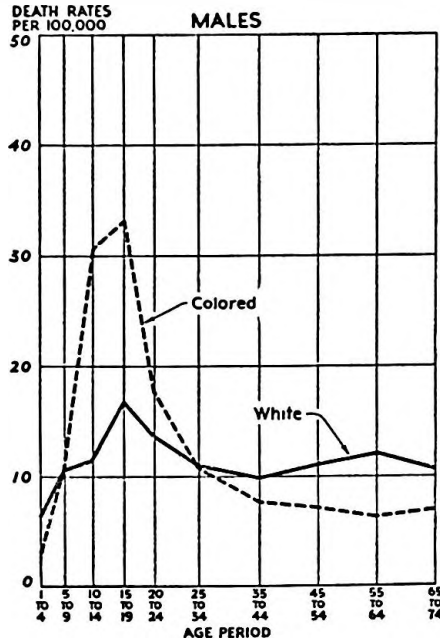
CHART XX

ACCIDENTAL DROWNING

Averages of Annual Death Rates per 100,000 Males

By Color and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935



Trend of Mortality

During the past quarter century the mortality from drowning has followed a downward course. As Table 20 shows, the early decade of the period under review was characterized by a rather rapid decline in the death rate, after which time the decline was more gradual. Between 1911 to 1915 and 1931 to 1935 the death rate dropped 45.1 percent. The fall in mortality was common to all the color and sex groups. Between these quinquennia the percent decline in death rate was 44.1 for white males, 51.9 for white females, 39.1 for colored males, and 33.3 for colored females. Moreover, virtually every period of life showed a large improvement in mortality. Chart XXI displays graphically the time series for white males and colored males at ages 1 to 74.

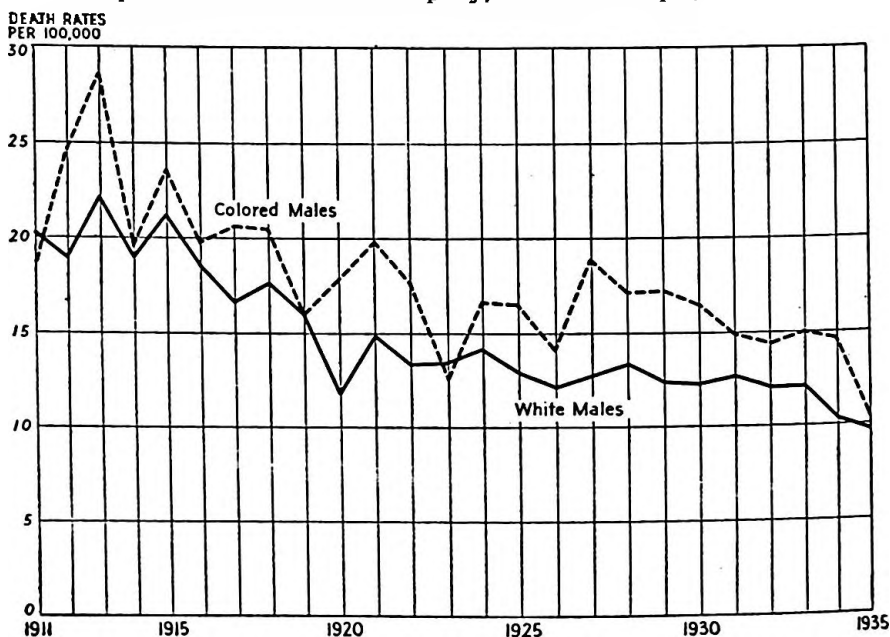
Annual fluctuations in mortality reflect largely the influences of marine disasters and floods, or of unusual climatic conditions. Exceptionally high rates of 12.4 and 12.5 per 100,000 were recorded in the years 1913 and 1915, respectively. These were years of major disasters—the floods of the Ohio River in the

TABLE 20
ACCIDENTAL DROWNING
Five-Year Averages of Annual Death Rates* per 100,000
By Color and Sex. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

YEARS	TOTAL PERSONS	WHITE		COLORED	
		Males	Females	Males	Females
1911 to 1935	8.2	14.8	1.8	17.8	1.5
1931 to 1935	6.2	11.3	1.3	14.0	1.4
1926 to 1930	7.0	12.5	1.5	16.7	1.1
1921 to 1925	7.5	13.7	1.6	16.6	1.3
1916 to 1920	8.9	16.1	1.8	18.9	1.6
1911 to 1915	11.3	20.2	2.7	23.0	2.1
Percent decline 1931-1935 since 1911-1915	45.1	44.1	51.9	39.1	33.3

*Standardized for age, and in the case of Total Persons, also for color and sex.

CHART XXI
ACCIDENTAL DROWNING
Standardized Annual Death Rates per 100,000 Males
By Color. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



spring of 1913, and the *Eastland* disaster on the Chicago River in 1915—which affected large numbers of our Industrial policyholders. Unusually cool summers undoubtedly attract fewer people to water sports and thus diminish the number exposed to the hazard of drowning.

Origin of Hazard

A tabulation of drownings among our Industrial policyholders according to origin of hazard, covering the years 1926 to 1935, shows that 91.1 percent of these fatalities among males, and 93.4 percent among females, occur in public places. These deaths, for the most part, result from water sports, from falls off boats, docks and piers, and from skating on thin ice. As is apparent from Appendix Table D, the occupational factor is important among males only; 7.6 percent of the drownings among them arise in the course of employment. Drownings in and about the home accounted for 1.3 percent of the accidental drownings among males and 6.0 percent of those among females. Domestic accidents affect mostly children and arise in a variety of ways, mostly through falls into wells, cisterns, ditches, bathtubs, and household vessels.

Prevention of Deaths from Drowning

More than 7,000 deaths from drowning occur in the United States each year. Through organized effort many of these deaths can be prevented. The public must be made aware of the dangers inherent in water sports, and both children and adults should be taught swimming and life-saving methods, as well as the proper method of administering artificial respiration. States and local communities can contribute to the safety campaign by providing opportunities for indulgence in water sports at well supervised pools and bathing beaches. A way must be found to bring the benefits of the safety movement, in a larger measure, to the sailor, the fisherman, the longshoreman, and to others who make their living on the water. Moreover, there is needed a larger body of statistical information than has yet been collected by any agency to show in detail the conditions under which all types of drownings occur.

ACCIDENTAL BURNS (CONFLAGRATION EXCEPTED)¹⁰

The vast majority of the nearly 6,000 fatal burns and scalds which occur annually in the United States take place in the home. Children are the principal victims. In fact, about 40 percent of all the deaths from burns occur among children under 15 years of age. Deaths from this cause are at a minimum in the five months May through September. With the coming of chilly weather and the lighting of home fires in October there is a marked rise in the number of deaths, which continue to increase until the maximum is reached in January or February.

Among Metropolitan Industrial policyholders, aged 1 to 74 years, burns ranked fourth in importance as a means of accidental death in the 25-year period under review. The deaths charged to this cause numbered 20,657, or 9.5 percent of all fatal accidents. The standardized annual death rates for the period averaged 6.4 per 100,000. The rates for each year appear in Appendix Table C.

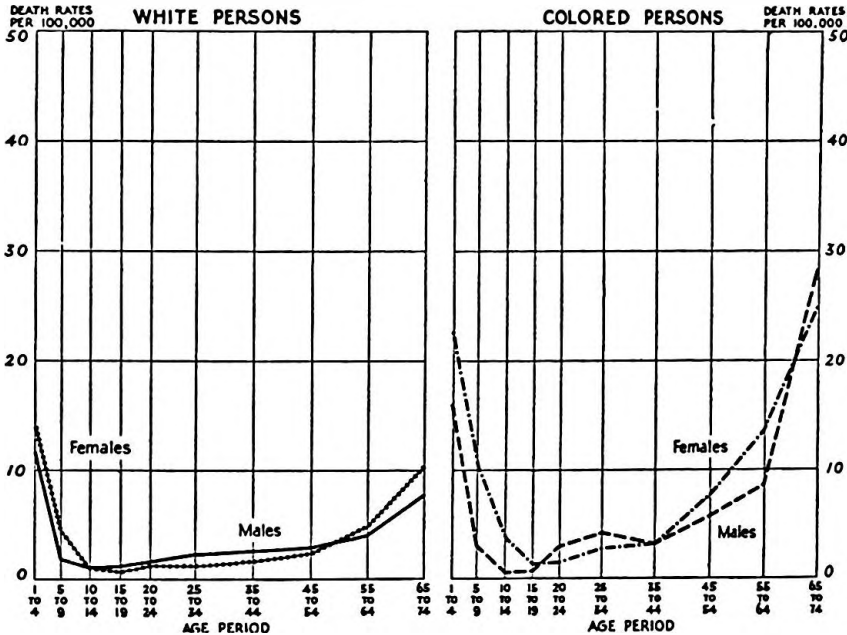
Mortality by Age, Sex, and Color

Age The death rate from burns among white persons is at a peak in early childhood, drops to a low point in adolescence and early adult life, then rises to a second, but lower, maximum at the older ages. In the quinquennium 1931 to 1935 among white males the rate at ages 1 to 4 was 11.7 per 100,000. Chart XXII shows clearly the sharp drop of the age curve to 1.0 at ages 10 to 14, and the progressive rise with advancing age to 7.7 per 100,000 at 65 to 74 years. Among colored persons in each sex the profile of the curve is similar to that for white persons, except that the curve reaches its maximum at the older ages, at which period the rates exceed those for the preschool years.

Sex Burns are the only means of accidental injury in which the mortality for females exceeds that for males. Owing to the differential movement of the death rate for males and females in a number of age groups, the sex ratio of the death rates at the various periods of life has changed materially over the 25-year period. In the early years of this experience the death rate for white females at ages 1 to 74 exceeded that for white males by 41 percent. In

¹⁰Burns and scalds due to land and air transportation vehicles, machinery, mining and quarrying accidents, and those caused by electricity and lightning are not classified under this heading.

CHART XXII
BURNS (CONFLAGRATION EXCEPTED)
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years
 Metropolitan Life Insurance Company, Industrial Dept., 1931 to 1935



the five-year period 1931 to 1935 the excess female mortality was only 6 percent. Moreover, in 1911 to 1915 females in each race recorded a higher death rate than males at every age period, except at 1 to 4 among white persons. In recent years the mortality among white females was actually lower than that for white males at ages 15 to 54. The age data for the initial and final quinquennia are shown in Table 21.

Color The mortality among colored policyholders exceeds that among the white. In the period 1931 to 1935 the death rate for colored males, 5.3 per 100,000, exceeded that for white males by 71 percent; the rate for colored females, 7.1 per 100,000, was slightly more than twice the rate for white females. The death rates for colored persons in each sex were higher than those for the respective white groups at virtually each age period.

Trend of Mortality

The mortality from burns declined appreciably in the 25-year period. In 1931 to 1935 the death rate (3.5 per 100,000) was 60.7 percent lower than that in 1911 to 1915 (8.9 per 100,000).

TABLE 21
BURNS (CONFLAGRATION EXCEPTED)
 Averages of Annual Death Rates per 100,000
 By Color, Sex, and Age. Ages 1 to 74 Years
 Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000						PERCENT CHANGE 1931-1935 SINCE 1911-1915	
	MALES			FEMALES			MALES	FEMALES
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915		
WHITE								
1 to 74*.....	5.2	3.1	6.8	6.6	3.3	9.6	-54.4	-65.6
1 to 4.....	26.7	11.7	43.5	28.1	13.9	39.3	-73.1	-64.6
5 to 9.....	4.1	1.9	7.0	8.9	4.3	12.7	-72.9	-66.1
10 to 14.....	1.3	1.0	1.3	2.4	1.0	3.9	-23.1	-74.4
15 to 19.....	1.5	1.1	0.9	1.8	0.6	2.8	+22.2	-78.6
20 to 24.....	2.0	1.5	1.5	2.3	1.3	3.6	0.0	-63.9
25 to 34.....	2.4	2.1	1.7	2.3	1.1	3.6	+23.5	-69.4
35 to 44.....	3.3	2.6	3.3	3.0	1.6	5.0	-21.2	-68.0
45 to 54.....	4.1	2.9	3.3	4.9	2.4	7.9	-12.1	-69.6
55 to 64.....	5.4	4.0	5.2	8.0	4.8	10.7	-23.1	-55.1
65 to 74.....	8.1	7.7	8.2	17.1	10.4	24.5	-6.1	-57.6
COLORED								
1 to 74*.....	8.6	5.3	11.4	13.5	7.1	18.6	-53.5	-61.8
1 to 4.....	42.5	16.1	73.3	51.7	22.6	76.3	-78.0	-70.4
5 to 9.....	6.4	2.9	10.2	21.9	10.3	30.1	-71.6	-65.8
10 to 14.....	2.1	0.5	2.3	5.4	3.6	7.9	-78.3	-54.4
15 to 19.....	2.3	0.6	2.6	5.0	1.3	6.4	-76.9	-79.7
20 to 24.....	2.6	2.8	2.7	4.6	1.4	8.0	+3.7	-82.5
25 to 34.....	4.1	4.1	3.6	3.9	2.7	5.5	+13.9	-50.9
35 to 44.....	5.1	3.1	4.5	4.7	3.0	7.2	-31.1	-58.3
45 to 54.....	5.5	5.6	4.4	8.9	7.5	13.7	+27.3	-45.3
55 to 64.....	9.6	8.5	6.1	18.3	13.4	17.5	+39.3	-23.4
65 to 74.....	22.8	28.3	20.8	42.8	24.8	46.9	+36.1	-47.1

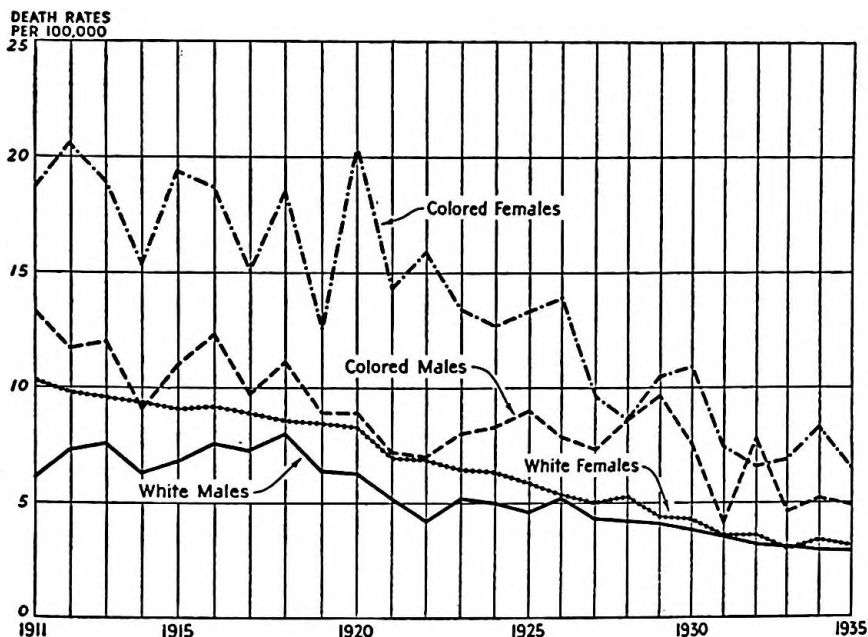
*Standardized for age.

Chart XXIII shows that the mortality trend over the period as a whole has been downward for each color and sex. Table 21 shows the percentage change in the death rates between the first and last quinquennia by color, sex, and age. Females in each race showed a greater improvement than males; white persons in each sex recorded a somewhat sharper decline than the colored.

Among both white females and colored females large decreases in death rate are evident at every age period. Among males, how-

CHART XXIII
BURNS (CONFLAGRATION EXCEPTED)
Standardized Annual Death Rates per 100,000
By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935



ever, the situation is quite different. For white males increases were registered at ages 15 to 19 and 25 to 34; the colored male rate rose at 20 to 34 and 45 to 74 years.

Home fatalities, it is clear from the decrease in mortality among women and children, are declining progressively. One important factor in this decrease, it is suggested, is the modernization of the American home, which has brought about a reduction in the number of homes using the coal range for house heating, cooking, and laundry purposes. Another factor has been the widespread replacement of the gas burner and the oil lamp by electric lighting systems. These improvements and others have materially reduced the hazards of the home. It is impossible to determine the extent to which the medical profession has contributed to the drop in mortality because of improved methods of treating burns. Some share in the decline must be assigned also to the organized efforts of workers in the field of safety who have forced upon the attention of parents the dangers that surround them and their children in and out of the home.

Origin of Hazard

Information regarding the origin of hazard of fatal burns was secured for 86 percent of the deaths which occurred among Industrial policyholders during the years 1926 to 1935. Appendix Table D shows the percentage distribution of these deaths by age, sex, and origin of hazard.

The great majority of fatal burns, as we have already indicated, occur in the course of activities in and about the home. Among females, 93.0 percent of the deaths of known origin of hazard were domestic; among males, 70.0 percent. Occupational burns are important among males only, and account for 22.0 percent of the deaths at ages 1 to 74. During the working period of life, 15 to 64 years, occupational burns accounted for 53.5 percent of the male deaths. The reader is reminded that not all occupational deaths from burns are included in these figures. Burns and scalds due to railroad, machinery, and mining accidents, as well as those caused by electricity and lightning are classified elsewhere.

Specific Agencies of Burns

Data referring to the specific agencies of burns are of the utmost importance in campaigns to reduce the number of deaths from this means of injury. Table 22 shows the percentage distribution of deaths from burns by sex and age for specific means of injury.

Stoves and grates, hot water, and matches, are the chief agencies of injury, together accounting for 66.2 percent of all female deaths and 52.7 percent of all male deaths. In early childhood hot water is the leading agency of accidental burns, particularly for boys. Scalds, at these ages, account for no less than 61.0 percent of the male deaths, and 38.2 percent of the female deaths. More than three quarters of the total deaths from scalds for all ages combined occur at these ages. Stoves and grates (including coal stoves and gas stoves), matches and bonfires, exact a heavy toll in early childhood and follow scalds in importance. The proportion of deaths from these agencies is considerably higher for girls than for boys—a condition which reflects the additional hazard of feminine clothing. At the school ages, 5 to 14 years, stoves and grates cause the largest number of deaths from accidental burns among both boys and girls. The percentage of such deaths among girls, however, is double that for boys. In the ages beyond 15, 55 percent of the female deaths are chargeable to stoves and grates. The practice of starting fires with kerosene or gasoline is an important factor in the high mortality from burns.

CONFLAGRATION¹¹

Conflagrations cost the people of the United States more than 1,500 lives and over one quarter of a billion dollars of property annually. Unusually heavy loss of life in a single fire—such as that which occurred in the Ohio State Penitentiary at Columbus in 1930—raises the total in some years to over 2,000 lives. In the Columbus holocaust 320 persons lost their lives. This was the largest loss of life in any fire in the 25 years under review, with the exception of the Minnesota forest fires in 1918, when the death toll amounted to more than 400. These are outstanding conflagrations, but major fires in which 20 or more persons are killed occur almost annually, and in some years there are as many as three such fires. Children in schools, patients and the staffs of hospitals, inmates of penitentiaries, factory workers, and dance-hall patrons are the chief victims of these fires. In spite of the large number of deaths due to catastrophes of this magnitude, the bulk of the deaths, possibly as many as two thirds, result from the burning of dwellings, hotels, and apartment houses.

The mortality picture of conflagrations, in certain of its aspects, is similar to that of the mortality from burns. In the first place, the majority of deaths from each of these causes occur in the home. Secondly, both record relatively low death rates in the summer months and maximum rates in the winter. Unlike burns, however, conflagrations cause more male than female deaths.

Among Metropolitan Industrial policyholders, ages 1 to 74 years, conflagration, in the period 1911 to 1935, accounted for 3,514 deaths, or 1.6 percent of all fatal accidents. The average standardized death rate for the 25-year period was 1.1 per 100,000.

Mortality by Age, Sex, and Color

Age Relatively high death rates for each race and sex group are exhibited at the youngest and at the oldest age periods, a condition which, it has been suggested, indicates the comparative inability of the very young and the very old to save themselves in emergencies. As can be seen from Table 23, in the recent quinquennium the average death rates at the older ages exceeded those for preschool years.

¹¹Under this title are included deaths resulting from burning buildings and from prairie and forest fires. Deaths from conflagration on ships were included for the period 1911 to 1930; in subsequent years deaths of this nature were allocated, in accordance with the revised International List, to "other accidents". Deaths in burning automobiles, airplanes, and other vehicles, and deaths from mine fires and explosions are allocated to other titles.

TABLE 23
CONFLAGRATION

Averages of Annual Death Rates per 100,000

By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
WHITE						
1 to 74*.....	1.3	1.2	1.4	0.6	0.6	0.7
1 to 4.....	1.9	1.3	1.8	1.5	1.2	1.7
5 to 9.....	0.8	0.8	0.7	0.8	0.6	0.8
10 to 14.....	0.5	0.4	0.2	0.5	0.3	0.6
15 to 19.....	0.5	0.5	0.4	0.3	0.3	0.4
20 to 24.....	0.7	0.7	0.5	0.5	0.4	0.5
25 to 34.....	1.2	1.2	1.0	0.4	0.4	0.3
35 to 44.....	1.8	1.7	2.6	0.4	0.3	0.5
45 to 54.....	2.1	2.1	2.5	0.6	0.7	0.6
55 to 64.....	2.2	2.0	2.3	0.9	0.7	1.5
65 to 74.....	3.2	2.9	4.5	1.9	2.4	2.7
COLORED						
1 to 74*.....	2.4	2.2	2.5	2.2	1.5	2.7
1 to 4.....	7.0	2.0	7.6	6.7	3.2	9.2
5 to 9.....	2.0	2.4	0.4	3.0	1.8	3.9
10 to 14.....	0.8	0.5	1.9	0.9	0.7	0.7
15 to 19.....	1.0	0.3	1.2	0.5	1.0	0.0
20 to 24.....	1.5	1.9	2.3	1.2	1.0	1.3
25 to 34.....	1.5	2.3	1.4	1.0	1.1	1.2
35 to 44.....	1.7	2.5	1.2	1.0	1.4	1.1
45 to 54.....	2.3	2.3	4.4	1.3	1.3	1.0
55 to 64.....	4.2	4.6	4.5	3.6	2.1	4.5
65 to 74.....	6.1	8.1	4.2	9.0	4.1	15.2

*Standardized for age.

Sex Among white policyholders the death rates for males exceeded those of females at every age period in the quinquennium 1931 to 1935. Between 25 and 54 years the death rates for white males ranged from three to six times those for white females. The death rate at all ages combined for white males was twice that for white females. Among colored policyholders the average rate in the recent period was 2.2 per 100,000 for males and 1.5 per 100,000 for females.

Color Colored male policyholders exhibited a mortality rate from conflagration almost twice that for white males; the rate for colored females was $2\frac{1}{2}$ times that for white females. Excess colored mortality is in evidence at virtually every age. Unsafe housing is partially responsible for the unfavorable position of the colored population. The fact that so many colored women go out to work and leave their young children in the care of older ones, is possibly an added factor in the excessive rates at the younger ages.

Trend of Mortality

The mortality among our weekly premium-paying policyholders exhibits no definite upward or downward trend in the 25-year period under review. The average death rate in 1931 to 1935 was 1.0 per 100,000; in 1911 to 1915 it was 1.2 per 100,000. In view of the fact that the rates are small and that annual fluctuations are relatively large, comparison of the rates for the two quinquennia does not yield a satisfactory measure of trend. The standardized annual death rates for each color-sex group of this experience are shown in Appendix Table C.

Origin of Hazard

Information regarding the origin of hazard of deaths from conflagration was secured for 97 percent of the deaths which occurred among Industrial policyholders during the years 1926 to 1935. Appendix Table D shows the percentage distribution of these deaths by age, sex, and origin of hazard. Among females 91.8 percent of the deaths occurred in the home; 4.6 percent in public places, and 3.6 percent arose out of employment. Likewise, the greatest proportion of deaths among males (72.8 percent) occurred in the home, but occupational deaths accounted for 18.9 percent, while deaths in public places accounted for 8.3 percent of the total specified. Between the ages of 5 and 14 years public accidents are of importance, and account for 16.5 percent of the male deaths and 10.3 percent of the female deaths at these ages. In the main working period of life nearly one third of the male deaths in conflagrations are of occupational origin.

Prevention of Deaths from Conflagration

Our survey brings out the disappointing fact that no definite progress has been made toward lowering the death rate from conflagration, in spite of many factors which should have had a favorable influence. Building laws relating to fireproof construc-

tion, requirements for fire escapes in apartment houses, theaters, etc., have been quite generally enacted in areas inhabited by an increasing proportion of the population; motorized fire equipment has made it possible for fire companies to reach burning buildings faster than before, and fire-prevention campaigns have been carried on all over the country. These efforts surely have been in the right direction and should be expanded. A more thorough study of the causes of fires than has yet been made is needed to determine what influences have been at work to counteract the gains which have been made. A thorough analysis will serve to bring out the points of attack which would yield the greatest returns. The National Fire Protection Association already has published many valuable analyses of the causes of fires. It is to be hoped that this organization will be able to secure more comprehensive data and that it will publish its findings in greater detail. Specific data obtained through a complete study covering a small area might prove of greater value than general information covering a large area. The problem is largely one of reducing the number of conflagrations in homes. But the great holocausts in schools, hospitals, penitentiaries, and in other public buildings, which have been all too common throughout the past 25 years, point to the need for more stringent supervision of such public structures and for a check-up on the fire hazards present in the construction and management of existing institutions.

TRAUMATISM BY FIREARMS¹²

Accidental injuries by firearms claim the lives of approximately 3,000 persons in the United States each year. Over 85 percent of the fatalities occur among males, and of these deaths almost one third occur in late childhood and in adolescence, *i.e.*, between the ages of 10 and 19 years. The high death rate at this age period is due mainly to children playing with firearms carelessly left in and about the home, and to the reckless use of guns in the pursuit of outdoor sports. Hunting accidents contribute generously to the total mortality, as is indicated by the fact that about half the accidental deaths from firearms occur during the gaming season, the four months October through January.

In the 25-year period under review a total of 6,039 deaths from firearms was reported among Metropolitan Industrial policyholders at ages 1 to 74 years; this number accounts for 2.8 percent of the total deaths from accidental and unspecified violence. The standardized death rates for the period averaged 1.7 per 100,000. Appendix Table C presents the annual rates.

Mortality by Age and Color

Boys at ages 15 to 19 are relatively the most frequent victims of shooting accidents. As Table 24 shows, this statement holds both for the white and the colored. The death rate among colored policyholders, however, is considerably higher than that for whites. In the recent quinquennium 1931 to 1935, the mortality among colored males was about twice that for white males.

Trend of Mortality

The quarter century since 1911 has witnessed a downward trend in the mortality from traumatism by firearms. Among Metropolitan Industrial policyholders, ages 1 to 74 years, the death rate dropped from 1.8 per 100,000 in 1911 to 1915, to 1.4 per 100,000 in 1931 to 1935, a decline of 22.2 percent. The improvement in mortality showed a distinct difference by color; among white males the decline was 17.9 percent, and among the colored 42.3 percent. It is gratifying that the largest drop is registered in the group which suffers the highest rates. Noteworthy in this

¹²Under this title are classified also deaths reported from "gunshot wound," etc., without qualification as to accidental, suicidal, or homicidal character. However, every effort has been made to obtain definite information in such cases, and they constitute only a small proportion of the deaths classified here. This title does not include deaths from wounds of war.

TABLE 24
TRAUMATISM BY FIREARMS
 Average of Annual Death Rates per 100,000 Males
 By Color and Age. Ages 1 to 74 Years
 Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000						PERCENT CHANGE 1931-1935 SINCE 1911-1915	
	WHITE MALES			COLORED MALES			White Males	Colored Males
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915		
1 to 74*.....	2.8	2.3	2.8	6.9	4.5	7.8	-17.9	- 42.3
1 to 4.....	1.0	0.7	1.0	1.9	0.5	2.3	-30.0	- 78.3
5 to 9.....	1.6	1.1	1.7	3.9	3.3	5.8	-35.3	- 43.1
10 to 14.....	4.4	2.9	5.5	8.1	5.9	10.3	-47.3	- 42.7
15 to 19.....	6.5	5.0	5.6	13.8	9.1	19.7	-10.7	- 53.8
20 to 24.....	3.8	3.8	3.6	11.2	7.0	13.7	+ 5.6	- 48.9
25 to 34.....	2.6	2.5	2.5	8.6	4.7	9.9	0.0	- 52.5
35 to 44.....	2.0	1.6	2.4	6.8	4.0	4.5	-33.3	- 11.1
45 to 54.....	1.5	1.5	1.1	3.4	3.8	0.4	+36.4	+850.0
55 to 64.....	1.6	1.9	1.3	2.2	1.9	1.5	+46.2	+ 26.7
65 to 74.....	1.2	1.2	1.9	2.1	0.0	2.2	-36.8	-100.0

*Standardized for age.

experience is the fact that in each race relatively high rates were recorded among males in the period 1918 to 1920, apparently under the influence of conditions attending the World War.

Table 24 shows the comparative death rates by age for the initial and final quinquennia of the period under review. In contrast with the experience for the aggregate, increases in mortality were recorded among both white males and colored males in the age range 45 to 64 years. The reasons for this rise in the death rate are not clear from the data at hand.

Origin of Hazard

Where do accidental gunshot injuries occur most frequently? A tentative answer only can be given from our study, as, during the years 1926 to 1935, only 62.2 percent of the records of deaths from firearms contained information on the origin of hazard. Of the deaths tabulated for both sexes combined, exactly one half took place in and about the home, 47.3 percent occurred in public places, and 2.7 percent arose out of or in the course of employment. The proportions vary widely, however, with sex and age. Among

males, ages 1 to 74, 44.6 percent are domestic accidents, 52.3 percent public, and 3.1 percent occupational. Among females, on the other hand, home accidents are predominant. Among males in the early years of life and at the older ages, domestic accidents are of main importance, whereas, in the active range of years, public accidents—incurred largely in sports—predominate.

Geographic Distribution

The mortality for this means of injury is highest in those sections of the country where the possession of firearms is most common, especially high rates being reported for most of the Western and Southern States. The maximum rates are registered in the Mountain States of Nevada, Montana, Idaho, and Wyoming; the rates for these States in the years 1931 to 1933 being, respectively, 7.6, 6.3, 5.9, and 5.4 per 100,000. Two Southern States—Florida and Mississippi—with rates of 5.2 and 5.1 per 100,000, respectively, come next, and then New Mexico, with a rate of 5.0. At the other end of the scale are three New England States—Connecticut, Massachusetts, and Rhode Island—and two Middle Atlantic States—New York and New Jersey—with rates varying between 0.5 and 0.8 deaths per 100,000 population. These figures appear in Table 25. It is instructive to note that in a general way the geographic picture of traumatism by firearms resembles that for homicides.

Prevention of Deaths from Firearms

Widespread publicity should be given to the conditions under which accidents from firearms occur and to the precautions that are necessary to prevent such fatalities. Most domestic fatalities are due to children playing with loaded guns carelessly left within their reach, to the discharge of firearms dropped, lifted, or being cleaned, and to scuffling for possession of a loaded gun. The great majority of the accidental gunshot fatalities occurring in public places result from the sport of hunting. The circumstances most frequently leading to these deaths, as reported by the Registrar of Vital Statistics for Kansas, are: crawling through fence carrying loaded gun, handling loaded gun by the muzzle, killed by stray bullet, falling on or dropping of loaded gun. The accident prevention campaign should be conducted especially vigorously in the southern and western parts of the United States. Undoubtedly, greater restrictions upon the sale of firearms to, and their use by, older children and adolescents would save a number of lives each year.

TABLE 25
TRAUMATISM BY FIREARMS
Crude Death Rates per 100,000 in the United States
All Ages. 1931 to 1933.

STATE	DEATH RATE PER 100,000	STATE	DEATH RATE PER 100,000
TOTAL U. S.*.....	2.4	Maine.....	3.2
Nevada.....	7.6	West Virginia.....	3.0
Montana.....	6.3	Minnesota.....	2.9
Idaho.....	5.9	Missouri.....	2.9
Wyoming.....	5.4	Nebraska.....	2.7
Florida.....	5.2	Iowa.....	2.6
Mississippi.....	5.1	Kansas.....	2.5
New Mexico.....	5.0	Washington.....	2.4
Georgia.....	4.5	Wisconsin.....	2.3
Texas.....	4.4†	Maryland.....	2.2
Utah.....	4.3	North Dakota.....	2.2
Arizona.....	4.2	Indiana.....	2.1
Arkansas.....	4.1	California.....	2.0
South Carolina.....	4.1	Illinois.....	2.0
Tennessee.....	4.1	New Hampshire.....	2.0
Kentucky.....	4.0	Delaware.....	1.9
Virginia.....	3.8	Michigan.....	1.8
South Dakota.....	3.7	Ohio.....	1.8
Louisiana.....	3.6	Pennsylvania.....	1.6
North Carolina.....	3.6	District of Columbia..	0.9
Alabama.....	3.5	Connecticut.....	0.8
Oregon.....	3.5	Massachusetts.....	0.8
Oklahoma.....	3.3	New York.....	0.8
Vermont.....	3.3	New Jersey.....	0.7
Colorado.....	3.2	Rhode Island.....	0.5

*Excluding Texas. †Rate for 1933 only; average rate for 1931-1933 not available.

TRAUMATISM IN MINES AND QUARRIES

Mining and quarrying, wherever carried on, are hazardous employments which exact a heavy toll among those who engage in them. In the United States, a country rich in mineral wealth and employing large numbers of workers in the extraction of minerals, mine and quarry accidents accounted for approximately 1,500 deaths in 1934. By far the largest proportion of these fatal injuries, 88 percent, were associated with coal mining; metal mines contributed some 8 percent of the deaths, and quarries 4 percent. Variations in the death toll from year to year are quite considerable, owing to fluctuations in employment and to the occurrence of major catastrophes. Among the worst disasters reported by the United States Bureau of Mines during the 25 years 1911 to 1935 were: the fire in the Butte, Mont., copper mine in 1917, which took 163 lives, and the explosions in coal mines at Dawson, N. M., in 1913, 263 deaths; at Eccles, W. Va., in 1914, 181 deaths; at Castle Gate, Utah, in 1924, 171 deaths; at Mather, Pa., in 1928, 195 deaths.

While it is true that dust and gas explosions and fires, such as those mentioned, influence the total number of deaths materially in the years in which they occur, they are by no means the chief causes of fatalities in mines. The false impression that they are, has been created by the spectacular nature of these accidents and the wide publicity given to them in the daily press. In reality, falls of roof, of rock, and of coal and ore, which take a small toll in each of a number of accidents, comprise the largest single cause of fatal accidental injury in mines, accounting for about one half of all underground coal mine fatalities, and more than one third of all underground metal mine fatalities.

For the 25-year period under survey a total of 3,912 deaths among Metropolitan Industrial policyholders, ages 1 to 74, was allocated to accidental traumatism in mines and quarries. This number accounts for 1.8 percent of all fatal injuries in this insurance experience. The average of the standardized annual death rates from accidents in mines and quarries was 1.4 per 100,000 insured; the annual rates appear in Appendix Table C. Almost all the deaths were among adult males and arose out of or in the course of employment. The mortality among colored males, 3.2

TABLE 26
TRAUMATISM IN MINES AND QUARRIES
Averages of Annual Death Rates per 100,000 Males
By Color and Age. Ages 10 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	WHITE MALES			COLORED MALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
1 to 74*.....	2.9	2.1	3.1	3.2	1.6	3.6
10 to 14.....	0.4	0.4	0.4	0.9	1.5	1.5
15 to 19.....	2.5	1.2	3.9	3.4	1.4	3.9
20 to 24.....	3.1	2.0	3.1	4.2	2.5	3.6
25 to 34.....	3.8	2.5	4.4	4.0	1.3	4.4
35 to 44.....	4.9	4.2	4.7	5.1	2.5	6.7
45 to 54.....	6.0	4.6	5.8	5.8	2.7	6.1
55 to 64.....	5.6	3.9	5.1	5.2	3.7	5.8
65 to 74.....	2.6	2.0	3.9	3.4	0.9	4.1

*Standardized for age.

per 100,000, exceeded that for white male policyholders, 2.9 per 100,000, by 10 percent. In each race the rate increased to a maximum at 45 to 54 years, then fell with advancing age to the end of life. These differences in the death rates, it should be pointed out, do not necessarily indicate a greater degree of hazard for colored than for white miners; nor do they necessarily indicate an increasing hazard with advancing age. Differences in the proportions of miners among both white and colored men in the various age groups may account for the differential death rates. Table 26 presents the death rates per 100,000 for males by color and age.

Trend of Mortality

Among these policyholders, the death rate showed little upward or downward trend for the 25-year period as a whole. That the mortality at the close of the series is lower than that at the beginning, results from the decline in death rate since 1929. Although part of this recent decline in mortality is due to a decrease in employment, this is not the whole explanation. According to the complete and valuable reports of the U. S. Bureau of Mines, the fatal accident rate per 1,000 workers, on a 300-day yearly basis, in mines and quarries is now at the lowest point in a quarter of a century. The pertinent figures appear in Table 27.

TABLE 27
TRAUMATISM IN MINES AND QUARRIES
Average Annual Number of Deaths and Death Rates per 1,000 Workers
in the United States, Calculated on a 300-Day Basis. 1911 to 1934

YEARS	COAL MINES			METAL MINES			QUARRIES		
	Number of 300-Day Workers	Number of Deaths	Deaths per 1,000 300-Day Workers	Number of 300-Day Workers	Number of Deaths	Deaths per 1,000 300-Day Workers	Number of 300-Day Workers	Number of Deaths	Deaths per 1,000 300-Day Workers
1931 to 1934	309,313	1,240	4.01	46,818	119	2.54	42,593	53	1.24
1926 to 1930	485,139	2,235	4.61	110,991	335	3.02	78,277	128	1.64
1921 to 1925	484,071	2,215	4.58	107,307	346	3.23	76,377	136	1.78
1916 to 1920	599,781	2,419	4.03	166,991	618	3.70	69,630	146	2.10
1911 to 1915	541,489	2,517	4.65	157,192	630	4.01	83,206	182	2.19

Source: U. S. Bureau of Mines.

The table shows that between 1911 and 1934 the accident rate among coal miners, who comprise the great majority of workers in the mineral extraction industries, showed the least improvement. On a production basis, however, the record is much more satisfactory. In 1934 a total of 339,752 tons of coal was produced for every miner killed, whereas in 1911 one miner was killed for every 186,887 tons mined.

The greatest improvement in mortality is recorded for metal miners and for quarrymen. The death rate per thousand 300-day metal miners declined from 4.01 in 1911 to 1915, to 2.54 for the years 1931 to 1934; the rate for quarrymen showed a corresponding decline from 2.19 to 1.24.

TRAUMATISM BY MACHINES¹³

Machinery accidents in the United States took the lives of more than 1,600 persons in 1934. The great majority of these deaths occur among adult males and arise out of or in the course of employment. Among Metropolitan Industrial policyholders a total of 4,782 deaths from machinery accidents was reported in the 25-year period 1911 to 1935. This number accounted for 2.2 percent of the deaths from all accidents. The death rates for white males and for colored males at ages 1 to 74 averaged 3.4 and 3.9 per 100,000, respectively.

Most of the deaths of insured persons were chargeable to three types of machinery: elevators in office buildings, factories and homes; building construction machinery, chiefly derricks, cranes, and power shovels; and machines used in manufacture, particularly power saws and other metalworking and woodworking machines. In addition to these major sources of mortality, a varying number of deaths each year resulted from boiler explosions and from injuries inflicted by agricultural and recreational machinery.

Most of the victims of elevator fatalities, it is worthy of mention, were operators and repairmen. Crushing by elevators and falls down shafts each accounted for large numbers of deaths. Freight elevators were involved in most instances.

Mortality by Age and Color

Age Throughout the quarter century under review the death rate among white males rose with advancing age to a maximum at ages 55 to 64, and then fell off slightly at the older ages. Among colored males the mortality rose to a maximum at ages 45 to 54, a decade earlier in life than for white males. Table 28 shows the mortality from machinery accidents by age for each group of males in this insurance experience.

To what extent the age mortality curve reflects the age distribution of those exposed to the machinery hazard is not known. It is improbable, however, that the number exposed to the risk increases steadily with advancing age. The rising rates probably reflect the added dangers of working with machinery when advancing years have reduced agility of movement, have diminished acuity of the senses, and have lessened ability to recuperate from injury. There can be little doubt, however, that the drop in

¹³Deaths from machinery accidents in mines and quarries are not included under this title.

mortality beginning with age 65 among white males and with age 55 among colored males results from a sharp decline in the number of older persons employed around machinery.

Color The color ratio of the death rate from traumatism by machines changed in the 25-year period under review. In 1911 to 1915 the rate for colored males exceeded that for white males by 13 percent; in 1931 to 1935, on the other hand, white males registered the higher mortality by 16 percent. This reversal of the color ratio may be due to a higher proportion of unemployment in recent years among Negroes than among whites.

Trend of Mortality

During the quarter century under review the mortality from machinery accidents among insured males manifested a downward trend. Among white male policyholders ages 1 to 74 the standardized death rates declined from 3.9 to 2.2 per 100,000, or 43.6 percent; between the first and last quinquennia the death rate for colored males declined from 4.4 to 1.9 per 100,000, or 56.8 percent. As Table 28 shows, declines are recorded at practically every im-

TABLE 28
TRAUMATISM BY MACHINES
Averages of Annual Death Rates per 100,000 Males
By Color and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000						PERCENT CHANGE 1931-1935 SINCE 1911-1915	
	WHITE MALES			COLORED MALES			White Males	Colored Males
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915		
1 to 74*.....	3.4	2.2	3.9	3.9	1.9	4.4	-43.6	-56.8
1 to 4.....	0.2	0.3	0.3	0.2	0.4	0.8	0.0	-50.0
5 to 9.....	0.4	0.3	0.2	1.8	0.3	0.4	+50.0	-25.0
10 to 14.....	0.9	0.5	0.8	1.5	0.5	0.4	-37.5	+25.0
15 to 19.....	3.3	1.0	4.0	4.7	1.7	6.2	-75.0	-72.6
20 to 24.....	3.5	2.4	4.4	4.3	0.9	5.0	-45.5	-82.0
25 to 34.....	3.5	2.4	3.9	5.4	3.7	5.8	-38.5	-36.2
35 to 44.....	5.1	2.8	7.1	5.2	2.2	5.8	-60.6	-62.1
45 to 54.....	6.4	4.4	7.3	7.3	3.9	10.8	-39.7	-63.9
55 to 64.....	7.6	5.6	7.6	6.5	3.1	6.5	-26.3	-52.3
65 to 74.....	6.6	4.7	6.9	3.8	0.9	0.0	-31.9	†

*Standardized for age. †Not computed.

portant age period. Considering the extent to which both industry and the home have become mechanized, the drop in mortality takes on added significance. It strongly suggests that the safeguarding of machines has, on the whole, more than kept pace with the increasing exposure to the hazard.

While the trend of the death rates has been downward, the annual fluctuations in the rate closely correspond with the rise and fall of employment and industrial activity. Among white males in the aggregate, the lowest death rate from machinery accidents in the first quinquennium of the series, 3.3 per 100,000, was recorded in 1915, a year of below-average business activity. Then followed three years of increasing production, with the result that the mortality moved steadily upward to 5.5 per 100,000 in 1918, the highest point in the entire series of years. During the postwar slump in business the death rate fell and in 1921 reached the low point, 2.4 per 100,000. With renewed industrial activity in 1922 and 1923 came a rise in mortality. From 1924 to 1930 the death rate remained fairly constant but at a lower level than in the preceding two years. In the quinquennium 1931 to 1935, years of widespread unemployment, the minimum rates in this experience were recorded. Annual death rates from machinery accidents among both white and colored males for the 25 years are presented in Appendix Table C.

Prevention of Machinery Accidents

Most machinery accidents can be prevented if proper precautions are taken. Many lives could be saved each year, for example, if all elevators were equipped with approved safety devices now in fairly common use. The risk of operating machines of various types can be minimized by guarding points of operation and by enclosing moving parts such as belts, pulleys, and gears. Mechanical safety measures should be supplemented by the education, training, and supervision of men working around machinery.

ELECTRICITY (LIGHTNING EXCEPTED)¹⁴

Electricity, numerically one of the less important means of fatal injury, was nevertheless responsible in 1934 for more than 600 deaths in the United States. About 85 percent of the deaths occurred among males 15 years of age and over; the great majority of these fatalities resulted from injuries arising out of or in the course of employment. In the experience of Metropolitan Industrial policyholders, occupational deaths account for almost three quarters of all the deaths from this means of injury. Electric linemen, electricians, and other electrical workers, because of their exposure to electricity, are the heaviest contributors to the annual toll of deaths from this cause.

More than half the deaths from electric shock each year occur in the four-month period June through September. This marked seasonal incidence is explained partly on the ground that employment in the electrical industry is at a maximum in the summer. It is largely at this period of the year that new lines are strung and existing services extended. Another factor, possibly of considerable importance, is the added susceptibility to fatal shock in the summer months due to the moist condition of the skin from perspiration.

In this 25-year insurance experience, electricity ranked 15th in importance among the means of accidental death and accounted for 2,440 deaths, or 1.1 percent of all fatal accidental injuries. The standardized death rates varied between 0.4 and 1.2 per 100,000, and averaged 0.9. Death rates for each year of the investigation are shown in Appendix Table C.

Mortality of White Males by Age

Of the 2,440 deaths from electricity in the period under review, 2,197 occurred among white male policyholders. The number of deaths among insured females and colored male policyholders is too small to give significant death rates by age. Table 29 shows death rates, by age, among white males for the years 1911 to 1915, 1931 to 1935, and for the entire period 1911 to 1935.

The death rate is highest during the working span of life and is at a minimum in childhood and in old age. Figures for the recent quinquennium show that the mortality rises slowly from 0.1 per

¹⁴Deaths from electricity resulting from land and air transportation vehicles machinery, and mining and quarrying accidents are not classified under this title.

TABLE 29
ELECTRICITY (LIGHTNING EXCEPTED)
Averages of Annual Death Rates per 100,000 White Males
By Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	DEATH RATES PER 100,000			PERCENT CHANGE 1931-1935 SINCE 1911-1915
	1911 to 1935	1931 to 1935	1911 to 1915	
1 to 74*.....	1.9	0.9	2.0	-55.0
1 to 4.....	0.1	0.1	0.2	-50.0
5 to 9.....	0.4	0.2	0.5	-60.0
10 to 14.....	1.0	0.5	1.1	-54.5
15 to 19.....	1.9	0.6	2.5	-76.0
20 to 24.....	3.4	1.0	4.4	-77.3
25 to 34.....	3.4	1.8	3.4	-47.1
35 to 44.....	2.7	1.3	3.2	-59.4
45 to 54.....	2.0	1.6	1.3	+23.1
55 to 64.....	1.1	0.9	0.9	0.0
65 to 74.....	0.4	0.7	0.0	†

*Standardized for age. †Not computed.

100,000 at ages 1 to 4, to a maximum, 1.8 per 100,000 at 25 to 34 years. From this point the rate drops with advancing age, reaching 0.7 per 100,000 at 65 to 74.

Trend of Mortality Among White Males

The mortality from electricity among white males shows two distinct levels in the quarter century under review. For the 20 years 1911 to 1930 the death rate, manifesting neither an upward nor a downward trend, averaged 2.1 per 100,000; for the period 1931 to 1935 the average rate was 0.9 per 100,000. The 55 percent decline in the death rate between the first and last quinquennia of the series, as shown in Table 29, is due to this difference in level. Undoubtedly the decline in employment has been largely responsible for this recent decrease in death rate. However, even if the experience of the last five years is left out of consideration, the situation is still encouraging. It should be borne in mind that in the 20 years between 1911 and 1930, the production of electricity had increased more than fivefold, the number of electrical workers had more than doubled, while the population of the United States had increased by only one third. It is clear that the efforts of the electrical companies to safeguard their employees and the general public have met with a large measure of success.

Origin of Hazard

Information regarding the origin of hazard was secured for 90 percent of the deaths which occurred among our policyholders in the years 1926 to 1935. Appendix Table D shows the percentage distribution of the deaths from electricity by age, sex, and origin of hazard.

Out of the total deaths of known origin of hazard at ages 1 to 74 years, 72.9 percent were recorded as occupational, 18.0 percent as public, and 9.1 percent as domestic. There is a marked difference in the place of occurrence of electrical injuries by sex and age. Among adult males, ages 15 to 64 years, 84.5 percent of the deaths occur in industry, whereas among adult females 82.6 percent of the deaths take place in the home. Among children between 5 and 14 years, 87.8 percent of the deaths occur in public places.

Deaths in the home, of which there were 79 among our Industrial policyholders in 1926 to 1935, focus attention on the hazard of low-voltage circuits, which, it is all too commonly believed, will not kill. Some of these domestic deaths, it is true, were caused by electrical burns, and some of them involved high voltages, but it is unquestionably true also that a goodly number of them resulted from contact with the ordinary house current of 110 volts. The general belief that low voltages are innocuous has been a factor in industrial as well as in domestic deaths. Whiting¹⁵ was able to collect records of 187 deaths from contact with low-voltage circuits during the three summer months of 1928. For the purpose of that investigation, voltages of 750 or less were considered as low. Of the 187 deaths, 43 resulted from handling extension lamps and cords in industry and in homes, and 28 deaths were due to household equipment other than lamps and tools. Low voltages will kill, and this fact should be made known to everyone. Handling electrical equipment while the hands or other parts of the body are wet is especially dangerous. Many deaths have been reported of persons who received a fatal shock handling electrical apparatus while in the bathtub or before drying.

The large percentage of electrical fatalities among children between the ages of 5 and 14 which occur in public places, reflects clearly the dangers of the rash actions of young boys. Playing about the rights-of-way of public utilities, and climbing telephone and power poles are extremely dangerous activities that cause many tragic deaths annually.

¹⁵Whiting, S. E. "Report of the Low-Voltage Electrical Committee." *Transactions of the National Safety Council*. 1928, Vol. I, p. 273.

Prevention of Deaths from Electricity

From the facts just displayed it is apparent that any material reduction in the death rate from electricity will depend mainly upon the saving of lives among electrical workers. Public utility companies should continue the safety campaigns among their employees with unrelenting vigor, stressing those measures of prevention which have already resulted in the saving of a great many lives—for example, proper methods of rescuing persons in contact with live wires, and the prompt application of artificial respiration by the prone-pressure method.

The general public also should be instructed in the prone-pressure method of administering artificial respiration, and in the dangers to be avoided in assisting persons in contact with live wires. Many would-be rescuers, unfamiliar with the dangers they were facing, have themselves been electrocuted by touching persons in contact with live wires. The general public should be acquainted also with the dangers of using defective electrical apparatus, and with the fact that low voltages will kill. Finally, parents should be strongly urged to keep children away from the rights-of-way of public utility companies.

ACCIDENTAL ABSORPTION OF POISONOUS GAS¹⁶

Over 1,600 deaths from the accidental absorption of poisonous gas occurred in the United States in 1934. Many kinds of gas contribute to this heavy loss of life, but one lethal agent alone, carbon monoxide, is responsible for almost all the deaths. Illuminating gas, which generally contains from 6 to 30 percent carbon monoxide, causes a majority of the fatalities. Detailed analysis of death claim records reveals that the escape of illuminating gas is due to a variety of circumstances: to flexible pipe becoming detached from the heater, to the inadvertent turning on of gas jets, to defective tubing, to leaking gas fixtures, or to the extinction of gas flames by water boiling over or by a gust of wind.

Carbon monoxide gas produced by automobiles was the cause of few deaths in the early years of the period under review, but the mortality from this cause climbed rapidly, increasing fourfold in the general population between 1924 and 1932. In the latter year 609 lives were thus taken, but since then the number has been declining, and in 1934 the toll was 362. Many of these deaths, it is worthy of mention, undoubtedly would have been classified as suicidal if all the facts surrounding them were known.

Poisoning by carbon monoxide gas emanating from coal, gas, or oil heaters used without flues in poorly ventilated rooms, is another cause of considerable mortality. In some instances asphyxiation occurs when stove or furnace pipes become disconnected or when the drafts are so set that partially burned gases escape into the cellar or other parts of the house. A few fatalities occur from gases such as ammonia, hydrogen sulfide, benzol, and hydrocyanic acid. Deaths from anesthesia are also classified under gas poisoning, and they are, likewise, relatively few in number. As Appendix Table D shows, the preponderance of asphyxial deaths from gas poisoning occur in the home. Only a small percentage arise out of or in the course of employment.

The mortality from gas poisoning is lowest during the summer and reaches a maximum in the winter months, when home-heating

¹⁶Comparable data for this title are available beginning with 1922. Prior to that date, in accordance with prevailing practice, deaths from mechanical suffocation were included under this heading. Deaths certified as due to "asphyxia by gas," "gas poisoning," "illuminating gas poisoning," etc., although not reported as accidental, are classified here unless identified as being due to suicide or homicide. Deaths from absorption of poisonous gas in mines and quarries are not included under this title.

appliances are most in use and when many persons are tempted to run motors in garages where doors and windows are closed.

During the years 1922 to 1935 a total of 4,814 deaths from accidental absorption of poisonous gas was recorded among Metropolitan Industrial policyholders. This number accounts for 3.5 percent of the mortality from all forms of accidents in this 14-year period. The standardized death rates averaged 2.6 per 100,000. Appendix Table C presents the standardized annual death rates for the period 1922 to 1935.

Mortality by Age, Sex, and Color

Age The death rate from accidental gas poisoning is very low in childhood, increases with advancing age, and registers its maximum at the highest age period. The increase with age is most pronounced among white male policyholders. In this group, for the period 1931 to 1935, the death rate rose from less than 1 per 100,000 in the ages under 20, to 11.0 per 100,000 at 65 to 74 years. Among white females the rate increased slowly from 0.1 per 100,000 at 10 to 14, to 4.0 per 100,000 at 65 to 74. The rise in death rate among colored males and colored females is less rapid than that for the respective white groups. It is possible that the reason for the increase in mortality with advancing age lies partly in the fact that persons suffering from pulmonary, cardiac, or other major diseases are more susceptible to, and less likely to recover from, carbon monoxide poisoning. Furthermore, as people age their senses become less acute. Old people, it is thought, do not detect the odor of escaping gas as readily as younger persons. They are more forgetful and occasionally fail to ignite the gas after turning it on. Suicide, not reported as such, undoubtedly, is also an important factor.

The profile of the age curve for all accidental gas poisoning is essentially that for illuminating gas poisoning. The death rate from automobile carbon monoxide is too small to yield a significant age distribution, but the deaths are practically confined to the age range 15 to 64 years.

Sex The death rate from accidental gas poisoning for males in each race is considerably higher than that for females. For the period 1931 to 1935, among white persons, the mortality among males was $3\frac{1}{2}$ times that for females; among the colored the ratio was about 2 to 1. Moreover, as Table 30 shows, the rate for males exceeded that for females at every important age period.

TABLE 30
ACCIDENTAL ABSORPTION OF POISONOUS GAS

Averages of Annual Death Rates per 100,000

By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1922 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1922 to 1935	1931 to 1935	1922 to 1925	1922 to 1935	1931 to 1935	1922 to 1925
WHITE						
1 to 74*.....	4.1	2.8	5.0	1.3	0.8	1.6
1 to 4.....	0.5	0.4	0.5	0.5	0.4	0.6
5 to 9.....	0.4	0.2	0.5	0.3	0.2	0.4
10 to 14.....	0.3	0.1	0.6	0.2	0.1	0.4
15 to 19.....	0.9	0.5	1.4	0.5	0.3	0.6
20 to 24.....	1.6	1.1	1.9	1.0	0.6	1.2
25 to 34.....	2.9	2.5	3.0	0.9	0.7	0.9
35 to 44.....	5.7	4.3	6.5	1.3	1.0	1.7
45 to 54.....	9.6	7.1	12.2	2.5	1.4	3.0
55 to 64.....	15.5	8.8	19.4	4.3	2.3	5.5
65 to 74.....	18.9	11.0	24.6	7.4	4.0	9.1
COLORED						
1 to 74*.....	2.0	1.3	2.2	0.9	0.6	1.0
1 to 4.....	0.3	0.9	0.0	1.0	1.4	0.5
5 to 9.....	0.0	0.0	0.0	0.3	0.3	0.3
10 to 14.....	0.4	0.2	0.0	0.4	0.7	0.6
15 to 19.....	1.1	0.3	1.7	0.6	0.0	0.3
20 to 24.....	1.1	0.3	1.2	0.8	0.6	1.1
25 to 34.....	2.0	1.4	2.0	0.8	0.6	0.8
35 to 44.....	2.9	2.1	3.0	1.0	0.3	1.1
45 to 54.....	4.4	3.2	4.7	1.3	1.2	1.2
55 to 64.....	5.4	3.7	6.8	1.2	0.5	2.0
65 to 74.....	6.1	3.6	8.0	2.9	1.8	4.4

*Standardized for age.

A review of the facts reported on insurance death claims discloses that this is due only in small part to occupational exposure. The greater number of probable suicides among males is one item. Another is the careless manipulation of gas heaters and fixtures by men who are under the influence of liquor.

A special tabulation for the period 1931 to 1935 shows that for accidental illuminating gas poisoning the male mortality was about $2\frac{1}{2}$ times that for females. Deaths from automobile carbon mon-

oxide among females are insignificant in number; more than 90 percent of the fatalities occur among males.

Color The mortality from accidental gas poisoning among white policyholders is greater than that among the colored. During the period 1931 to 1935 the death rate among white males, 2.8 per 100,000, was more than twice that for colored males. The excess white over colored mortality obtained at each of the important age groups.

For the years 1931 to 1935 the mortality from illuminating gas poisoning among white persons averaged about $1\frac{1}{2}$ times that among the colored. This figure should be interpreted in the light of the fact that the Company's colored policyholders are quite numerous in the southern parts of the United States, where the use of manufactured gas among colored persons probably is not very extensive. The tabulation shows further that the mortality from automobile carbon monoxide poisoning among white males was six times that among colored males. This fact is undoubtedly due to the greater proportion of white persons owning and operating automobiles.

Trend of Mortality

The mortality from accidental gas poisoning among Metropolitan Industrial policyholders displayed a downward tendency for the period 1922 to 1935. The death rate in 1935, 1.4 per 100,000, was one half that recorded in 1922. As Table 30 shows, each color and sex shared in the improvement. Moreover, among white persons declines were recorded in every age group.

The fairly steady decline in mortality from accidental gas poisoning since 1926 resulted primarily from the drop in the number of deaths from illuminating gas poisoning. This decline is reflected in the fact that illuminating gas comprised 76 percent of the total deaths from gas poisoning in the period 1926 to 1930 and only 60 percent of the deaths in the years 1931 to 1935. The decline may be attributed mainly to the wider use of tested and approved gas tubing and appliances. In recent years a number of cities have enacted laws regulating the construction, sale, and installation of gas-burning appliances. Table 31 presents the crude annual death rates per 100,000 from illuminating gas poisoning among Metropolitan Industrial policyholders, by color and sex, for the years 1925 to 1935.

Partly as a result of the decreased mortality from illuminating gas but also as the result of an increased death toll from auto

TABLE 31
ACCIDENTAL ABSORPTION OF ILLUMINATING GAS
Crude Annual Death Rates per 100,000
By Color and Sex. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1925 to 1935

COLOR AND SEX	1935	1934	1933	1932	1931	1930	1925 to 1929
TOTAL PERSONS.....	1.3	1.3	1.4	1.6	1.8	1.4	2.0
White males.....	2.0	2.0	2.2	2.6	2.9	2.0	3.0
White females.....	0.7	0.9	0.8	1.0	1.0	0.9	1.4
Colored males.....	1.9	1.3	1.5	1.1	1.9	1.4	1.8
Colored females.....	0.6	0.8	0.3	0.3	1.2	0.5	0.8

exhaust gas, the proportion of deaths from auto carbon monoxide poisoning increased from 5.4 percent of all deaths from gas poisoning in the period 1926 to 1930, to 16.6 percent in 1931 to 1935.

Prevention of Deaths from Gas Poisoning

Vigorous and widespread educational campaigns are called for to combat the dangers of gas poisoning, particularly in the home. All gas tubing and appliances should be inspected by a competent person. A warning should be given against using gas heaters without flues. Furnaces and chimneys should be cleaned and inspected each fall. Operators of automobiles should be repeatedly cautioned, especially when cold weather sets in, against the danger of running engines while garage doors are closed. It is not generally known that the exhaust fumes of a single car can render the atmosphere of a small ill-ventilated garage deadly within five minutes. Wide publicity should also be given the fact that carbon monoxide usually gives no warning and that the first effect is often a muscular weakness which renders the victim helpless. Further, information should be broadcast that in all types of acute gas poisoning, the manual prone pressure method of resuscitation, such as is used in drowning, should be applied immediately. Many lives would be saved in the United States each year if these precautions were heeded.

POISONING BY FOOD

The great majority of the deaths included under this title were reported as due to either "ptomaine poisoning" or simply to "food poisoning." Medical authorities consider these terms very unsatisfactory in describing causes of death, as the terms do not usually represent the findings of thorough diagnosis or of autopsy. The title includes also deaths from botulism and fatalities resulting from eating poisonous plants, such as certain varieties of mushrooms or berries. It does not include deaths definitely known to have been caused by parasitic infection derived from contaminated foods, such as trichinosis, nor does it include deaths from poisoning by lead, arsenic, or other chemicals sprayed on foods or used in the process of food manufacture.

Because of the unsatisfactory nature of the basic data and because of the relatively small number of deaths, our study is limited to certain major aspects of the Metropolitan Industrial experience. It is interesting to note, however, that in the United States about 700 deaths each year are ascribed to food poisoning and that such poisonings are most frequently reported during the warm months.

There were 2,234 deaths recorded as due to food poisoning among the Metropolitan Industrial policyholders, ages 1 to 74, during the 25 years 1911 to 1935. These deaths constituted 1.0 percent of the total accident mortality in this experience. The standardized death rates for the period averaged 0.7 per 100,000.

Mortality by Age, Sex, and Color

In the general population approximately one quarter of the deaths from food poisoning occur among children under five years of age. Similarly, among the Industrial policyholders of the Metropolitan Life Insurance Company, death rates are highest at ages 1 to 4. During adolescence and middle life there are few deaths from this cause. At the older ages, however, the mortality tends to be somewhat higher, but it does not reach the level of the rate registered in early childhood. Average death rates by color, sex, and age for the period 1911 to 1935 are shown in Table 32.

Colored policyholders showed a death rate about twice that for the white. Moreover, in each sex the excess colored over white death rate obtained at every age period. There is virtually no difference in the death toll from food poisoning by sex.

TABLE 32
POISONING BY FOOD
Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	WHITE		COLORED	
	Males	Females	Males	Females
1 to 74*.....	0.7	0.6	1.3	1.4
1 to 4.....	2.3	2.0	3.0	3.2
5 to 9.....	0.7	0.5	1.0	1.0
10 to 14.....	0.3	0.3	0.8	0.5
15 to 19.....	0.2	0.2	0.7	0.6
20 to 24.....	0.3	0.3	0.7	0.7
25 to 34.....	0.4	0.4	0.9	1.0
35 to 44.....	0.5	0.4	1.2	1.6
45 to 54.....	0.8	0.5	1.8	2.3
55 to 64.....	1.1	0.6	2.3	1.9
65 to 74.....	1.0	1.4	2.4	2.9

*Standardized for age.

Trend of Mortality

The death rate from food poisoning has shown a substantial and continuous downward trend during the 25 years under review. The rate in 1931 to 1935, 0.3 per 100,000, was one fourth that recorded in 1911 to 1915. Each color-sex group shared in the improvement. Among white policyholders the decline amounted to almost 80 percent; the decline in the colored rates was not nearly so large. These facts are apparent from Table 33. Standardized annual death rates for each color-sex group are shown in Appendix Table C.

To what extent the lower mortality results from efforts to safeguard the national food supply and to what extent more accurate reporting of causes of death has been responsible for the decline, we do not know.

Prevention of Food Poisoning

The death toll from food poisoning can be reduced to even a lower level. One simple measure is the refrigeration of food at temperatures sufficiently low to prevent bacterial growth. Another effective means of preventing food poisoning is the consumption of food shortly after it has been prepared. Thorough cooking is a simple and important safeguard. In preserving food at home

TABLE 33
POISONING BY FOOD
Five-Year Averages of Annual Death Rates* per 100,000
By Color and Sex. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

YEARS	TOTAL PERSONS	WHITE		COLORED	
		Males	Females	Males	Females
1911 to 1935	0.7	0.7	0.6	1.3	1.4
1931 to 1935	0.3	0.3	0.2	1.2	1.0
1926 to 1930	0.5	0.5	0.4	1.3	1.4
1921 to 1925	0.6	0.5	0.5	1.1	1.4
1916 to 1920	0.8	0.7	0.7	1.3	1.4
1911 to 1915	1.2	1.3	1.0	1.6	1.8
Percent decline 1931-1935 since 1911-1915	75.0	76.9	80.0	25.0	44.4

*Standardized for age, and in the case of Total Persons, also for color and sex.

only fresh and clean food should be used and it should be heated sufficiently to kill the spores; a number of cases of botulism have been traced to products canned at home. Particular care should be exercised by those preparing meals for schools, camps, picnics, hospitals, and other domiciliary institutions. Laws regarding the inspection of food supplies and the conditions under which they are handled, should be stringently enforced. All these precautions are necessary because food may not reveal its poisonous nature through unpleasant smell or disagreeable taste.

OTHER ACUTE ACCIDENTAL POISONINGS

Allocated to this title are deaths from acute poisonings, except those due to food, grain alcohol, bites of venomous animals, or toxic gases. The vast majority of the deaths are reported as due to arsenic, bichloride of mercury, lysol, veronal, strychnine, methyl alcohol, and kerosene. In the United States over 1,400 deaths a year are charged to this title of the International List. Children of preschool age are the heaviest contributors to the annual death toll. Approximately one third of the fatal accidental poisonings occur in the ages under 5, and of these nearly one half occur in the second year of life.

Among Metropolitan Industrial policyholders ages 1 to 74 the deaths assigned to this heading over the 25 years 1911 to 1935 totaled 5,101.¹⁷ This number comprised 2.4 percent of the total deaths from accidents in this experience. The standardized annual death rates, which appear in Appendix Table C, averaged 1.7 per 100,000 for the period under survey.

Mortality by Age, Sex, and Color

Table 34 shows the average death rates, by age, sex, and color, for the years 1911 to 1915, 1931 to 1935, and for the entire period 1911 to 1935.

Age The death rates in each color-sex group are at a maximum among children 1 to 4 years. Colored boys at this age registered the high rate of 7.6 per 100,000 during the quinquennium 1931 to 1935. From the relatively high rates at these ages, the mortality drops to a minimum in the years of adolescence. Beyond these years the death rates tend to rise for a time with advancing age but do not reach the level recorded in childhood.

Sex Males in each race show a higher death rate than females. For the period 1931 to 1935, among white policyholders the rate for males averaged over two times that for females; among colored the disparity in mortality by sex was not so marked. The excess male mortality among white persons obtained at all ages except at 15 to 24; the most marked excess was recorded at the older ages. This fact lends support to the belief that a large number of the deaths among males were suicides.

¹⁷Includes deaths from attack by venomous animals for the years 1911 to 1921. Such deaths, it is estimated, amounted to less than 5 percent of the total in that period.

TABLE 34
OTHER ACUTE ACCIDENTAL POISONINGS†
Averages of Annual Death Rates* per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	MALES			FEMALES		
	1911 to 1935	1931 to 1935	1911 to 1915	1911 to 1935	1931 to 1935	1911 to 1915
WHITE						
1 to 74*.....	2.0	1.5	2.8	1.3	0.7	2.1
1 to 4.....	5.3	3.4	8.3	4.5	2.0	7.1
5 to 9.....	0.5	0.2	1.0	0.3	0.1	0.5
10 to 14.....	0.2	0.2	0.3	0.1	0.1	0.2
15 to 19.....	0.3	0.1	0.6	0.7	0.3	1.1
20 to 24.....	1.1	0.6	1.3	1.3	0.8	2.0
25 to 34.....	1.9	1.2	2.6	1.4	0.7	2.3
35 to 44.....	2.6	2.1	2.8	1.3	0.9	2.0
45 to 54.....	3.7	3.3	4.3	1.1	0.8	1.5
55 to 64.....	3.4	3.3	5.0	1.1	0.9	2.1
65 to 74.....	3.1	2.1	5.8	1.3	0.9	2.6
COLORED						
1 to 74*.....	2.7	1.9	3.7	1.9	1.5	2.3
1 to 4.....	11.8	7.6	21.6	7.3	4.9	8.4
5 to 9.....	1.1	0.3	2.8	1.1	1.8	1.5
10 to 14.....	0.4	0.2	0.0	0.4	0.0	0.8
15 to 19.....	0.7	0.8	0.4	0.7	0.8	0.7
20 to 24.....	1.8	0.9	2.5	2.1	2.2	3.5
25 to 34.....	2.7	2.6	2.3	2.2	1.3	1.7
35 to 44.....	2.3	1.8	2.4	1.2	0.8	1.9
45 to 54.....	2.6	2.9	1.1	1.3	0.8	1.9
55 to 64.....	2.2	0.3	2.1	0.8	1.4	1.1
65 to 74.....	2.2	0.0	4.0	1.0	0.6	1.4

*Standardized for age. †Includes deaths from attack by venomous animals for the years 1911 to 1921.

Color In the aggregate, colored policyholders record higher death rates than do the white. The excess is not evident, however, at each period of life, but occurs only at the ages under 35.

Trend of Mortality

The death rate showed a definite downward trend over the 25-year period—from 2.4 per 100,000 in the years 1911 to 1915, to 1.1 per 100,000 in 1931 to 1935, a decline of 54.2 percent. Each

TABLE 35
OTHER ACUTE ACCIDENTAL POISONINGS†
Five-Year Averages of Annual Death Rates* per 100,000
By Color and Sex. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

YEARS	TOTAL PERSONS	WHITE		COLORED	
		Males	Females	Males	Females
1911 to 1935	1.7	2.0	1.3	2.7	1.9
1931 to 1935	1.1	1.5	0.7	1.9	1.5
1926 to 1930	1.4	1.7	1.0	2.1	1.6
1921 to 1925	1.6	2.0	1.2	2.5	2.0
1916 to 1920	1.9	2.1	1.5	3.4	1.9
1911 to 1915	2.4	2.8	2.1	3.7	2.3
Percent decline 1931-1935 since 1911-1915	54.2	46.4	66.7	48.6	34.8

*Standardized for age, and in the case of Total Persons, also for color and sex. †Includes deaths from attack by venomous animals for the years 1911 to 1921.

color and sex group contributed to the decline, white females exhibiting the greatest improvement. These facts are evident from Table 35. Further analysis of the mortality data reveals that among both white males and white females declines were registered at every age period; among colored policyholders decreases in death rates were evident at most age groups.

Manner of Poisoning

A study of the death records of 298 persons insured in the Industrial Department of the Metropolitan Life Insurance Company who died of acute accidental poisoning during the years 1934-1935, reveals the circumstances surrounding these tragedies and suggests measures to prevent them.

The manner of poisoning was given on 84 percent of the death records relating to these insured persons. All but a few of the fatalities may be roughly grouped into three classes: (a) Poisonous substances picked up and consumed by children, (b) poisons mistaken for medicines and overdoses of medicines, (c) ignorant use of substitutes for alcohol and fluids mistaken for alcoholic beverages.

Poisonous substances picked up and consumed by children were reported most frequently. There were 82 deaths of this type. Virtually all of these deaths may be charged, fairly, to the care-

lessness of parents in leaving pills and other poisonous agents within reach. Strychnine took the lives of 13 children. All but a few of the deaths of this character were caused by eating cathartic and tonic pills which seem to have a peculiar attraction for small children. Drinking kerosene caused 13 deaths. In addition to these there were seven deaths from gasoline, benzine, and other petroleum products. Lye, oil of wintergreen, hydrochloric and other acids, figure more or less prominently. Insecticides, rat poisons, and similar compounds containing phosphorous or arsenic, as well as undisclosed substances, caused many deaths of children.

Mistaking poisonous drugs for medicines or overdoses of medicines containing poisons accounted for 78 deaths. Veronal, luminal, allanol, and amytal lead the list with a total of 14 deaths; bichloride of mercury with nine was next in order; lysol caused six deaths; arsenic, acetanilid, and paraldehyde, with four deaths each, were next in numerical importance.

Ignorant use of substitutes for ethyl alcohol was responsible for 30 deaths, most of which were due to ingesting wood or denatured alcohol. Fluids mistaken for alcohol were responsible for 13 additional deaths, five of which were due to drinking hydrochloric (muriatic) acid.

Food prepared with insecticides or other poisonous compounds mistaken for innocuous ingredients, and poisonous liquids mistaken for water caused several deaths.

Comparison of the findings of the 1934-1935 study with a similar one for the years 1929-30, shows relatively fewer deaths in the later period from most of the numerically more important poisons. There were definitely fewer deaths from drinking substitutes for ethyl alcohol or substances mistaken for it, from bichloride of mercury, strychnine, arsenic, lysol, and carbolic acid. Improvement in the labeling of poison-containing compounds, and a better understanding by the population generally of the dangers they face in using such substances, have probably brought about this improvement. But the number of deaths is still far too high. There is need to intensify the campaign. Education of the general public apparently, should be stressed most. Such educational activities should be made a part of the program of the many home safety crusades now being carried on all over the United States.

More care in the handling and storage of poisonous materials cannot be emphasized too strongly. These compounds, if they must be kept about the house, should be stored in places not easily accessible, and certainly well out of the reach of children.

Built-in cabinets, preferably locked, to provide for the safe-keeping of family medicines and drugs are recommended. To avoid mistakes or improper use, however, it usually is desirable to indicate these poisons by specially shaped containers, or bottles with luminous markings. A pin stuck in the cork of every bottle containing a poisonous substance also serves to indicate, in the dark, the nature of the contents.

EXCESSIVE HEAT

Under this title are included deaths resulting from sunstroke, as well as deaths from all forms of heat exhaustion and heat cramps, which arise from natural atmospheric conditions or from artificial conditions in engine rooms of buildings, in the hot metal and other industries. Although a relatively minor cause of fatal accidents in most years, excessive heat has been an important factor in the total mortality from accidents in some years. If we turn to the records for the U. S. Registration Area, where death rates are available back to 1900, it will be found that the extreme rate of 12.8 per 100,000 was reached in 1901 and that this rate was 43 times the low rate of 0.3 in 1920. Among Metropolitan Industrial policyholders, ages 1 to 74 years, the high standardized death rate of 7.9 per 100,000 registered in 1911 was approximately 40 times the rate recorded in 1920. The course of the mortality over the period was characterized by wide periodic fluctuations rather than by a consistent upward or downward trend.

Excessive heat was charged with 3,537 deaths, or 1.6 percent of all accident fatalities among Industrial policyholders during the years 1911 to 1935. The standardized death rates for the 25-year period averaged 1.4 per 100,000. Annual death rates are shown in Appendix Table C.

Mortality by Age, Sex, and Color

Relatively high rates are recorded in infancy and in old age. Data for the first year of life are not, however, available in this insurance experience. As Table 36 shows, heat fatalities are relatively much more frequent among males than among females, the standardized death rates running about three times as high for the former as for the latter. In adult life males registered a higher rate than females at every age period. Greater exposure of males in the course of their occupations in all probability is responsible for a large share of this excess. Negroes, strangely, have a higher death rate than whites. It is evident from Table 37 on page 519 that this situation obtains throughout the United States. This difference in mortality may possibly be explained on the basis of greater occupational exposure for Negroes.

Geographic Distribution

Analysis of the statistics of deaths from excessive heat in 1931 to 1933 shows that, with the exception of Arizona and Nevada,

TABLE 36
EXCESSIVE HEAT

Averages of Annual Death Rates per 100,000
By Color, Sex, and Age. Ages 1 to 74 Years

Metropolitan Life Insurance Company, Industrial Dept., 1911 to 1935

AGE PERIOD YEARS	WHITE		COLORED	
	Males	Females	Males	Females
1 to 74*.....	2.1	0.7	2.8	1.0
1 to 4.....	0.7	0.5	0.9	1.0
5 to 9.....	0.2	0.2	0.2	0.1
10 to 14.....	0.1	0.1	0.3	0.3
15 to 19.....	0.2	0.1	0.6	0.2
20 to 24.....	0.4	0.1	0.7	0.3
25 to 34.....	1.1	0.2	1.8	0.5
35 to 44.....	3.4	0.5	3.6	1.0
45 to 54.....	5.8	1.0	6.7	2.0
55 to 64.....	6.8	2.5	10.1	2.8
65 to 74.....	10.7	6.8	14.4	6.9

*Standardized for age.

the highest mortality rates prevail in the East North Central and West North Central States, especially in Minnesota, South Dakota, Wisconsin, Illinois, Iowa, and Missouri. It will come as a surprise to many to be told that most of our Southern States register relatively favorable death rates from this cause, in spite of their subtropical climate. The States of North and South Carolina, Florida, and Alabama, for example, record mortality rates from this cause at least 50 percent below the mean for the United States, and the figures for Mississippi, Tennessee, and Arkansas, in the South Central region, are also well below the average for the country as a whole.

The relatively low mortality from this cause in these Southern areas is registered despite the concentration therein of almost four fifths of the Negro population of the country, and despite the fact that the death rates from the effects of heat throughout the South run from two to more than six times as high among Negroes as among white persons, perhaps on account of greater occupational exposure of the Negro. If the geographic comparison were limited to the white population alone, the differences would be even more striking. A white person living in Wisconsin, for example, is approximately 20 times more likely to suffer death from heat stroke than is a white resident of Florida; about 13 times more

TABLE 37
EXCESSIVE HEAT
Crude Death Rates per 100,000 in the United States
All Ages. 1931 to 1933

STATE	DEATH RATE	STATE	DEATH RATE
U. S. REGISTRATION AREA*	1.2	South Atlantic States (Continued):	
New England States.....	0.2	Georgia.....	1.0
Maine.....	0.2	White.....	0.7
New Hampshire.....	0.3	Colored.....	1.5
Vermont.....	0.3	Florida.....	0.5
Massachusetts.....	0.2	White.....	0.2
Rhode Island.....	0.5	Colored.....	1.3
Connecticut.....	0.2	East South Central States..	0.8
Middle Atlantic States....	0.7	White.....	0.6
New York.....	0.4	Colored.....	1.4
New Jersey.....	0.6	Kentucky.....	1.1
Pennsylvania.....	1.1	White.....	1.0
East North Central States..	2.2	Colored.....	2.7
Ohio.....	1.6	Tennessee.....	0.8
Indiana.....	1.6	White.....	0.5
Illinois.....	3.1	Colored.....	2.1
Michigan.....	1.0	Alabama.....	0.6
Wisconsin.....	3.9	White.....	0.3
West North Central States..	2.2	Colored.....	1.0
Minnesota.....	2.4	Mississippi.....	0.7
Iowa.....	3.2	White.....	0.3
Missouri.....	2.8	Colored.....	1.1
North Dakota.....	0.7	West South Central States*	0.9
South Dakota.....	2.1	White.....	0.7
Nebraska.....	1.1	Colored.....	1.5
Kansas.....	1.0	Arkansas.....	0.9
South Atlantic States.....	0.8	White.....	0.5
White†.....	0.5	Colored.....	2.1
Colored†.....	1.3	Louisiana.....	1.0
Delaware.....	1.1	White.....	0.7
Maryland.....	1.4	Colored.....	1.5
White.....	1.0	Oklahoma.....	0.9
Colored.....	3.4	White.....	0.9
District of Columbia....	1.0	Colored.....	0.8
White.....	0.3	Mountain States.....	1.6
Colored.....	2.9	Montana.....	0.2
Virginia.....	0.7	Idaho.....	0.3
White.....	0.4	Wyoming.....	0.0
Colored.....	1.4	Colorado.....	0.1
West Virginia.....	0.9	New Mexico.....	0.1
North Carolina.....	0.4	Arizona.....	9.7
White.....	0.3	Utah.....	0.6
Colored.....	0.6	Nevada.....	8.6
South Carolina.....	0.6	Pacific States.....	0.9
White.....	0.4	Washington.....	§
Colored.....	1.0	Oregon.....	0.1
		California.....	1.3

*Exclusive of Texas.
 †Less than 0.05.

‡Exclusive of Delaware and West Virginia.

likely than one in North Carolina, Alabama, or Mississippi, and about 10 times more likely than one who resides in Virginia or South Carolina. As compared with more southerly areas, the States of Iowa and Illinois are similarly at a disadvantage.

States adjoining one another frequently show wide differences in death rates from the effects of heat. Outstanding examples are Arizona and Nevada, which have the very highest mortality rates in the United States from this cause, while some of the other States in the Mountain Division have the lowest rates. As shown in Table 37, Arizona had an average death rate of 9.7 per 100,000 in the years 1931 to 1933, and was followed closely by Nevada with 8.6 per 100,000. Colorado and New Mexico, Arizona's neighboring States, nevertheless had rates of only 0.1 deaths per 100,000 persons, while for Oregon, Idaho, and Utah, which border Nevada on the north and east, the rates were far below the average, namely 0.1, 0.3, and 0.6, respectively. Wyoming was the only State in the country with no deaths attributed to this cause during the three years 1931 to 1933.

Cities have a much higher mortality rate from heat and sunstroke than do rural districts in those years in which an above-average number of deaths are attributed to this cause. In other years, the difference is not so marked, although the rate in urban communities is usually as high as or higher than that in rural districts. The higher urban rate is unquestionably due to the special environmental conditions which obtain among city inhabitants.

Origin of Hazard

Reporting on the origin of hazard of deaths from excessive heat is very unsatisfactory. As can be seen from Appendix Table D, only 46 percent of the death records gave this information in the period 1926 to 1935. Of the deaths of known origin of hazard, 24.7 percent were classified as domestic accidents, 47.6 percent as public, and 27.7 percent as arising out of or in the course of employment. During the main working span of life, ages 15 to 64 years, occupational accidents accounted for 40.8 percent of the male deaths of known origin of hazard.

APPENDIX I

METHODS OF COMPILATION AND ANALYSIS OF DATA USED IN THIS REPORT

METHODS OF COMPILATION AND ANALYSIS OF DATA USED IN THIS REPORT

For purposes of record, and for the benefit of the reader interested in detailed technique, there follows here a brief statement of some of the chief processes employed in preparing this report.

Estimating the Number of Policyholders Exposed to Risk

The registers of an Industrial Life insurance company do not show the number of separate persons exposed to risk. In everyday actuarial practice, the accounts of mortality are related only to the policy exposure. Industrial insurance medical statistics, however, require that a reliable estimate of the number of separate persons, or the years of life exposed, be obtained. Fortunately, it is possible to make a safe estimate of this number of insured persons. We may say briefly that this estimate of the number of years of life exposed to risk according to the several color, sex, and age classes of the data was prepared on the assumption that the ratio, in each of these classes, of the number of lives insured to the number of policies outstanding, was the same as that of the number of decedents to the number of corresponding claims paid. From the tabulation of the number of deaths and the number of claims according to color, sex, and age classes, these ratios were computed. They were then applied to the mean numbers of policies outstanding in each of the calendar years of this experience, and the number of years of life exposed to risk was thus estimated for each year of the entire 25-year experience. The material analyzed was exclusively that of the weekly premium-paying policyholders. This excluded the experience on the lives of persons insured on a "paid-up" or similar basis, who were a small proportion of the total. The reason for this is that sufficiently detailed and reliable information with regard to the mortality of these "paid-up" policyholders is not available.

Age Limits of Exposure

At age 75 by far the majority of Industrial policies are put on a paid-up basis, and, as indicated above, become unsuited for

inclusion in this type of study. The study also omitted the experience under 1 year of age, first because insurance was not written for lives of infants until 1923; and secondly, because the age distribution of these very young children is deficient in the proportion of newly born children, where mortality is at a very high point, so that the group of insured children under 1 is quite atypical in its mortality picture as compared with infants in the general population. In a number of instances, where special interest attaches to the mortality of children under 1 and to that of persons 75 and over, the information obtained from Metropolitan sources was supplemented by data derived from population statistics. One particular instance of this kind calls for special mention, namely, the requirements for the construction of life tables, as set forth in the third chapter.

In order to be able to estimate the expectation of life at birth, extraneous sources were used to represent the first year of life, namely the combined infant mortality for a large group of cities which were felt to correspond to the essentially urban character of the Industrial exposure. For the age group 75 and over also, extraneous material was used, the sources being as follows: for white males and white females, Glover's life table for the Original Registration States, urban areas, 1910; for colored males and colored females, Glover's corresponding life tables for the total Original Registration States, 1910. The closing of the table by the aid of these population data was effected in the manner described by C. C. Grove in the *Journal of the American Statistical Association*, Vol. 28, 1923, page 1,028. It should be remarked that this use of noninsurance material for closing the life table is sufficiently accurate, because at these higher ages there has not been much change in mortality over a considerable period of time, and because the particular data used at this part of the table have relatively slight effect on the computations of the expectation of life at the younger ages.

Classifying and Tabulating the Data for Deaths

The preparation of the data from the primary records of the claims paid in the Industrial Department involved a number of technical processes. The accuracy and planning of these matters of office practice have an important bearing upon the value of the conclusions to be drawn from the tabular material displayed in this report. A brief discussion of these processes follows:

All of the necessary records in connection with each claim were examined and the items which it was desired to consider in the tabulation of the statistics were abstracted upon so-called "transcript sheets," each line containing the necessary information for a single claim. Some of the facts, such as age, amount of insurance, and other strictly numerical data, were directly copied upon the line corresponding to the particular claim document. Other items, such as the disease causing death, the occupation, place of birth, etc., were first classified and then codified in terms of numerical symbols before they were copied upon the transcript sheets. The final product of this transcription and classification process, for each claim, is a single line of numerical symbols, the meaning of which is interpreted according to the previously arranged coding system. Ages were recorded in this investigation according to the age at the last birthday.¹ Where the term "colored" is used, it means essentially Negro.

Classification of Causes of Death

The system of nomenclature and classification employed in this analysis of the mortality experience among wage-earners and their families, was the "International List of Causes of Death." In the routine of currently compiling the records of deaths according to cause, three different editions of the International List were employed, namely, for the years 1911 to 1921, the 1909 classification; for the years 1922 to 1929, the 1920 classification; for the years 1930 to 1935, the 1929 classification. However, in working up the material, continuity was secured wherever possible by using the 1920 classification as a basis, and reassorting titles, wherever necessary, according to the other Lists to make them conform as nearly as possible with the 1920 List. There have been some exceptions in which it was impossible to carry a consistent series through the whole calendar period of 25 years on the basis of the 1920 code. In a few instances the alternative procedure was adopted of carrying the series through on the basis of the 1909 code. In a few other instances the attempt to establish a consistent series for the whole calendar period had to be abandoned. All these matters are duly mentioned in the pertinent chapters.

In certain instances we have made further subdivisions of the standard titles of the International List, usually along the lines followed by the Bureau of the Census.

¹For the years 1911 to 1916 the use of the basis of "last" birthday required an adjustment, because the original data were available in terms of age nearest birthday. The requisite adjustment was made by graphic interpolation.

Where two or more diseases or conditions were reported by physicians on the same death certificate, assignment of the death to one particular disease or condition was made according to the rules laid down in the Manual of Joint Causes of Death, using in each calendar year the latest edition available.² Prior to 1914, when the first Manual of Joint Causes of Death appeared, certain general rules of selective classification procedure authorized by the United States Bureau of the Census, Division of Vital Statistics, were followed, as set forth in the Introduction to the 1925 edition of the Manual of Joint Causes of Death.

Supplementary Information from Physicians

While in most cases the information given on the death certificate was sufficient to carry out the classification along the lines described in preceding paragraphs, in about 10 percent of all cases the data on the certificate were considered inadequate. In such cases, special pains were taken, through correspondence with the doctor who had signed the certificate, to supplement the information and, wherever possible, make it sufficiently complete properly to classify the death. Studies have been conducted both by the Statistical Bureau of the Metropolitan Life Insurance Company and by the Bureau of the Census as to the extent to which such supplementary information affects the final classification. For details regarding this, the reader may be referred to the 1916 report *Mortality Statistics of Insured Wage-earners and Their Families*, published by the Metropolitan Life Insurance Company, pages 377 *et seq.*, and to the annual volumes on mortality statistics issued by the Bureau of the Census.

Standardization of Death Rates

During the 25 years covered by this investigation, the color, sex, and age composition of the insured population has changed, and these changes have been reflected in the crude death rates. In order to eliminate the effects of these fortuitous factors the annual rates have been "standardized," *i.e.*, adjusted on the basis of a population kept constant for color, sex, and age distribution. Standardized death rates have been computed for certain broad age periods in each color-sex group and for the experience as a whole. The process of standardizing death rates is described in all

²There have been three editions dated respectively 1914, 1925, and 1933. Exact continuity of specific causes could not be carried out absolutely through the period 1911 to 1935 with these changes of Manuals, but deviations caused in this way are known to have been relatively unimportant in most cases. Where more important deviations occurred through this cause, the fact has been noted in the pertinent chapters.

modern texts on vital statistics and calls for no extended comment here. It is sufficient to say that the standard population adopted was the "Standard Million" of England and Wales, based on the actual age distribution of the total population of those countries in 1901, both sexes combined. Standardized death rates for white males, white females, colored males, and colored females have been calculated separately, and standardized death rates for white persons and for colored persons have been computed by weighting the standardized male and female death rates in each color group in proportion to the males and females in the standard population within the age limits of the age group to be standardized—*e.g.*, 1 to 74, 15 to 44, 45 to 74, etc. Finally, a standardized death rate for the entire group of insured persons within each broad age period has been computed by weighting the corresponding standardized death rates for white and for colored persons on the basis of the percentage of population in each of these color groups within the same age periods in the States of the Death Registration Area of the United States in 1920.³

The standard population, and the factors used in standardizing for color and sex are set forth in the accompanying Tables 1 and 2.

Computation of Trends

Straight-line trends were calculated throughout the study, breaking the entire time series into two or more parts where the character of the curve indicated the necessity of this procedure.

TABLE 1
Standard Million Population of England and Wales, 1901

AGE	POPULATION	AGE	POPULATION
Under 1	24,496	50 to 54	40,857
1 to 4	89,766	55 to 59	32,359
5 to 9	107,209	60 to 64	27,382
10 to 14	102,735	65 to 69	19,358
15 to 19	99,796	70 to 74	13,722
20 to 24	95,946	75 to 79	8,131
25 to 29	86,833	80 to 84	3,959
30 to 34	74,746	85 to 89	1,198
35 to 39	65,956	90 to 94	252
40 to 44	56,893	95 to 99	37
45 to 49	48,365	100+	4
ALL AGES = 1,000,000			

³See *Mortality Statistics*, 1922. United States Bureau of the Census. Table J, page 12.

TABLE 2
Weights Applied to Standardized Death Rates by Color and Sex to
Secure Standardized Death Rates for Both Sexes Combined and for
Total Persons Within Broad Age Groups

AGE GROUP	WEIGHTS TO STANDARDIZE BY SEX		WEIGHTS TO STANDARDIZE BY COLOR	
	Males	Females	White	Colored
1 to 74	0.4840	0.5160	0.9165	0.0835
1 to 14	.4991	.5009	.9093	.0907
1 to 24	.4930	.5070	.9073	.0927
1 to 44	.4873	.5127	.9117	.0883
5 to 14	.4993	.5007	.9061	.0939
15 to 24	.4837	.5163	.9040	.0960
15 to 44	.4801	.5199	.9132	.0868
15 to 54	.4802	.5198	.9152	.0848
20 to 44	.4761	.5239	.9151	.0849
20 to 54	.4770	.5230	.9171	.0829
20 to 74	.4740	.5260	.9217	.0783
25 to 44	.4775	.5225	.9184	.0816
25 to 74	.4745	.5255	.9249	.0751
35 to 74	.4753	.5247	.9274	.0726
45 to 74	.4699	.5301	.9345	.0655
55 to 74	.4590	.5410	.9448	.0552

Trend fitting and the computation of standard errors were performed in the usual way by the method of least squares. For details regarding the methods employed, the reader may be referred to any of the standard works, more particularly R. A. Fisher, *Statistical Methods for Research Workers*, 5th edition, Oliver and Boyd, London, 1934, page 129.

APPENDIX II

TABLES: MORTALITY EXPERIENCE METROPOLITAN LIFE INSURANCE COMPANY, INDUSTRIAL DEPARTMENT, AGES 1 TO 74 YEARS

TABLE A

Number of Deaths and Crude Death Rates, by Color and Sex, for Each Title of the 1920 International List of Causes of Death. 1911 to 1935. 531

TABLE B

Annual Death Rates from All Causes Combined, by Color, Sex, and Age. 1911 to 1935 541

TABLE C

Standardized Annual Death Rates for Specified Causes, by Color, Sex, and Broad Age Periods. 1911 to 1935 545

TABLE D

Percentage Distribution of Deaths from Accidental and Unspecified Violence by Origin of Hazard, for Principal Means of Injury, by Sex and Age. 1926 to 1935 591

APPENDIX TABLE A

NUMBER OF DEATHS AND CRUDE DEATH RATES PER 100,000. BY COLOR AND SEX. AGES 1 TO 74 YEARS

Detailed International List of Causes of Death, Third Decennial Revision, 1920

Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935 Combined, and Other Specified Periods

Inter-national List Number (1920 Revision)	CAUSE OF DEATH (1920 Revision)	PERIOD OF YEARS	NUMBER OF DEATHS						DEATH RATES PER 100,000				
			TOTAL PERSONS		WHITE		COLORED		TOTAL PER- SONS	WHITE		COLORED	
			Number	Percent	Males	Females	Males	Females		Males	Females		
1 to 205	All causes of death**	1911-1935	3,198,737	†	1,200,126	1,375,317	288,959	334,335	923.2	887.9	811.1	1,525.0	1,466.2
1	Typhoid and paratyphoid fever	1911-1935	21,575	.67	7,999	8,012	2,708	2,856	6.2	5.9	4.7	14.3	12.5
2	Typhus fever	1911-1935	27	*	15	9	1	2	†	†	†	†	†
3, 4	Relapsing fever and Malta fever	1911-1935	38	*	15	15	3	5	†	†	†	†	†
5	Malaria	1911-1935	5,390	.17	1,062	1,229	1,266	1,833	1.6	.8	.7	6.7	8.0
6	Smallpox	1911-1935	694	.02	247	238	117	92	.2	.2	.1	.6	.4
7	Measles	1911-1935	17,193	.54	8,141	7,736	650	666	5.0	6.0	4.6	3.4	2.9
8	Scarlet fever	1911-1935	15,259	.48	7,355	7,384	236	284	4.4	5.4	4.4	1.2	1.2
9	Whooping cough	1911-1935	12,715	.40	4,325	5,947	1,094	1,340	3.7	3.2	3.5	5.8	5.9
10	Diphtheria	1911-1935	45,233	1.41	21,829	21,111	1,113	1,180	13.1	16.2	12.4	5.9	5.2
11, 100, 101	Influenza and pneumonia (all forms)†	1911-1935	391,023	12.22	152,545	160,585	40,077	37,816	112.9	112.9	94.7	211.5	165.8
100	Bronchopneumonia†	1911-1935	46,668	2.28	15,231	19,744	5,123	6,570	19.0	16.0	16.3	38.4	40.8
101	Pneumonia, lobar and unspecified	1911-1935	87,595	2.74	34,947	37,879	7,248	7,521	25.3	25.9	22.3	33.0	33.0
12	Miliary fever	1911-1935	105,178	5.14	40,944	38,328	14,779	11,127	42.9	43.1	31.7	110.8	69.1
13	Mumps	1911-1929	232	.01	103	105	9	15	†	†	†	†	†
14	Asiatic cholera	1911-1935	8	*	3	4	0	1	†	†	†	†	†
15	Cholera nostras	1911-1929	366	.02	163	131	28	44	†	†	†	†	†
16	Dysentery	1911-1935	5,185	.16	1,818	1,981	583	803	1.5	1.3	1.2	3.1	3.5
17	Plague	1911-1935	14	*	8	8	0	1	†	†	†	†	†
18	Yellow fever	1911-1935	9	*	4	5	1	1	†	†	†	†	†
19	Spirochetal hemorrhagic jaundice	1911-1935	54	*	27	22	10	4	†	†	†	†	†
20	Leprosy	1911-1935	49	*	21	11	10	7	†	†	†	†	†
21	Erysipelas	1911-1935	4,922	.15	2,097	2,339	257	229	1.4	1.6	1.4	1.4	1.0
22	Acute anterior poliomyelitis	1911-1935	5,175	.16	2,725	2,909	189	162	1.5	2.0	1.2	1.0	.7
23	Lethargic encephalitis	1920-1935	3,493	.16	1,282	1,758	209	243	1.4	1.3	1.4	1.5	1.4

(Footnotes appear on page 540.)

APPENDIX TABLE A—Continued
NUMBER OF DEATHS AND CRUDE DEATH RATES PER 100,000. BY COLOR AND SEX. AGES 1 TO 74 YEARS
Detailed International List of Causes of Death, Third Decennial Revision, 1920
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935 Combined, and Other Specified Periods

Inter- national List Number (1920 Revision)	CAUSE OF DEATH	PERIOD OF YEARS	NUMBER OF DEATHS						DEATH RATES PER 100,000					
			TOTAL PERSONS		WHITE		COLORED		TOTAL PER- CENTS	WHITE		COLORED		
			Number	Percent	Males	Females	Males	Females		Males	Females			
24	Meningococcus meningitis.....	1912-1935	5,665	.18	2,800	1,790	625	450	1.7	2.1	1.1	3.4	2.0	
25a	Chickenpox.....	1921-1935	309	.02	141	136	19	13	.1	.1	.1	.1	.1	
25b	German measles.....	1921-1935	51	*	20	26	4	1	.1	.1	.1	.1	.1	
26	Glanders.....	1911-1935	13	*	5	2	4	2	.1	.1	.1	.1	.1	
27	Anthrax.....	1911-1935	91	*	70	19	2	.....	.1	.1	.1	.1	.1	
28	Rabies.....	1911-1935	255	.01	152	65	28	10	.1	.1	.1	.1	.1	
29	Tetanus.....	1911-1935	3,979	.12	2,226	820	680	253	1.1	1.6	.5	3.6	1.1	
30	Mycoses.....	1922-1935	231	.01	105	86	23	17	.1	.1	.1	.2	.1	
31 to 37	Tuberculosis (all forms).....	1911-1935	403,851	12.63	147,107	145,903	51,872	58,969	116.6	108.8	86.0	273.8	258.6	
31, 37a	of the respiratory system and acute dis- seminated tuberculosis.....	1911-1935	365,592	11.43	133,495	131,116	47,058	53,923	105.5	98.8	77.3	248.4	236.5	
32	of the meninges and central nervous system	1911-1935	17,033	.53	7,032	7,029	1,541	1,431	4.9	5.2	4.1	8.1	6.3	
33	of the intestines and peritoneum.....	1911-1935	10,848	.34	2,560	4,106	1,732	2,450	3.1	1.9	2.4	9.1	10.7	
34 to 36, 37b	of other organs and chronic disseminated tuberculosis.....	1911-1935	10,378	.32	4,020	3,652	1,541	1,165	3.0	3.0	2.2	8.1	5.1	
38, 72, 76	Syphilis, locomotor ataxia, and general paralysis of the insane.....	1911-1935	44,480	1.39	17,851	9,663	10,399	6,567	12.8	13.2	5.7	54.9	28.8	
39, 40	Soft chancre and gonococcus infection.....	1911-1935	2,463	.08	166	1,217	143	937	.7	.1	.7	.8	4.1	
41	Purulent infection, septicemia.....	1911-1935	5,563	.17	2,371	2,308	422	462	1.6	1.8	1.4	2.2	2.0	
42	Other infectious diseases.....	1922-1929	17	*	6	7	1	3	.1	.1	.1	.1	.1	
43 to 49	Cancer (all forms).....	1911-1935	262,046	8.19	78,051	152,523	8,645	22,827	75.6	57.7	89.9	45.6	100.1	
43	of the buccal cavity ²	1911-1935	8,095	.25	5,963	1,378	493	261	2.3	4.4	.8	2.6	1.1	
44	of the stomach, liver ¹	1911-1935	84,051	2.63	32,894	42,565	4,039	4,553	24.3	24.3	25.1	21.3	20.0	
45	of the peritoneum, intestines, rectum.....	1911-1935	35,632	1.11	11,297	21,033	1,071	2,231	10.3	8.4	12.4	5.7	9.8	
46	of the female genital organs.....	1911-1935	52,704	1.65	.....	42,946	.....	9,758	15.2	.....	25.3	.....	42.8	
47	of the breast.....	1911-1935	26,324	.82	.....	212	.....	38	7.6	.....	13.3	.....	15.5	
48	of the skin.....	1911-1935	4,315	.13	2,158	1,854	127	176	1.2	1.6	1.1	.7	.8	
49	of other or unspecified organs ¹	1911-1935	50,925	1.59	25,527	20,214	2,877	2,307	14.7	18.9	11.9	15.2	10.1	

(Footnotes appear on page 540.)

APPENDIX TABLE A—Continued

NUMBER OF DEATHS AND CRUDE DEATH RATES PER 100,000. BY COLOR AND SEX. AGES 1 TO 74 YEARS
Detailed International List of Causes of Death, Third Decennial Revision, 1920

Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935 Combined, and Other Specified Periods

Inter- national List Number (1920 Revision)	CAUSE OF DEATH	PERIOD OF YEARS	NUMBER OF DEATHS				DEATH RATES PER 100,000			
			TOTAL PERSONS		WHITE		TOTAL PER- SONS	WHITE		COLORED
			Number	Percent	Males	Females		Males	Females	
50	Benign tumors and tumors not returned as malignant (tumors of the female genital organs excepted).....	1922-1929	1,007	.09	308	504	.8	.6	.8	1.6
51	Acute rheumatic fever.....	1911-1935	13,503	.42	4,977	6,033	3.9	3.7	3.6	6.7
52	Chronic rheumatism, osteoarthritis, gout.....	1911-1935	2,943	.09	843	1,620	.8	.6	1.0	1.3
53	Scurvy.....	1911-1935	91	*	37	32	14	1	1	1
54	Pellagra.....	1911-1935	8,619	.27	1,342	3,429	2.5	1.0	2.0	4.1
55	Beri-beri.....	1911-1935	11	*	5	3	2	1	1	13.5
56	Rickets ¹	1911-1935	773	.02	270	247	.2	.2	.1	1
57	Diabetes mellitus.....	1911-1935	60,407	1.89	14,421	38,819	17.4	10.7	22.9	7
58	Acemia, chlorosis.....	1911-1935	10,522	.33	3,049	6,662	5.055	2.3	3.9	11.1
58a	Periculous anemia.....	1911-1935	6,223	.30	1,787	4,015	3.0	1.9	3.3	2.4
58b	Other pernicious and chlorosis.....	1911-1935	1,033	.05	346	554	.4	.4	.5	1.7
59	Diseases of the pituitary gland.....	1911-1935	10,012	.31	845	7,724	1.1	.1	1.1	3.5
60	Diseases of the thyroid gland.....	1911-1935	8,402	.26	623	6,560	2.9	.6	4.6	.8
60a	Exophthalmic goiter.....	1911-1935	1,610	.05	222	1,164	2.4	.5	3.9	5.7
60b	Other diseases of the thyroid gland.....	1911-1935	81	*	32	34	.5	.2	.7	4.8
61	Diseases of the parathyroid glands.....	1911-1935	655	.03	313	252	6	1	1	9
62	Diseases of the thymus gland.....	1911-1935	903	.03	301	547	3.5	3.3	2.2	1
63	Diseases of the adrenals (Addison's disease) ¹	1911-1935	700	.02	270	359	41	30	2.2	1.1
64	Leukemia.....	1911-1935	4,333	.21	1,897	2,093	170	123	1.8	1.1
65a	Hodgkin's disease.....	1911-1935	1,877	.09	950	732	104	91	1.0	.8
65b	Alcoholism (acute or chronic).....	1911-1935	10,383	.32	7,432	1,381	395	30	5.5	6.2
66	Chronic poisoning by mineral or organic substances.....	1911-1935	1,354	.04	862	257	156	79	.4	.8
67a	Chronic lead poisoning.....	1911-1935	634	.02	536	26	85	7	.2	.3
67b, 68	Others under this title.....	1911-1935	700	.02	326	231	71	72	.4	.4

(Footnotes appear on page 540.)

(Footnotes appear on page 540.)

APPENDIX TABLE A—Continued
NUMBER OF DEATHS AND CRUDE DEATH RATES PER 100,000. BY COLOR AND SEX. AGES 1 TO 74 YEARS
Detailed International List of Causes of Death, Third Decennial Revision, 1920
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935 Combined, and Other Specified Periods

Inter- national List Number (1920 Revision)	CAUSE OF DEATH	PERIOD OF YEARS	NUMBER OF DEATHS						DEATH RATES PER 100,000					
			TOTAL PERSONS		WHITE		COLORED		TOTAL PER- SONS	WHITE		COLORED		
			Number	Percent	Males	Females	Males	Females		Males	Females			
69	Other general diseases.....	1922-1929	1,115	.10	439	552	49	75	.9	.9	.7	.8		
70	Encephalitis.....	1911-1935	3,180	.10	1,350	1,302	269	259	.9	1.0	.8	1.4		
71	Meningitis.....	1912-1935	11,605	.37	5,490	4,536	885	694	3.4	4.2	2.7	4.8		
73	Other diseases of the spinal cord.....	1921-1929	3,217	.26	1,274	1,362	260	321	2.2	2.3	1.9	3.2		
74a, 75	Cerebral hemorrhage and paralysis without specified cause ^a	1911-1935	200,217	6.26	62,452	95,318	16,593	25,854	57.8	46.2	87.6	113.4		
77	Mental alienation (except general paralysis of the insane).....	1911-1935	3,673	.11	854	1,882	356	581	1.1	.6	1.1	1.9		
78	Epilepsy.....	1911-1935	8,556	.27	3,838	3,303	870	545	2.5	2.8	1.9	4.6		
79	Convulsions (nonpuerperal; 5 years and over).....	1911-1929	444	.02	123	237	22	62	.2	.1	.2	.4		
80	Infantile convulsions (under 5 years of age).....	1911-1935	1,577	.05	763	640	91	83	.5	.6	.5	.4		
81	Chorea.....	1911-1935	349	.01	90	218	16	25	.1	.1	.1	.1		
82	Neuralgia and neuritis.....	1911-1935	859	.03	270	406	64	119	.2	.2	.2	.3		
83	Softening of the brain.....	1911-1935	1,303	.04	476	605	102	120	.4	.4	.5	.5		
84	Other diseases of the nervous system.....	1921-1929	4,065	.33	1,649	1,904	248	264	2.8	3.0	2.7	3.0		
85	Diseases of the eye and annexa.....	1911-1935	244	.01	96	108	18	22	.1	.1	.1	.1		
86a	Diseases of the ear.....	1911-1935	5,823	.18	2,842	2,444	255	282	1.7	2.1	1.4	1.3		
86b	Diseases of the mastoid process.....	1921-1935	2,808	.14	1,357	1,212	101	138	1.1	1.4	1.0	.8		
87	Pericarditis.....	1911-1935	2,553	.08	869	871	392	421	.7	.6	.5	2.1		
88	Endocarditis and myocarditis (acute) ^b	1911-1935	41,108	1.29	14,271	17,215	4,230	5,392	11.9	10.6	10.2	22.3		
§	Diseases of the coronary arteries and angina pectoris.....	1930-1935	22,643	2.74	12,049	8,298	1,166	1,130	22.4	30.7	16.5	17.7		
89	Angina pectoris.....	1911-1935	24,265	.76	12,378	8,858	1,441	1,588	7.0	9.2	5.2	7.6		
§	Diseases of the coronary arteries.....	1930-1935	12,572	1.52	6,704	4,705	598	565	12.4	17.1	9.4	11.6		
90	Other diseases of the heart (organic) ^b	1911-1935	445,833	13.94	154,910	205,325	38,404	47,194	128.7	114.6	121.1	202.7		
91	Diseases of the arteries ^a	1911-1935	36,584	1.14	15,313	14,345	3,719	3,207	10.6	11.3	8.5	19.6		
91b	Arteriosclerosis.....	1922-1935	18,610	.96	7,675	7,883	1,437	1,615	8.0	8.6	6.9	11.4		

(Footnotes appear on page 540.) NOTE: Locomotor ataxia (72) and General paralysis of the insane (76) combined with Syphilis (38). See p. 532.

APPENDIX TABLE A—Continued

NUMBER OF DEATHS AND CRUDE DEATH RATES PER 100,000. BY COLOR AND SEX. AGES 1 TO 74 YEARS Detailed International List of Causes of Death, Third Decennial Revision, 1920

Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935 Combined, and Other Specified Periods

Inter- national List Number (1920 Revision)	CAUSE OF DEATH	PERIOD OF YEARS	NUMBER OF DEATHS						DEATH RATES PER 100,000				
			TOTAL PERSONS		WHITE		COLORED		TOTAL PUR- SONS	WHITE		COLORED	
			Number	Percent	Males	Females	Males	Females		Males	Females		
92, 74b	Embolism and thrombosis (including cerebral) ^a	1911-1929	8,183	.34	2,942	4,173	464	604	3.3	3.1	3.5	3.4	3.7
93	Diseases of the veins.....	1911-1929	1,453	.06	352	904	76	121	.6	.4	.8	.6	.7
94	Diseases of the lymphatic system.....	1921-1935	367	.02	152	143	40	32	.1	.2	.1	.3	.2
95, 96	Hemorrhage without specified cause and other diseases of the circulatory system.....	1921-1935	1,211	.06	423	463	153	172	.5	.4	.4	1.1	1.1
97	Diseases of the nasal fossae and their annexa.....	1921-1935	1,175	.06	559	447	79	90	.5	.6	.4	.6	.6
98	Diseases of the larynx.....	1911-1935	2,072	.06	1,061	797	114	100	.6	.8	.5	.6	.4
99a, c	Acute bronchitis, and bronchitis unspecified under 5 years of age.....	1921-1935	2,411	.12	904	996	228	283	1.0	1.0	.8	1.7	1.8
99b, d	Chronic bronchitis, and bronchitis unspecified 5 years and over.....	1911-1935	10,347	.32	3,785	4,576	843	1,143	3.0	2.8	2.7	4.4	5.0
102	Pleurisy.....	1911-1935	9,465	.30	4,282	3,387	929	867	2.7	3.2	2.0	4.9	3.8
103	Congestion and hemorrhagic infarct of the lung.....	1911-1929	2,521	.11	944	1,141	212	224	1.0	1.0	1.0	1.5	1.4
104	Gangrene of the lung.....	1911-1929	532	.02	205	165	41	31	.2	.3	.1	.3	.2
105	Asthma.....	1911-1935	6,098	.19	2,337	2,329	649	783	1.8	1.7	1.4	3.4	3.4
106	Pulmonary emphysema.....	1911-1935	440	.01	234	123	49	34	.1	.2	.1	.3	.1
107	Other diseases of the respiratory system (tuberculosis excepted).....	1922-1929	1,435	.13	778	318	230	109	1.1	1.5	.5	3.1	1.2
108	Diseases of the mouth and annexa.....	1922-1935	1,710	.09	669	667	160	219	.7	.7	.6	1.3	1.4
109	Diseases of the pharynx and tonsils.....	1922-1935	9,686	.50	3,675	4,063	551	857	4.2	4.1	4.0	4.4	5.6
110	Diseases of the esophagus.....	1911-1935	482	.02	243	163	43	33	.1	.2	.1	.2	.1
111a	Ulcer of the stomach.....	1911-1935	12,183	.38	6,274	3,369	1,377	1,163	3.5	4.6	2.0	7.3	5.1
111b	Ulcer of the duodenum.....	1921-1935	2,940	.14	1,959	656	234	91	1.2	2.1	.5	1.8	.6
112	Other diseases of the stomach (cancer excepted).....	1911-1935	14,901	.47	4,475	4,886	2,185	3,355	4.3	3.3	2.9	11.5	14.7

(Footnotes appear on page 540.) Note: For data on pneumonia, titles 100 and 101, see influenza and pneumonia p. 531.

APPENDIX TABLE A—Continued
NUMBER OF DEATHS AND CRUDE DEATH RATES PER 100,000. BY COLOR AND SEX. AGES 1 TO 74 YEARS
Detailed International List of Causes of Death, Third Decennial Revision, 1920
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935 Combined, and Other Specified Periods

Inter- national List Number (1920 Revision)	CAUSE OF DEATH	PERIOD OF YEARS	NUMBER OF DEATHS						DEATH RATES PER 100,000					
			TOTAL PERSONS		WHITE		COLORED		TOTAL PER- SONS	WHITE		COLORED		
			Number	Percent	Males	Females	Males	Females		Males	Females			
113, 114	Diarrhea and enteritis ¹¹	1911-1935	43,354	1.36	18,749	18,352	2,746	3,507	12.5	13.9	10.8	14.5	15.4	
115	Ankylostomiasis.....	1911-1935	31	*	14	11	2	4	†	†	†	†	†	
116	Diseases due to other intestinal parasites	1922-1929	82	.01	28	39	7	8	.1	.1	.1	.1	.1	
117	Appendicitis.....	1911-1935	45,337	1.42	19,936	18,876	3,098	3,427	13.1	14.8	11.1	16.4	15.0	
118 ^a	Hernia.....	1911-1935	12,728	.40	4,279	6,826	985	638	3.7	3.2	4.0	5.2	2.8	
118 ^b	Intestinal obstruction.....	1922-1935	10,393	.54	3,077	4,780	925	1,611	4.5	3.4	4.2	7.3	10.6	
119	Other diseases of the intestines.....	1922-1935	2,600	.13	832	1,048	248	472	1.1	.9	.9	2.0	3.1	
120	Acute yellow atrophy of the liver ¹²	1911-1935	1,332	.04	305	798	71	158	.4	.2	.5	.4	.7	
121	Hydatid tumor of the liver.....	1911-1935	47	*	11	27	2	7	†	†	†	†	†	
122	Cirrhosis of the liver.....	1911-1935	28,369	.89	14,495	10,045	2,225	1,604	8.2	10.7	5.9	11.7	7.0	
123	Biliary calculi.....	1911-1935	10,414	.33	1,409	8,366	136	503	3.0	1.0	4.9	.7	2.2	
124	Other diseases of the liver.....	1911-1935	12,100	.38	3,043	7,231	739	1,087	3.5	2.3	4.3	3.9	4.8	
125, 127	Diseases of the pancreas and other diseases of the digestive system (cancer and tuberculosis excepted).....	1911-1935	1,815	.06	626	958	98	133	.5	.5	.6	.5	.6	
126	Peritonitis without specified cause.....	1911-1935	6,420	.20	1,673	3,157	438	1,152	1.9	1.2	1.9	2.3	5.1	
128	Acute nephritis (including unspecified under 10 years of age) ¹³	1911-1935	19,542	.61	6,433	7,021	2,777	3,311	5.6	4.8	4.1	14.7	14.5	
129	Chronic nephritis (including unspecified 10 years and over) ¹⁴	1911-1935	246,217	7.70	83,218	111,476	23,586	27,937	71.1	61.6	65.7	124.5	122.5	
130	Chyluria.....	1911-1929	3	*	.....	2	1	.....	†	.....	†	.....	.....	
131	Other diseases of the kidneys and annexa.....	1911-1935	6,768	.21	2,164	3,391	592	621	2.0	1.6	2.0	3.1	2.7	
132	Calculi of the urinary passages.....	1911-1935	2,171	.07	971	953	162	85	.6	.7	.6	.9	.4	
133	Diseases of the bladder.....	1911-1935	1,792	.06	794	484	376	138	.5	.6	.3	2.0	.6	
134	Diseases of the urethra, urinary abscess, etc.	1911-1935	1,273	.04	589	60	591	33	.4	.4	†	3.1	.1	
135	Diseases of the prostate.....	1911-1935	6,237	.19	4,760	.....	1,477	.....	1.8	3.5	.....	7.8	.....	
136	Nonvenereal diseases of the male genital organs.....	1911-1935	245	.01	157	.....	88	.....	.1	.1	.....	.5	.....	

(Footnotes appear on page 540.)

APPENDIX TABLE A—Continued

NUMBER OF DEATHS AND CRUDE DEATH RATES PER 100,000. BY COLOR AND SEX. AGES 1 TO 74 YEARS

Detailed International List of Causes of Death, Third Decennial Revision, 1920

Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935 Combined, and Other Specified Periods

Inter- national List Number (1920 Revision)	CAUSE OF DEATH	PERIOD OF YEARS	NUMBER OF DEATHS						DEATH RATES PER 100,000			
			TOTAL PERSONS		WHITE		COLORED		TOTAL PER- SONS	WHITE		COLORED
			Number	Percent	Males	Females	Males	Females		Males	Females	
137 to 142	Nonvenereal diseases of the female genital organs.....	1911-1935	23,601	.74	.....	15,718	.....	7,883	6.8	.....	.....	34.6
137	Cysts and other benign tumors of the ovary.....	1911-1935	2,968	.09	.....	2,382	.....	586	.9	.....	.....	2.6
139	Benign tumors of the uterus.....	1911-1935	8,217	.26	.....	4,635	.....	3,582	2.4	.....	.....	15.7
140	Nonperiparturine hemorrhage.....	1911-1929	236	.01	.....	188	.....	48	.1	.....	.....	.3
138, 141	Salpingitis and other diseases of the female genital organs.....	1911-1929	9,007	.38	.....	6,212	.....	2,795	3.7	.....	.....	17.0
142	Nonperiparturine diseases of the breast (cancer excepted).....	1911-1929	77	*	.....	59	.....	18	†	.....	.....	.1
143 to 150	The puerperal state.....	1911-1935	55,141	1.72	.....	45,508	.....	9,633	15.9	.....	.....	42.2
143	Accidents of pregnancy.....	1911-1935	5,911	.18	.....	4,923	.....	988	1.7	.....	.....	4.3
144	Puerperal hemorrhage.....	1911-1935	5,066	.16	.....	4,393	.....	673	1.5	.....	.....	3.0
145	Other accidents of labor.....	1911-1935	7,565	.24	.....	6,316	.....	1,249	2.2	.....	.....	5.5
146	Puerperal septicemia ¹	1911-1935	21,222	.66	.....	16,969	.....	4,253	6.1	.....	.....	18.7
147	Puerperal phlegmasia alba dolens, em- bolus, sudden death.....	1911-1935	2,385	.07	.....	2,147	.....	238	.7	.....	.....	1.0
148	Puerperal albuminuria and convulsions ^{1a}	1911-1935	12,756	.40	.....	10,564	.....	2,192	3.7	.....	.....	9.6
149, 150	Other puerperal conditions.....	1911-1935	236	.01	.....	196	.....	40	.1	.....	.....	.2
151	Gangrene.....	1911-1935	1,956	.06	.....	734	.....	253	.6	.....	.....	1.3
152	Furuncle and carbuncle.....	1911-1935	1,290	.04	.....	684	.....	44	.3	.....	.....	.3
153	Acute abscess.....	1911-1935	2,013	.06	.....	884	.....	777	.6	.....	.....	.8
154	Other diseases of the skin and annexe.....	1911-1935	1,114	.03	.....	297	.....	98	.3	.....	.....	.5
155	Diseases of the bones (tuberculosis ex- cepted) ¹¹	1911-1935	2,506	.13	.....	1,364	.....	854	1.1	.....	.....	.8
156	Diseases of the joints (tuberculosis and rheumatism excepted).....	1911-1935	697	.02	.....	301	.....	267	.2	.....	.....	.3
157, 158	Amputations and other diseases of the organs of locomotion.....	1911-1935	167	.01	.....	65	.....	66	.1	.....	.....	.1

(Footnotes appear on page 540.)

APPENDIX TABLE A—Continued
NUMBER OF DEATHS AND CRUDE DEATH RATES PER 100,000. BY COLOR AND SEX. AGES 1 TO 74 YEARS
Detailed International List of Causes of Death, Third Decennial Revision, 1920
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935 Combined, and Other Specified Periods

Inter- national List Number (1920 Revision)	CAUSE OF DEATH	PERIOD OF YEARS	NUMBER OF DEATHS						DEATH RATES PER 100,000				
			TOTAL PERSONS		WHITE		COLORED		TOTAL PER- SONS	WHITE		COLORED	
			Number	Percent	Males	Females	Males	Females		Males	Females		
159	Congenital malformations (stillbirths not included) ^{1a}	1911-1935	2,934	.09	1,555	1,187	114	78	.8	1.2	.7	.6	.3
164	Senility.....	1911-1935	5,879	.18	1,526	2,965	523	865	1.7	1.1	1.7	2.8	3.8
165 to 174	Suicide (all forms).....	1911-1935	31,309	.98	19,422	9,251	1,728	908	9.0	14.4	5.5	9.1	4.0
165, 166	by poison (gas excepted).....	1911-1935	7,400	.23	3,362	3,311	282	445	2.1	2.5	2.0	1.5	2.0
167	by poisonous gas.....	1911-1935	5,883	.18	3,380	2,301	130	72	1.7	2.5	1.4	.7	.3
168	by hanging or strangulation.....	1911-1935	4,617	.14	3,506	918	155	38	1.3	2.6	.5	.8	.2
169	by drowning.....	1911-1935	1,822	.06	914	712	109	87	.5	.7	.4	.6	.4
170	by firearms.....	1911-1935	8,069	.25	6,043	1,100	780	146	2.3	4.5	.6	4.1	.6
171	by cutting or piercing instruments.....	1911-1935	1,577	.05	1,189	224	142	22	.5	.9	.1	.7	.1
172 to 174	by other means.....	1911-1935	1,941	.06	1,028	685	130	98	.6	.8	.4	.7	.4
175 to 189, 191 to 196, 201 to 203	Accidental and unspecified violence ^{1b}	1911-1935	216,531	6.77	132,657	54,044	21,401	8,429	62.5	98.1	31.9	112.9	37.0
177	Poisoning by food.....	1911-1935	2,234	.07	834	861	235	304	.6	.6	.5	1.2	1.3
178	Other acute accidental poisonings (gas excepted) ^{2a}	1911-1935	5,101	.16	2,365	1,913	451	372	1.5	1.7	1.1	2.4	1.6
179	Confagration.....	1911-1935	3,514	.11	1,616	1,065	422	411	1.0	1.2	.6	2.2	1.8
180, 181	Accidental burns (conflagration excepted) Accidental absorption of poisonous gas and accidental mechanical suffoca- tion.....	1911-1935	20,657	.65	6,981	10,076	1,318	2,282	6.0	5.2	5.9	7.0	10.0
180	Accidental mechanical suffocation.....	1911-1935	8,278	.26	4,986	2,555	505	232	2.4	3.7	1.5	2.7	1.0
181	Accidental mechanical suffocation.....	1922-1935	480	.02	322	83	62	13	.2	.4	.1	.5	.1
182	Accidental absorption of irrespirable, irritating or poisonous gas.....	1922-1935	4,814	.25	2,891	1,507	280	136	2.1	3.2	1.3	2.2	.9
183	Accidental drowning.....	1911-1935	25,646	.80	19,377	2,799	3,167	303	7.4	14.3	1.7	16.7	1.3
	Accidental traumatism by firearms (wounds of war excepted).....	1911-1935	6,039	.19	3,827	570	1,311	331	1.7	2.8	.3	6.9	1.5

(Footnotes appear on page 540.) NOTE: Titles 160 to 163 inclusive, are restricted to infants, and hence are not included in this study.

APPENDIX TABLE A—Concluded

NUMBER OF DEATHS AND CRUDE DEATH RATES PER 100,000. BY COLOR AND SEX. AGES 1 TO 74 YEARS

Detailed International List of Causes of Death, Third Decennial Revision, 1920

Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935 Combined, and Other Specified Periods

Inter-national List Number (1920 Revision)	CAUSE OF DEATH (1920 Revision)	PERIOD OF YEARS	NUMBER OF DEATHS						DEATH RATES PER 100,000								
			TOTAL PERSONS		WHITE		COLORED	TOTAL PER- SONS	WHITE		COLORED		TOTAL PER- SONS	WHITE		COLORED	
			Number	Percent	Males	Females			Males	Females	Males	Females		Males	Females	Males	Females
184	Accidental traumatism by cutting or piercing instruments.....	1911-1935	928	.03	516	170	169	73	.3	4	1	9	.3				
185	Accidental traumatism by fall.....	1911-1935	31,593	.99	17,112	11,349	1,996	1,136	9.1	12.7	6.7	10.5	5.0				
186	Accidental traumatism in mines and quarries.....	1911-1935	3,912	.12	3,218	22	666	6	1.1	2.4	1	3.5	1				
187	Accidental traumatism by machines.....	1911-1935	4,782	.15	3,729	209	794	50	1.4	2.8	1	4.2	2				
188a	Railroad accidents.....	1911-1935	16,306	.51	12,039	1,907	2,076	284	4.7	8.9	1.1	11.0	1.2				
188b	Streetcar accidents.....	1911-1935	5,766	.18	3,770	1,338	481	177	1.7	2.8	1.1	2.5	.8				
188c	Automobile accidents.....	1911-1935	52,583	1.64	32,579	14,109	4,269	1,626	15.2	24.1	8.3	22.5	7.1				
188d, e, f	Injuries by other vehicles.....	1911-1935	5,496	.17	4,179	699	554	64	1.6	3.1	.4	2.9	.3				
189	Injuries by animals (not poisoning).....	1911-1935	777	.02	583	75	109	10	.2	.4	1	.6	1				
192	Starvation (deprivation of food or water).....	1911-1935	60	.00	26	19	9	6	1	1	1	1	1				
193	Excessive cold.....	1911-1935	836	.03	487	89	188	72	2.2	.4	1.1	1.0	.3				
194	Excessive heat.....	1911-1935	3,537	.11	1,908	893	509	227	1.0	1.4	.5	2.7	1.0				
195	Lightning.....	1911-1935	430	.01	302	70	62	16	.1	1.2	1	.3	1				
196	Other accidental electric shocks.....	1911-1935	2,440	.08	2,197	93	140	10	.7	1.6	.1	.7	1				
176, 188g, 191, 201 to 203	Other accidental and unspecified violence.....	1911-1935	15,596	.49	10,026	3,163	1,970	437	4.5	7.4	1.9	10.4	1.9				
197 to 200	Homicide (all forms).....	1911-1935	23,469	.73	7,171	3,019	10,004	3,275	6.8	5.3	1.8	52.8	14.4				
197	by firearms.....	1911-1935	15,572	.49	4,809	1,563	7,186	2,014	4.5	3.6	.9	37.9	8.8				
198	by cutting or piercing instruments.....	1911-1935	3,768	.12	1,811	265	1,969	753	1.1	.6	.2	10.4	3.3				
199, 200	by other means.....	1911-1935	4,129	.13	1,581	1,191	849	508	1.2	1.2	.7	4.5	2.2				
190	Wounds of war.....	1915-1935	9,362	.33	9,099	16	247	1	.3	7.5	1	1.5	1.5				
204, 205	Cause of death not specified or ill-defined.....	1911-1935	25,663	.80	12,497	6,733	3,839	2,594	7.4	9.2	4.0	20.3	11.4				

(Footnotes appear on page 540.)

APPENDIX TABLE A—FOOTNOTES

* Less than 0.005.

† Less than 0.05.

** The total number of deaths from all causes appearing in the first line of each column exceeds the result obtained by summing all the items in the column appearing under this total. This is because it has been impossible to obtain comparable data for a number of titles over the entire 25-year period. In such cases only one part (usually that containing most closely to the 1920 International List) of the whole period has been incorporated in that part of the table which deals with individual causes, while in the first line all deaths are included. As a consequence of this, a residual of 48,267 deaths (19,150 white males, 21,492 white females, 3,444 colored males, and 4,181 colored females) does not appear in the body of the table, although it is contained in the totals in the first line.

† The percentages for the various causes of death listed below relate in each case to the particular period for which corresponding data are available. Since the figures in this column do not all relate to one period, they do not add up to 100.

§ Provision for the segregation of deaths from diseases of the coronary arteries was first made in the 1929 revision of the International List.

1 Does not include capillary bronchitis for the years 1911 to 1920.

2 Excluding cancer of the pharynx.

3 Including cancer of the pharynx.

4 Including osteomalacia.

5 Does not include tuberculosis of the adrenal glands for the years 1930 to 1935.

6 Does not include cerebral embolism and thrombosis.

7 Includes "endocarditis" and "myocarditis" unqualified for ages under 60 years. The inclusions under this title are so modified as to be comparable with title 78 of the 1909 International List.

8 The inclusions under this title have been so modified as to be comparable with title 79 of the 1909 International List.

9 Comprises titles 96 and 97 of the 1930 International List for the years 1930 to 1935.

10 The series is comparable to title 82 of the 1909 International List.

11 Includes ulcer of the duodenum for the years 1911 to 1920.

12 Includes spirochetal hemorrhagic jaundice for the years 1911 to 1921.

13 Does not include "nephritis" unqualified under 10 years of age for the years 1911 to 1920.

14 Includes deaths from "nephritis" unqualified for decedents under 10 years of age for the years 1911 to 1920.

15 Does not include puerperal tetanus. Deaths from puerperal tetanus are included under puerperal albuminuria for the entire 25-year period.

16 Includes deaths from puerperal tetanus for the entire 25-year period.

17 Does not include osteomalacia.

18 Includes congenital endocarditis and congenital myocarditis for the years 1930 to 1935.

19 Excluding wounds of war.

20 Includes poisoning by venomous animals for the years 1911 to 1921.

APPENDIX TABLE B
ALL CAUSES OF DEATH COMBINED
Annual Death Rates per 100,000. By Color, Sex, and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

Color; Sex; Age	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
TOTAL PERSONS:																									
1 to 74 years*	762.6	786.6	803.1	812.9	846.4	856.0	927.4	910.4	888.3	947.1	909.0	910.3	967.3	928.6	909.7	941.4	1,133.8	1,070.5	1,264.5	1,258.2	1,210.0	1,243.0	1,294.0	1,295.0	1,354.9
1 to 14†	207.7	213.7	210.8	225.6	264.9	200.7	310.8	310.5	300.7	363.9	332.6	358.6	304.9	306.4	433.1	511.1	502.9	803.5	558.9	540.9	493.0	544.5	504.1	502.0	623.7
15 to 44†	308.8	405.5	428.7	444.9	470.0	481.5	531.0	523.9	522.0	543.4	544.2	545.8	571.9	521.1	557.4	684.8	857.2	1,122.0	822.5	827.4	807.3	823.0	850.0	870.0	917.4
45 to 74†	2,011.2	2,708.8	2,738.0	2,726.0	2,746.5	2,783.0	2,947.0	2,870.2	2,765.4	2,846.4	2,805.7	2,700.5	2,938.0	2,756.0	2,613.9	2,843.0	2,867.8	3,464.9	3,560.1	3,433.3	3,453.3	3,463.3	3,560.5	3,596.3	3,694.5
WHITE PERSONS:																									
1 to 74 years†	724.0	747.4	702.0	772.4	799.4	807.3	878.3	804.2	844.9	900.3	805.0	807.2	926.3	801.4	871.9	938.5	1,091.5	1,027.4	1,215.7	1,163.0	1,103.0	1,199.0	1,240.9	1,240.0	1,300.4
WHITE MALES:																									
1 to 74 years†	838.0	873.1	883.3	870.8	918.0	925.4	1,003.5	978.7	958.3	1,014.3	971.0	900.3	1,027.8	973.0	934.5	1,060.2	1,200.9	1,870.4	1,480.0	1,415.0	1,329.8	1,376.0	1,449.0	1,434.5	1,498.5
1 to 14†	213.3	220.0	220.4	231.3	274.0	275.8	321.0	310.8	315.0	332.7	331.1	350.7	405.0	402.8	437.2	510.9	490.2	750.8	503.0	543.0	477.0	527.1	578.3	548.4	594.7
15 to 44†	413.4	424.7	438.0	442.8	481.3	482.0	534.2	517.9	517.3	530.0	537.1	536.0	573.1	550.2	532.8	646.4	901.1	1,781.0	948.0	942.4	884.5	907.0	963.4	975.7	1,024.8
45 to 74†	2,080.0	3,120.1	3,147.9	3,082.9	3,120.1	3,188.7	3,303.0	3,278.4	3,170.3	3,330.2	3,171.0	3,053.8	3,265.3	3,027.0	2,811.0	3,047.2	3,453.9	3,936.8	4,154.1	4,100.1	3,900.4	4,007.2	4,150.8	4,101.3	4,234.3
1 to 14†	353.1	390.5	375.0	401.3	497.5	501.5	555.7	501.5	553.7	733.2	612.8	683.8	800.5	770.2	821.8	937.7	972.2	1,550.2	1,087.4	1,333.3	980.2	1,074.0	1,100.0	1,146.1	1,220.9
15 to 44†	171.1	170.6	170.3	171.2	207.5	203.9	226.7	222.1	210.8	232.8	232.8	252.8	288.5	273.3	315.2	346.8	347.8	471.6	346.1	380.0	310.4	347.0	381.5	354.2	403.0
45 to 74†	1,351.1	1,340.0	1,335.0	1,407.2	1,492.5	1,500.0	1,600.0	1,555.4	1,553.0	1,563.2	1,568.0	1,568.0	1,568.0	1,568.0	1,568.0	1,568.0	1,568.0	1,568.0	1,568.0	1,568.0	1,568.0	1,568.0	1,568.0	1,568.0	1,568.0
1 to 14†	180.8	193.3	207.0	217.4	232.7	248.3	290.0	296.0	272.2	275.8	280.0	280.0	300.0	311.0	320.3	300.2	460.2	907.7	448.3	404.6	385.0	368.2	423.8	394.9	400.3
15 to 44†	267.6	270.5	200.5	201.6	222.8	242.4	272.0	248.4	302.3	374.8	380.4	380.5	400.0	403.1	423.3	483.1	700.0	1,791.0	673.4	635.6	547.5	578.4	604.2	621.2	688.8
45 to 74†	392.3	403.2	412.2	422.8	455.4	446.0	494.0	497.3	498.3	511.0	512.0	512.0	512.0	512.0	512.0	512.0	512.0	512.0	512.0	512.0	512.0	512.0	512.0	512.0	512.0
1 to 14†	730.7	701.2	767.7	767.1	841.0	830.8	910.3	919.5	893.3	921.0	921.0	921.0	921.0	921.0	921.0	921.0	921.0	921.0	921.0	921.0	921.0	921.0	921.0	921.0	921.0
15 to 44†	1,500.1	1,503.9	1,060.8	1,076.7	1,072.0	1,077.0	1,780.1	1,750.0	1,695.4	1,731.0	1,731.0	1,731.0	1,731.0	1,731.0	1,731.0	1,731.0	1,731.0	1,731.0	1,731.0	1,731.0	1,731.0	1,731.0	1,731.0	1,731.0	1,731.0
45 to 74†	3,203.6	3,200.0	3,468.4	3,403.7	3,410.0	3,410.0	3,518.0	3,480.0	3,400.0	3,400.0	3,400.0	3,400.0	3,400.0	3,400.0	3,400.0	3,400.0	3,400.0	3,400.0	3,400.0	3,400.0	3,400.0	3,400.0	3,400.0	3,400.0	3,400.0
1 to 74 years†	6,020.3	6,077.8	6,070.7	6,030.6	6,060.6	6,060.6	6,377.1	6,227.0	6,300.4	6,223.4	6,173.1	6,161.0	6,161.0	6,161.0	6,161.0	6,161.0	6,161.0	6,161.0	6,161.0	6,161.0	6,161.0	6,161.0	6,161.0	6,161.0	6,161.0

*Standardized for color, sex, and age.

†Standardized for sex and age.

‡Standardized for age.

APPENDIX TABLE B—Continued
ALL CAUSES OF DEATH COMBINED
Annual Death Rates per 100,000. By Color, Sex, and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

Color; Sex; Age	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
WHITE FEMALES:																									
1 to 74 years†	617.7	629.5	640.0	674.5	688.2	697.3	760.8	766.7	738.0	793.4	767.3	771.5	831.1	814.8	813.2	940.6	988.8	1,399.4	1,008.3	1,027.8	1,006.5	1,032.9	1,062.0	1,070.4	1,131.9
1 to 14†	182.1	180.9	183.0	196.3	223.3	228.4	275.6	278.5	265.7	309.5	284.5	310.3	339.6	348.8	384.8	451.9	444.3	730.6	472.4	492.9	438.2	494.7	540.0	498.1	560.9
15 to 44†	306.1	303.6	337.7	359.8	376.2	378.6	425.3	432.6	432.2	452.3	480.5	462.4	483.3	494.0	494.6	633.2	732.2	1,231.6	609.5	625.0	637.0	643.8	684.7	672.3	725.7
45 to 74†	2,156.9	2,214.2	2,241.0	2,290.8	2,275.8	2,309.7	2,444.2	2,397.0	2,325.6	2,485.9	2,371.0	2,343.7	2,555.0	2,424.2	2,358.6	2,556.8	2,562.0	2,931.3	2,940.7	2,969.7	2,915.6	2,944.3	2,968.4	3,061.6	3,142.1
1 to 4	323.2	338.0	332.9	354.1	425.7	435.7	535.4	546.2	483.5	648.9	536.4	608.0	686.7	674.2	730.4	936.8	880.1	1,536.3	981.8	1,054.8	876.6	982.4	1,120.3	1,026.4	1,167.6
5 to 9	138.9	129.7	141.7	141.3	159.7	162.9	191.3	190.6	203.9	187.5	196.4	210.6	219.6	227.1	273.3	287.3	292.3	436.1	298.9	302.9	286.2	335.5	358.8	322.9	376.2
10 to 14	103.9	97.2	95.8	116.5	113.6	115.5	138.3	137.4	140.0	141.3	157.6	155.0	162.4	162.9	200.7	201.6	224.2	359.6	210.0	202.4	215.4	236.6	224.2	221.2	225.7
15 to 19	151.0	143.4	163.6	177.0	197.9	220.3	238.8	251.2	264.0	269.8	271.7	285.4	293.6	313.0	314.5	383.9	405.9	723.7	376.8	372.3	390.7	369.7	354.7	367.4	385.8
20 to 24	219.9	245.3	255.9	308.3	311.4	320.2	360.0	381.5	369.6	375.9	404.0	416.8	416.9	432.8	457.8	533.5	681.1	1,201.4	527.3	502.2	516.0	519.5	539.0	557.2	600.3
25 to 34	314.9	315.6	354.1	362.6	385.4	382.4	430.5	423.8	431.3	451.1	462.6	457.8	491.9	504.9	491.3	698.8	855.2	1,503.5	616.1	644.0	661.3	669.1	700.2	704.1	775.6
35 to 44	487.8	483.0	521.5	544.8	559.4	548.0	620.8	631.3	618.9	661.9	665.4	647.9	677.9	674.5	674.0	788.3	875.5	1,231.2	853.9	900.2	899.6	930.1	967.9	988.0	1,034.2
45 to 54	974.1	1,005.0	1,016.0	1,044.1	1,089.5	1,096.0	1,143.0	1,128.0	1,114.0	1,176.3	1,131.1	1,145.9	1,188.0	1,185.7	1,122.1	1,233.9	1,308.6	1,575.8	1,439.2	1,478.7	1,439.5	1,466.0	1,520.4	1,494.7	1,591.8
55 to 64	2,193.4	2,288.7	2,299.3	2,411.2	2,319.8	2,414.5	2,530.3	2,480.7	2,427.7	2,569.3	2,450.1	2,363.4	2,576.1	2,381.5	2,401.9	2,567.2	2,534.6	2,924.0	2,967.7	2,980.5	2,965.2	2,965.2	3,009.5	3,020.8	3,156.9
65 to 74	5,280.3	5,341.0	5,439.7	5,434.4	5,590.2	5,394.0	6,708.5	6,668.3	6,408.9	6,865.3	5,572.6	5,538.6	6,203.7	5,976.5	6,015.2	6,104.8	5,992.1	6,000.3	6,941.6	6,971.6	6,807.3	6,813.9	6,779.3	7,115.7	7,120.3

†Standardized for age.

APPENDIX TABLE B—Continued
ALL CAUSES OF DEATH COMBINED
Annual Death Rates per 100,000. By Color, Sex, and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

Color; Sex; Age	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
Colored Persons:																									
1 to 74 years†...	1,179.81	1,210.61	1,244.71	1,257.61	1,361.91	1,380.61	1,460.61	1,417.91	1,364.31	1,460.91	1,389.61	1,383.21	1,417.41	1,337.21	1,324.61	1,511.81	1,597.52	1,438.81	1,798.61	1,724.91	1,736.31	1,726.21	1,780.31	1,825.51	1,854.51
Colored Males:																									
1 to 74 years†...	1,273.91	1,310.61	1,325.51	1,331.01	1,434.11	1,474.11	1,545.61	1,486.81	1,425.11	1,512.81	1,437.21	1,422.21	1,432.71	1,339.61	1,304.41	1,490.91	1,620.02	1,441.51	1,917.91	1,793.51	1,798.31	1,813.21	1,912.71	1,914.81	1,897.71
1 to 14†.....	324.3	327.5	313.2	353.7	462.2	464.8	570.1	550.4	545.2	654.3	609.1	627.7	645.2	610.4	672.9	737.7	853.81	825.51	931.9	813.7	810.1	848.4	960.0	929.21	1,099.0
15 to 44†.....	882.1	884.6	910.0	943.41	1,070.71	1,064.91	1,110.71	1,055.11	1,038.31	1,056.61	1,034.01	1,021.11	1,028.21	944.0	952.21	1,091.61	1,276.41	1,870.61	1,414.61	1,450.11	1,380.71	1,405.21	1,454.11	1,496.01	1,411.3
45 to 74†.....	3,870.91	4,100.4	4,085.7	3,903.53	3,900.0	4,220.21	4,290.81	4,162.71	3,928.31	4,122.91	3,967.01	3,798.81	3,791.61	3,663.43	3,271.93	3,785.01	3,784.41	4,704.01	4,800.01	4,310.51	4,488.01	4,475.61	4,688.91	4,638.91	4,494.2
1 to 4.....	532.6	575.5	530.8	505.8	874.9	804.71	1,101.61	1,104.61	1,035.31	1,440.51	1,203.01	1,241.91	1,351.81	1,211.91	1,266.81	1,499.11	1,602.92	1,687.51	1,808.21	1,642.01	1,628.41	1,608.71	1,624.31	1,642.61	2,338.9
5 to 9.....	238.5	183.4	202.4	245.4	297.8	291.9	307.9	303.5	333.3	338.3	319.7	353.5	380.1	380.3	406.5	421.4	510.5	732.9	551.5	478.8	480.1	515.9	520.9	510.8	636.4
10 to 14.....	231.7	261.3	280.6	257.1	274.8	297.8	320.1	346.9	330.4	291.5	387.8	305.6	339.6	340.4	430.7	405.4	510.0	774.0	512.1	442.4	453.0	481.5	485.8	477.7	502.9
15 to 19.....	431.1	401.3	482.7	571.3	715.3	820.4	691.3	646.2	603.1	682.4	704.2	660.3	715.3	658.4	716.5	841.9	907.21	1,521.8	985.61	1,014.5	910.6	870.1	997.21	1,062.91	1,018.8
20 to 24.....	654.1	644.3	672.8	715.3	872.8	800.7	832.3	897.8	810.6	888.3	840.2	840.1	825.3	830.5	810.4	918.71	1,172.51	1,792.71	1,213.91	1,100.31	1,140.61	1,176.41	1,245.71	1,213.31	1,333.0
25 to 34.....	920.8	917.2	937.5	902.3	1,017.31	1,034.81	1,083.01	1,011.3	950.81	1,035.9	974.3	984.8	993.7	911.5	876.81	1,012.21	1,207.21	1,030.91	1,370.11	1,488.31	1,430.81	1,487.51	1,490.81	1,497.51	1,409.1
35 to 44.....	1,363.91	1,372.61	1,434.71	1,472.71	1,583.41	1,504.51	1,627.31	1,587.91	1,552.81	1,559.01	1,530.81	1,493.81	1,486.31	1,307.31	1,355.91	1,533.01	1,605.71	1,168.91	1,970.41	1,973.11	1,890.31	1,010.51	1,028.11	1,060.71	1,704.2
45 to 54.....	2,334.4	2,530.2	2,634.7	2,415.02	2,403.62	2,680.82	2,579.82	2,668.02	2,444.02	2,380.72	2,398.22	2,334.32	2,278.72	1,570.1	1,034.82	2,447.12	2,290.22	2,950.91	2,004.02	2,780.52	2,712.72	2,904.32	2,089.62	2,794.32	2,740.4
55 to 64.....	4,035.5	4,200.2	4,360.3	4,274.84	376.94	336.54	515.24	510.94	1,020.4	488.13	974.54	940.33	931.6	3,688.1	1,343.13	3,959.23	3,938.85	5,110.25	1,855.54	5,530.34	4,032.34	4,070.04	4,038.75	5,052.34	8,890.5
65 to 74.....	7,717.7	8,046.9	7,961.01	7,577.67	570.48	1,021.18	653.22	7,760.77	7,512.28	1,338.07	634.47	290.51	910.27	7,050.30	3,688.47	918.37	5,111.38	7,022.19	1,008.68	8,023.58	4,777.08	3,627.78	8,831.28	8,867.58	5,510.6

†Standardized for sex and age. ‡Standardized for age.

APPENDIX TABLE B—Concluded
ALL CAUSES OF DEATH COMBINED
Annual Death Rates per 100,000. By Color, Sex, and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

Color; Sex; Age	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
COLORED FEMALES:																									
1 to 74 years†	1,090.9	1,120.0	1,168.9	1,188.3	1,294.2	1,304.6	1,391.3	1,353.3	1,307.2	1,412.2	1,344.9	1,346.7	1,403.0	1,335.0	1,343.5	1,531.5	1,576.4	2,052.2	1,686.7	1,660.5	1,680.1	1,644.6	1,656.1	1,741.7	1,814.0
1 to 14†	292.8	300.9	292.1	333.9	394.1	428.6	502.2	492.0	463.8	628.7	558.3	598.6	592.2	586.9	637.7	820.3	807.9	1,390.2	963.8	861.8	894.3	915.4	930.1	986.4	1,069.1
15 to 44†	786.9	795.5	851.0	900.3	1,011.4	1,014.1	1,076.7	1,046.2	1,043.4	1,070.9	1,040.5	1,045.7	1,069.4	1,040.7	1,092.0	1,225.7	1,330.8	1,722.9	1,297.4	1,263.7	1,328.3	1,326.3	1,295.2	1,365.1	1,434.8
45 to 74†	3,206.3	3,324.6	3,449.0	3,353.0	3,520.4	3,509.9	3,681.6	3,580.3	3,392.5	3,597.4	3,440.7	3,419.2	3,621.6	3,339.4	3,168.4	3,509.8	3,480.2	4,010.1	3,899.1	4,020.3	3,900.3	3,683.2	3,801.7	3,977.4	4,039.3
1 to 4	520.5	565.3	501.5	580.4	654.6	763.2	939.7	971.0	853.3	1,320.4	1,062.5	1,125.6	1,201.8	1,088.9	1,168.2	1,555.0	1,444.7	2,805.0	1,815.1	1,610.2	1,773.9	1,739.4	1,737.5	1,909.9	2,107.4
5 to 9	177.6	170.0	183.6	208.9	257.4	276.1	329.2	289.7	278.2	307.2	309.7	289.8	309.9	337.4	371.2	477.5	504.9	823.2	589.9	531.9	478.6	552.6	574.3	528.0	626.6
10 to 14	214.2	206.6	217.9	249.9	310.0	296.8	302.3	286.0	318.8	363.2	380.6	370.7	357.9	409.6	463.1	534.2	574.1	746.9	608.9	554.8	562.7	577.0	599.0	661.4	627.4
15 to 19	510.2	538.6	556.9	602.9	784.7	786.8	813.2	789.7	811.8	895.6	854.4	907.8	853.5	854.8	857.3	997.4	1,267.3	1,544.2	1,219.0	1,066.5	1,191.1	1,198.7	1,105.0	1,193.8	1,237.4
20 to 24	676.3	694.3	745.0	783.8	909.7	877.9	972.3	962.0	926.7	972.0	915.5	921.9	1,011.9	995.5	1,151.1	1,233.9	1,231.0	1,663.9	1,146.2	1,156.7	1,200.9	1,248.2	1,178.9	1,256.7	1,393.5
25 to 34	772.4	758.6	833.0	873.4	972.4	960.5	1,017.0	968.6	1,021.2	989.9	991.9	924.3	991.5	995.6	1,044.0	1,195.3	1,265.7	1,768.7	1,228.9	1,212.7	1,275.3	1,226.1	1,240.9	1,251.3	1,371.9
35 to 44	1,117.3	1,131.7	1,196.4	1,268.1	1,326.3	1,375.7	1,451.0	1,422.4	1,351.7	1,397.2	1,353.2	1,336.0	1,392.3	1,286.3	1,338.9	1,444.6	1,545.9	1,852.5	1,569.4	1,574.4	1,609.0	1,622.8	1,612.1	1,739.2	1,710.1
45 to 54	1,882.7	1,940.5	1,955.0	2,027.6	2,172.9	2,251.5	2,320.1	2,084.5	2,088.4	2,075.4	2,075.4	2,009.9	2,172.9	2,123.1	2,185.2	2,103.6	2,266.8	2,468.5	2,349.3	2,324.9	2,436.3	2,396.7	2,374.3	2,545.1	2,483.0
55 to 64	3,359.7	3,391.8	3,666.9	3,640.9	3,646.9	3,693.7	3,820.8	3,860.3	3,675.6	3,839.5	3,719.6	3,560.3	3,884.3	3,550.0	3,269.7	3,575.5	3,601.8	4,128.5	4,051.0	4,128.5	4,171.1	4,034.0	4,254.4	4,375.0	
65 to 74	6,499.4	6,936.1	7,084.9	6,407.6	6,926.1	6,831.5	7,287.4	6,717.3	6,409.1	7,230.2	6,619.6	6,720.2	7,034.4	6,778.5	6,419.2	7,183.7	6,533.5	8,231.7	7,804.7	7,949.2	7,358.1	6,903.6	7,232.2	7,339.5	7,630.8

†Standardized for age.

APPENDIX TABLE C
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
PRINCIPAL COMMUNICABLE DISEASES OF CHILDHOOD—																									
Total Persons:	8.7	9.2	7.7	9.6	11.8	11.9	15.7	17.4	17.5	23.3	17.4	23.7	31.3	28.3	35.4	40.2	28.4	38.2	42.4	38.1	34.7	45.6	55.2	44.3	56.3
1 to 14.....	25.2	27.5	22.3	28.3	34.9	35.7	47.3	52.5	52.5	70.9	51.9	70.7	95.1	86.4	106.9	123.0	86.0	115.9	127.5	117.3	106.0	139.3	168.6	136.4	171.8
WHITE MALES:																									
1 to 74 years.....	8.4	9.3	7.5	9.2	11.6	11.8	15.0	16.4	17.4	23.1	17.0	22.8	30.9	28.4	35.1	40.5	28.8	36.0	41.9	37.4	34.8	44.7	54.8	45.4	56.5
1 to 14.....	24.7	27.9	22.3	27.9	34.6	36.0	45.7	50.3	52.9	70.4	51.1	69.7	95.1	88.0	107.3	125.3	88.5	108.2	126.6	116.4	107.1	138.0	167.9	141.1	174.3
WHITE FEMALES:																									
1 to 74 years.....	9.0	9.0	8.0	10.0	11.7	12.1	15.7	17.8	17.5	22.5	17.3	24.5	31.2	29.0	36.7	41.5	29.5	38.7	42.2	39.5	35.2	47.1	57.2	44.6	57.1
1 to 14.....	26.1	26.6	22.9	28.8	34.1	35.7	46.9	52.8	52.0	67.9	51.2	71.7	93.6	87.0	109.6	126.1	88.9	117.9	126.6	121.0	107.6	142.6	174.6	137.0	172.8
COLORED MALES:																									
1 to 74 years.....	7.4	8.1	6.4	9.5	15.6	10.3	18.1	20.6	18.1	27.5	17.8	22.3	31.0	26.0	30.8	27.5	17.1	45.7	38.3	33.6	28.3	36.3	45.8	35.0	50.9
1 to 14.....	21.9	24.0	19.4	27.7	48.8	31.8	55.1	64.1	55.5	84.4	56.4	69.5	97.8	83.1	94.0	85.5	53.0	140.7	119.4	102.4	87.0	113.3	139.5	107.3	160.1
COLORED FEMALES:																									
1 to 74 years.....	8.2	11.7	6.8	10.2	10.8	12.4	19.4	19.8	17.0	31.0	20.5	24.0	35.7	21.5	29.3	34.1	21.4	47.6	52.0	34.4	33.6	47.7	47.8	37.1	49.2
1 to 14.....	24.1	34.9	10.0	28.8	31.3	36.6	59.0	60.0	50.9	93.5	62.9	72.2	108.1	66.8	88.0	103.3	65.4	145.0	153.9	105.1	100.0	140.9	143.2	113.0	147.5
MEASLES—																									
Total Persons:	2.2	2.5	1.3	1.4	2.6	2.2	2.2	3.8	2.9	7.3	2.1	5.2	8.2	4.2	3.2	8.0	3.3	7.0	10.2	9.4	5.6	6.8	12.2	7.7	11.2
1 to 74 years.....	0.7	7.5	4.1	4.5	8.1	6.9	7.0	12.0	9.1	22.4	6.9	15.7	25.3	13.5	9.4	26.1	10.1	23.0	30.3	20.4	17.5	20.9	36.9	23.5	34.0
WHITE MALES:																									
1 to 74 years.....	2.2	2.6	1.3	1.5	2.6	2.2	2.5	3.6	3.0	7.5	2.3	5.1	8.1	4.5	3.2	8.6	3.4	7.0	10.3	9.9	5.5	6.9	11.9	8.1	11.1
1 to 14.....	0.7	8.1	4.2	4.9	8.2	7.1	7.8	11.3	9.2	23.1	7.3	15.0	25.0	14.3	9.9	27.0	10.4	22.9	30.4	31.2	17.0	21.0	36.6	25.2	34.6
WHITE FEMALES:																									
1 to 74 years.....	2.3	2.3	1.4	1.3	2.6	2.2	2.2	3.8	3.0	6.7	2.0	5.2	7.8	4.2	3.2	7.9	3.3	7.9	0.8	9.5	6.1	6.7	12.6	7.5	10.9
1 to 14.....	7.1	6.9	4.4	4.3	8.0	6.7	6.7	11.9	9.2	20.7	6.2	15.8	23.5	13.2	9.1	24.8	10.0	24.2	28.0	20.4	10.2	20.4	38.5	22.7	32.2
COLORED MALES:																									
1 to 74 years.....	2.0	1.9	0.9	1.1	3.7	2.1	1.8	5.4	2.1	8.0	2.8	5.5	13.3	3.6	2.8	5.1	2.8	8.2	13.6	6.1	3.2	0.8	10.8	5.9	13.6
1 to 14.....	6.0	6.1	2.5	3.2	11.3	6.0	5.0	17.3	6.7	24.6	9.1	16.7	41.7	11.2	8.0	15.6	7.9	22.5	42.6	18.3	8.4	21.4	30.4	17.7	43.0
COLORED FEMALES:																									
1 to 74 years.....	1.5	3.2	0.8	1.2	2.0	2.5	1.4	5.0	2.7	0.7	2.4	4.9	9.7	3.8	2.6	6.3	3.6	8.3	11.2	7.0	4.5	6.3	10.7	0.2	13.3
1 to 14.....	4.4	9.5	2.4	3.5	5.9	7.7	1.4	15.5	8.5	29.9	7.6	14.6	29.6	12.1	8.4	19.4	11.2	25.2	32.0	21.9	13.5	18.8	31.3	10.4	37.7

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; Color, Sex, and Age	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
SCARLET FEVER—																									
Total Persons:																									
1 to 74 years.....	2.8	2.6	2.6	2.8	3.1	2.3	2.5	2.4	2.7	3.0	3.0	3.9	4.1	4.5	6.5	5.5	3.4	3.3	5.4	3.7	4.3	9.0	11.8	8.6	12.0
1 to 14.....	7.5	7.1	6.8	7.4	8.2	6.4	6.7	6.4	7.2	8.5	8.1	10.3	11.3	12.6	18.1	15.4	9.9	8.6	14.7	10.4	12.4	26.3	34.3	26.1	35.4
WHITE MALES:																									
1 to 74 years.....	2.8	2.7	2.7	2.9	3.4	2.6	2.6	2.4	3.0	3.3	3.2	3.9	4.1	4.7	6.5	5.7	3.9	3.5	5.5	3.7	4.7	9.6	12.4	9.1	12.7
1 to 14.....	7.8	7.6	7.4	8.1	9.1	7.4	7.2	6.8	8.4	9.4	8.8	11.3	12.0	13.5	18.7	16.7	11.3	9.1	15.5	10.9	13.2	28.8	36.3	27.9	38.5
WHITE FEMALES:																									
1 to 74 years.....	3.0	2.8	2.7	2.9	3.0	2.3	2.6	2.6	2.7	3.2	3.2	4.4	4.5	4.9	7.0	6.0	3.6	3.5	5.8	3.9	4.2	9.3	12.5	9.1	13.1
1 to 14.....	8.1	7.3	7.0	7.5	7.9	6.2	7.0	6.3	6.8	8.5	8.3	10.9	11.8	13.1	19.4	16.6	10.0	9.6	16.0	10.1	12.4	26.5	36.8	27.7	37.7
COLOR MALES:																									
1 to 74 years.....	0.8	1.4	0.9	0.8	2.5	1.3	1.6	1.8	1.0	1.5	1.4	0.9	1.8	1.8	1.9	1.0	1.0	0.5	1.1	3.2	2.3	4.2	3.7	2.2	3.8
1 to 14.....	1.9	4.1	2.0	1.7	7.3	3.4	3.5	5.4	2.7	4.0	4.5	2.4	4.9	5.7	4.8	2.7	3.2	1.7	2.5	8.9	6.4	13.0	11.3	6.4	12.1
COLOR FEMALES:																									
1 to 74 years.....	1.4	1.6	1.7	2.2	1.4	0.9	0.8	1.5	1.3	1.3	1.3	1.2	1.9	1.7	4.1	0.8	0.5	0.9	2.5	3.2	3.7	4.4	3.9	4.1	1.7
1 to 14.....	3.1	3.8	3.7	4.3	2.6	2.5	2.3	4.5	3.4	3.3	3.1	3.0	5.0	4.9	11.3	2.3	1.6	1.3	6.3	9.3	9.5	12.0	11.9	12.0	3.8
WHOOPING COUGH—																									
Total Persons:																									
1 to 74 years.....	1.4	2.0	1.3	1.7	1.9	2.0	2.9	2.6	2.7	4.6	3.2	3.3	4.9	2.8	4.2	6.7	3.1	9.9	5.0	6.0	5.0	6.1	6.2	5.4	7.4
1 to 14.....	4.5	6.3	3.8	5.3	6.0	6.3	9.4	8.1	8.8	14.8	10.3	10.6	15.8	9.0	13.3	21.5	9.6	31.7	16.2	19.3	16.0	19.7	20.0	17.3	23.9
WHITE MALES:																									
1 to 74 years.....	1.1	1.6	1.1	1.1	1.2	1.4	2.0	1.7	1.9	3.5	2.4	2.2	3.7	2.2	2.6	4.9	2.4	6.5	3.2	4.2	3.7	4.0	3.9	3.9	4.8
1 to 14.....	3.4	5.0	3.2	3.5	3.9	4.6	6.4	5.5	6.2	11.3	7.7	7.0	11.8	7.0	8.1	15.5	7.5	20.8	10.2	13.4	11.9	12.7	12.5	12.5	15.4
WHITE FEMALES:																									
1 to 74 years.....	1.4	2.0	1.3	1.7	2.1	2.2	2.9	2.6	2.7	4.5	2.7	3.1	4.5	2.7	4.3	7.0	3.3	9.9	4.8	6.6	4.9	5.9	6.2	5.3	7.3
1 to 14.....	4.5	6.4	4.0	5.3	6.5	6.9	9.3	8.2	8.6	14.2	8.8	9.8	14.5	8.7	13.8	22.4	10.4	31.6	15.2	20.9	15.6	18.9	19.7	16.4	23.3
COLOR MALES:																									
1 to 74 years.....	3.3	3.2	1.2	4.7	4.2	3.2	6.2	6.9	7.4	10.2	8.1	10.3	10.4	8.0	10.9	11.8	4.4	24.2	10.7	12.6	11.5	16.0	16.4	13.0	20.2
1 to 14.....	10.5	10.1	3.7	15.2	13.6	10.3	19.8	22.0	23.1	32.5	26.0	33.1	32.8	25.8	34.6	38.0	14.1	76.5	34.2	40.4	36.9	51.4	52.0	41.7	64.8
COLOR FEMALES:																									
1 to 74 years.....	3.2	4.7	2.5	4.2	4.3	4.5	9.1	6.2	7.1	11.7	11.5	10.3	16.3	4.7	12.3	17.9	5.7	30.6	21.1	12.8	12.6	20.7	20.9	15.5	23.3
1 to 14.....	10.2	15.0	8.1	13.6	13.7	13.9	29.2	19.9	22.5	37.6	36.4	33.2	51.9	15.0	39.3	66.6	17.9	97.8	67.7	41.1	39.3	60.4	67.0	49.0	73.6

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1925	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
DIPHTHERIA—																									
Total Persons:																									
1 to 74 years.....	2.3	2.2	2.6	3.8	4.2	5.4	7.9	8.5	9.0	8.4	8.0	11.3	14.2	16.7	21.7	20.5	18.5	17.1	21.7	18.9	19.7	23.7	25.2	22.0	25.6
1 to 14.....	6.5	6.5	7.0	11.2	12.5	10.1	23.9	25.9	27.3	25.3	20.7	33.9	42.8	51.1	60.1	61.0	59.4	51.8	60.1	58.3	60.3	72.5	77.3	69.7	78.6
WHITE MALES:																									
1 to 74 years.....	2.3	2.4	2.5	3.7	4.4	5.5	7.9	8.6	9.4	8.7	9.1	11.5	15.1	17.1	22.8	21.4	19.2	18.1	22.9	19.6	20.9	24.3	26.0	24.4	27.0
1 to 14.....	6.8	7.2	7.5	11.4	13.3	17.0	24.2	26.0	29.0	26.5	27.4	35.8	46.3	53.1	70.7	66.3	59.2	55.3	70.4	61.0	65.0	74.9	82.5	75.6	85.9
WHITE FEMALES:																									
1 to 74 years.....	2.3	2.0	2.6	4.0	4.0	5.5	7.9	8.8	9.0	8.2	9.3	11.8	14.5	17.1	22.2	21.6	19.3	17.4	21.8	19.6	19.9	25.1	25.9	22.7	25.8
1 to 14.....	6.4	6.0	7.5	11.7	11.7	10.0	23.9	26.3	27.2	24.5	28.0	35.0	43.9	51.8	67.1	62.3	58.0	52.3	60.3	60.5	60.5	70.8	70.0	70.3	70.7
COLORED MALES:																									
1 to 74 years.....	1.3	1.0	3.5	2.8	5.2	3.7	8.5	6.6	7.5	7.9	5.5	5.7	0.2	13.2	15.2	9.0	8.0	12.7	12.8	11.7	11.3	9.3	18.0	14.0	13.3
1 to 14.....	3.5	4.3	11.2	7.0	10.0	11.3	26.1	10.3	22.8	23.4	10.8	17.3	18.6	40.5	46.3	20.5	27.0	40.0	39.9	34.8	33.0	27.3	45.0	41.0	40.2
COLORED FEMALES:																									
1 to 74 years.....	2.1	2.3	1.8	2.5	3.1	4.5	7.5	7.1	5.7	8.2	5.4	7.5	7.9	11.4	10.4	9.1	11.5	7.8	17.3	11.4	12.8	16.4	12.4	11.4	10.9
1 to 14.....	6.4	6.6	5.4	7.4	9.2	12.5	21.2	21.0	19.4	22.0	15.9	21.4	21.7	34.7	20.1	20.8	34.5	23.5	48.0	32.7	36.2	40.7	33.0	32.6	32.5

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH: COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
TUBERCULOSIS—																									
All forms—																									
Total Persons:																									
1 to 74 years....	56.4	60.9	67.0	71.9	77.7	82.0	88.0	91.8	94.7	101.9	101.5	107.8	115.1	119.1	120.6	143.3	165.3	201.5	202.2	204.3	210.6	219.4	221.4	226.7	241.6
1 to 14.....	11.8	13.9	14.1	15.9	18.4	20.4	21.8	21.6	23.1	27.1	25.0	27.9	28.3	29.4	32.3	40.8	45.3	53.6	53.4	54.9	55.3	59.3	60.2	58.8	63.5
15 to 24.....	58.3	63.0	70.0	82.3	91.6	101.5	108.0	116.9	118.3	124.2	127.5	139.4	141.4	153.0	157.8	180.5	187.6	234.6	216.0	218.9	218.5	224.7	233.5	240.1	261.0
WHITE MALES:																									
1 to 74 years....	58.8	64.3	69.4	72.0	77.7	82.4	89.2	93.9	95.0	105.5	104.0	109.1	119.8	123.6	120.0	145.8	177.3	229.3	239.0	239.6	246.3	263.3	265.2	266.8	284.0
1 to 14.....	7.2	8.7	8.6	10.2	12.5	12.6	13.3	14.2	15.6	18.6	16.0	18.9	19.8	19.6	21.1	29.5	30.0	36.0	36.7	38.5	36.0	41.9	39.7	42.0	40.2
15 to 24.....	30.4	33.4	37.8	43.1	46.5	57.3	59.4	65.2	64.4	72.6	77.9	85.0	90.7	101.5	102.0	116.1	121.4	170.9	158.5	161.9	167.9	177.0	198.1	198.1	221.8
WHITE FEMALES:																									
1 to 74 years....	37.1	41.2	45.7	51.4	53.3	58.6	64.8	68.5	72.9	76.7	79.0	85.9	90.0	94.6	97.4	117.4	128.4	144.7	138.4	140.8	144.9	148.4	152.0	160.4	172.4
1 to 14.....	9.1	10.3	9.4	11.1	12.1	15.2	16.2	16.6	17.4	20.5	19.7	22.7	22.0	23.0	26.0	32.4	36.4	41.1	42.8	41.8	44.6	49.8	51.5	48.6	51.6
15 to 24.....	47.0	54.1	61.1	74.7	77.7	90.7	100.3	113.2	117.2	118.9	123.3	137.8	136.4	151.3	152.3	182.4	186.2	217.2	198.3	197.3	193.8	194.3	196.8	209.7	221.3
COLORED MALES:																									
1 to 74 years....	162.3	164.5	190.3	193.7	220.8	215.8	214.5	215.2	214.0	223.2	213.2	218.7	229.8	230.2	236.4	265.4	305.2	391.1	389.4	406.3	405.9	411.8	413.5	418.9	418.3
1 to 14.....	40.5	55.6	59.2	61.2	72.9	70.8	79.8	79.7	81.2	94.2	85.8	83.4	98.5	100.7	103.8	109.4	138.9	193.2	153.1	164.9	155.9	163.4	177.2	165.7	217.7
15 to 24.....	194.0	195.7	212.8	240.3	307.6	306.4	324.0	316.7	308.8	301.7	317.7	309.4	322.7	341.4	322.4	375.7	386.1	543.1	498.0	564.6	484.6	525.7	531.9	546.9	549.3
COLORED FEMALES:																									
1 to 74 years....	143.1	145.2	161.2	182.5	211.5	209.0	212.7	209.5	218.2	227.8	217.7	232.3	235.1	239.0	273.6	288.6	315.1	360.6	348.4	349.1	381.4	365.4	350.9	361.2	398.8
1 to 14.....	56.6	60.2	70.6	75.1	87.3	95.1	104.6	87.1	96.6	111.5	107.6	115.3	106.3	121.1	136.6	170.0	173.2	216.2	227.6	241.2	254.2	224.3	235.4	223.3	262.3
15 to 24.....	283.3	284.4	303.7	350.7	418.8	400.6	407.5	420.9	427.9	462.4	426.1	475.3	466.5	441.2	546.6	547.9	597.9	671.7	625.2	600.4	648.2	650.2	611.2	610.0	710.7

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
TUBERCULOSIS OF THE RESPIRATORY SYSTEM—																									
Total Persons:																									
1 to 74 years....	51.8	55.1	61.5	65.5	70.7	73.8	80.7	83.2	85.9	92.4	92.2	98.3	105.8	108.9	109.7	129.9	150.9	184.1	187.7	187.3	193.0	200.7	201.3	205.6	220.1
1 to 14 years....	6.2	6.7	6.9	8.1	9.5	10.0	11.6	10.5	11.0	13.5	12.1	13.9	14.8	15.4	15.8	19.4	22.0	26.2	27.2	25.9	26.5	27.1	26.3	25.4	29.9
1 to 14 years....	54.2	57.7	64.5	70.4	84.5	93.8	101.5	108.1	110.5	115.1	118.8	130.8	133.1	142.9	147.0	169.8	175.7	220.8	204.1	206.8	205.5	210.9	218.6	223.1	247.5
15 to 24 years....																									
WHITE MALES:																									
1 to 74 years....	55.0	59.1	64.4	68.2	71.5	75.6	82.7	86.2	87.3	96.8	96.1	100.5	111.3	113.9	110.6	132.9	164.4	212.9	223.7	223.8	229.6	246.5	247.1	246.7	263.3
1 to 14 years....	3.0	2.8	2.8	3.4	4.1	4.4	5.1	4.5	5.2	6.3	5.7	6.0	7.7	6.5	6.8	9.1	10.2	11.5	12.6	11.4	10.4	12.1	11.4	11.6	11.9
15 to 24 years....	27.5	29.9	33.9	39.3	42.7	52.5	55.2	59.3	59.1	65.9	72.0	78.9	84.5	93.6	93.5	107.1	112.9	159.3	149.1	153.1	156.8	167.7	180.9	184.4	210.3
WHITE FEMALES:																									
1 to 74 years....	33.6	36.0	41.6	46.3	48.2	51.9	59.0	61.6	65.6	69.0	71.0	77.8	82.2	85.7	87.5	106.1	115.9	130.1	124.8	127.0	130.3	131.7	134.5	142.3	154.8
1 to 14 years....	4.4	4.2	3.7	5.0	6.0	6.5	8.0	7.1	7.3	8.6	8.2	10.7	10.5	10.7	12.1	14.6	16.4	18.4	18.4	19.0	19.6	21.0	21.5	18.3	22.8
15 to 24 years....	44.7	49.9	56.9	66.4	72.4	84.9	94.7	105.6	111.0	111.3	110.4	130.9	130.3	142.4	142.7	173.9	176.2	204.7	188.2	188.1	183.0	180.7	184.3	197.1	210.9
COLORED MALES:																									
1 to 74 years....	146.9	147.7	173.6	176.3	195.9	189.5	194.4	189.7	189.4	197.8	186.5	195.0	202.9	208.0	210.0	234.3	272.1	340.5	353.7	303.3	369.9	371.5	360.0	373.2	387.7
1 to 14 years....	24.0	34.6	36.6	39.5	41.3	44.1	52.0	49.8	49.9	57.6	46.0	54.5	59.5	68.0	59.5	62.8	90.8	122.5	101.7	100.3	101.5	101.2	92.3	99.0	116.0
15 to 24 years....	176.7	170.0	196.4	220.1	273.4	273.6	300.3	281.6	274.9	273.1	282.8	283.6	287.0	315.7	297.7	343.5	353.6	505.9	458.6	520.0	451.9	494.4	490.1	488.4	518.2
COLORED FEMALES:																									
1 to 74 years....	128.0	130.7	145.3	165.7	192.3	186.8	191.1	190.1	196.8	206.3	195.0	209.6	216.5	220.1	240.0	261.7	281.7	325.2	327.5	307.5	337.0	325.0	308.3	320.1	354.7
1 to 14 years....	39.5	43.3	49.5	55.0	60.3	60.0	71.0	62.9	67.3	81.4	78.7	84.2	83.7	85.0	98.9	127.7	118.1	154.7	172.9	165.9	180.9	163.5	158.3	161.8	194.1
15 to 24 years....	205.0	263.2	282.0	328.9	390.6	373.0	386.8	390.0	405.5	437.2	401.1	445.2	443.5	421.0	518.5	521.8	558.7	647.1	601.2	563.8	607.3	609.9	567.5	560.2	667.4
TUBERCULOSIS OF THE MENINGES AND CENTRAL NERVOUS SYSTEM—																									
Total Persons:																									
1 to 74 years....	2.0	2.5	2.4	2.7	2.9	3.4	3.3	3.8	3.9	4.2	4.1	4.1	4.1	4.3	4.7	6.0	6.7	7.9	8.0	8.1	8.3	8.8	9.2	9.5	8.9
WHITE MALES:																									
1 to 74 years....	1.6	2.1	2.1	2.3	2.7	3.1	2.8	3.5	3.6	4.2	3.4	3.9	4.0	4.1	4.4	6.1	6.0	7.8	7.9	7.9	7.7	8.5	8.4	8.9	8.9
WHITE FEMALES:																									
1 to 74 years....	1.7	2.0	1.9	2.4	2.3	2.0	2.9	3.4	3.4	3.5	3.7	3.6	3.5	3.9	4.4	5.3	6.1	7.1	7.1	7.3	7.7	8.3	8.0	9.1	7.8
COLORED MALES:																									
1 to 74 years....	6.2	7.8	6.4	6.3	9.4	9.3	6.8	9.4	7.8	10.5	10.5	7.5	10.2	8.2	8.2	10.1	13.0	14.7	13.4	15.3	11.9	12.4	17.1	10.9	19.4
COLORED FEMALES:																									
1 to 74 years....	5.4	6.1	6.3	6.0	5.9	6.2	7.0	7.4	8.4	7.0	7.9	8.3	6.4	7.2	8.0	8.1	12.8	11.1	14.1	16.1	17.2	12.9	10.8	12.5	11.7

*And acute disseminated tuberculosis.

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods

Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; Color, Sex, and Age	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
TUBERCULOSIS OF THE INTESTINES AND PERITONEUM—																									
Total Persons:	1.0	1.2	1.2	1.6	1.9	2.2	2.0	2.2	2.2	2.5	2.6	2.8	2.7	2.8	3.3	4.0	4.2	4.7	4.1	4.8	4.9	5.0	5.8	6.2	6.7
1 to 74 years.....																									
WHITE MALES:																									
1 to 74 years.....	0.6	0.8	0.8	1.1	1.2	1.3	1.3	1.4	1.5	1.6	1.8	2.1	1.6	2.0	2.2	3.1	3.0	3.3	3.2	3.5	3.6	3.1	4.0	5.4	5.3
WHITE FEMALES:																									
1 to 74 years.....	0.6	1.0	1.0	1.3	1.5	1.8	1.6	1.9	1.9	2.2	2.4	2.4	2.5	2.7	3.1	3.2	3.8	3.8	3.3	3.8	4.0	4.7	5.1	4.9	5.9
COLORLED MALES:																									
1 to 74 years.....	5.7	5.0	4.4	5.4	8.2	8.6	6.2	8.2	7.7	8.2	7.1	7.0	9.3	0.4	8.6	11.0	11.6	16.7	12.3	15.1	15.6	14.8	17.8	17.4	15.5
COLORLED FEMALES:																									
1 to 74 years.....	5.2	4.8	5.2	7.4	7.7	9.9	8.9	7.6	7.7	9.2	9.4	9.6	9.0	7.8	11.6	13.7	13.5	17.1	12.5	18.3	18.3	19.4	20.2	20.2	21.2
TUBERCULOSIS OF OTHER ORGANS*—																									
Total Persons:	1.6	2.0	1.9	2.2	2.2	2.6	2.2	2.5	2.6	2.7	2.8	2.7	2.6	2.9	3.0	3.5	3.8	4.7	4.0	4.2	4.5	5.1	5.2	5.4	5.9
1 to 74 years.....																									
WHITE MALES:																									
1 to 74 years.....	1.7	2.3	2.1	2.4	2.2	2.5	2.4	2.7	2.6	2.9	2.7	2.7	2.7	3.3	2.9	3.6	4.2	5.3	4.2	4.8	5.5	5.3	5.7	5.8	6.6
WHITE FEMALES:																									
1 to 74 years.....	1.2	1.5	1.2	1.5	1.5	1.9	1.4	1.6	1.9	2.0	2.1	2.0	2.0	2.1	2.3	2.7	2.6	3.4	3.2	2.7	2.8	3.9	3.9	4.2	3.9
COLORLED MALES:																									
1 to 74 years.....	3.6	3.9	5.9	5.7	7.3	8.2	7.0	7.8	8.9	6.7	8.9	8.4	7.5	7.7	9.7	9.8	8.5	10.3	9.9	12.8	8.5	13.2	12.6	11.4	15.8
COLORLED FEMALES:																									
1 to 74 years.....	3.6	3.6	4.4	3.4	5.6	6.0	4.7	4.4	5.2	5.3	4.8	4.9	3.2	3.9	4.3	5.0	7.1	7.1	4.4	7.3	8.9	8.2	5.7	8.3	11.2

*And chronic disseminated tuberculosis.

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
INFLUENZA AND PNEUMONIA†—																									
TOTAL PERSONS:																									
1 to 74 years....	67.8	64.6	71.9	72.8	81.5	77.1	113.5	96.5	80.6	108.9	91.4	88.1	114.2	99.2	80.6	167.2	224.6	575.0	140.8	149.8	127.5	120.8	128.3	124.8	140.6
WHITE MALES:																									
1 to 74 years....	74.6	73.1	78.2	76.0	80.8	85.4	121.0	105.7	89.3	116.0	97.7	95.2	117.5	103.2	83.5	166.8	228.5	640.1	167.3	166.1	138.0	133.1	141.3	135.0	154.6
WHITE FEMALES:																									
1 to 74 years....	50.4	46.8	56.5	58.9	60.1	56.6	89.7	72.7	59.0	85.2	70.9	60.5	95.5	83.4	68.4	150.7	205.4	511.5	110.8	120.3	103.5	98.3	103.5	102.6	113.0
COLOR MALES:																									
1 to 74 years....	152.8	145.6	138.2	150.9	177.4	178.0	237.9	205.5	181.8	229.8	197.9	199.2	222.3	177.0	150.1	269.3	321.6	628.9	291.2	252.0	228.2	195.3	230.3	209.0	242.3
COLOR FEMALES:																									
1 to 74 years....	108.4	97.5	113.8	118.5	142.6	122.4	178.8	159.7	132.4	183.7	151.8	148.2	185.1	150.1	119.1	250.9	304.2	552.5	195.0	208.1	188.1	168.7	165.8	184.9	205.9
INFLUENZA—																									
TOTAL PERSONS:																									
1 to 74 years....	12.4	9.6	17.8	16.7	18.3	12.8	36.9	21.7	15.5	27.6	19.4	14.3	31.3	21.9	8.7										
WHITE MALES:																									
1 to 74 years....	12.8	9.7	16.5	15.3	17.5	12.3	34.4	20.6	14.0	26.7	17.9	13.8	29.5	20.8	8.2										
WHITE FEMALES:																									
1 to 74 years....	9.0	7.5	16.0	15.0	14.8	9.9	33.3	19.0	12.8	24.0	16.9	11.5	28.5	19.8	7.7										
COLOR MALES:																									
1 to 74 years....	26.1	21.4	29.2	33.0	40.8	33.0	69.9	42.3	33.3	51.8	41.7	34.3	54.2	38.6	16.1										
COLOR FEMALES:																									
1 to 74 years....	25.1	20.6	34.2	34.0	44.9	30.1	72.3	42.3	34.4	53.6	41.4	31.5	50.4	41.1	18.2										
PNEUMONIA—																									
ALL FORMS†																									
TOTAL PERSONS:																									
1 to 74 years....	55.4	55.0	54.1	56.1	63.2	64.3	70.5	74.8	65.1	81.4	71.9	73.8	83.0	77.4	71.9										
WHITE MALES:																									
1 to 74 years....	61.8	63.4	61.7	60.0	72.3	73.0	80.7	85.0	74.3	89.3	79.7	81.5	88.1	82.4	75.2										
WHITE FEMALES:																									
1 to 74 years....	40.8	39.3	39.9	44.0	45.3	40.7	56.4	53.7	40.3	61.2	54.0	55.0	67.1	63.7	60.8										
COLOR MALES:																									
1 to 74 years....	126.7	124.2	109.1	117.9	136.6	145.0	168.1	163.8	148.4	178.2	150.5	164.8	167.9	138.3	134.0										
COLOR FEMALES:																									
1 to 74 years....	83.3	76.9	70.6	83.0	97.7	92.3	106.5	117.4	98.0	130.0	110.4	116.7	125.7	118.1	100.9										

*Death rates for the years 1911 to 1920, inclusive, not comparable with those for subsequent years. †Does not include capillary bronchitis for the years 1911 to 1920.

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH: COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
BRONCHOPNEUMONIA†																									
TOTAL PERSONS:																									
1 to 74 years....	18.6	18.9	18.8	19.2	21.6	21.5	23.0	24.5	21.8	29.0	23.4	25.1	29.2	27.4	25.1	37.8	37.9	57.1	32.9	35.1	33.6	33.4	30.3	30.3	27.7
WHITE MALES:																									
1 to 74 years....	19.5	20.9	20.8	20.0	23.4	23.9	27.5	25.9	23.5	29.5	24.3	26.1	28.2	27.4	24.8	37.9	39.8	60.8	33.5	34.0	32.6	32.9	29.6	29.8	26.5
WHITE FEMALES:																									
1 to 74 years....	15.1	15.1	15.3	16.0	17.3	16.9	21.9	19.9	17.2	24.0	19.3	20.6	26.8	24.7	22.6	34.4	33.4	49.5	29.6	32.5	30.8	30.2	28.1	28.6	26.6
COLORED MALES:																									
1 to 74 years....	36.9	33.0	28.3	31.7	39.7	38.2	45.2	42.3	43.2	57.2	43.9	48.0	49.2	44.4	42.6	52.4	55.8	82.8	50.4	56.7	51.7	51.4	52.6	44.8	42.5
COLORED FEMALES:																									
1 to 74 years....	30.9	26.4	28.4	28.5	33.2	31.5	38.3	43.3	36.5	51.2	39.3	41.6	46.4	40.3	38.8	60.9	51.5	77.0	46.7	55.4	58.1	56.3	41.6	39.4	37.3
PNEUMONIA, LOBAR AND UNSPECIFIED—																									
TOTAL PERSONS:																									
1 to 74 years....	36.8	36.2	35.3	36.9	41.6	42.9	50.5	50.3	43.3	52.5	48.7	48.3	53.9	49.9	46.8	*	*	*	*	*	*	*	*	*	*
WHITE MALES:																									
1 to 74 years....	42.3	42.6	40.9	40.7	48.9	49.2	58.1	59.1	50.9	59.9	55.5	55.4	59.9	54.9	50.4	*	*	*	*	*	*	*	*	*	*
WHITE FEMALES:																									
1 to 74 years....	25.7	24.1	24.6	27.4	27.9	29.9	34.6	33.8	29.1	37.2	34.7	34.4	40.3	39.0	38.1	*	*	*	*	*	*	*	*	*	*
COLORED MALES:																									
1 to 74 years....	89.8	91.2	80.8	86.2	96.9	107.0	122.7	121.2	105.3	120.9	112.5	117.0	118.9	93.9	91.6	*	*	*	*	*	*	*	*	*	*
COLORED FEMALES:																									
1 to 74 years....	52.4	50.4	51.3	55.4	64.5	60.8	68.2	74.1	61.5	79.0	71.2	75.1	79.4	77.8	62.1	*	*	*	*	*	*	*	*	*	*

*Not available † Does not include capillary bronchitis for the years 1911 to 1920.

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; Color, Sex, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
CANCER—all forms—																									
Total Persons:																									
1 to 74 years.....	86.8	88.2	88.1	87.1	84.8	82.1	84.0	83.8	83.7	84.8	81.3	80.6	81.6	79.3	79.7	78.5	75.6	75.8	80.7	79.2	79.0	77.9	78.4	77.5	75.8
1 to 24.....	3.3	3.5	3.5	3.7	3.6	3.2	2.9	3.2	2.9	3.0	2.4	2.8	2.6	3.0	3.2	2.4	3.1	2.4	3.0	2.7	2.5	2.9	2.6	2.7	2.7
25 to 44.....	38.2	38.3	38.3	39.3	37.4	37.2	39.1	38.4	37.7	38.4	37.0	37.2	37.0	37.7	36.3	36.0	38.3	39.1	40.9	39.5	42.2	42.4	42.5	41.4	39.9
45 to 74.....	391.0	398.2	397.5	390.0	381.9	369.3	376.9	376.7	376.7	381.8	366.7	362.3	368.7	354.3	358.4	349.7	333.6	335.9	358.2	352.5	348.1	341.6	344.0	341.1	334.1
WHITE MALES:																									
1 to 74 years.....	85.5	87.0	88.5	84.1	83.2	79.7	80.4	80.8	80.9	81.1	76.8	76.9	76.7	74.5	73.2	70.5	65.2	63.9	71.5	70.9	68.8	67.3	68.7	63.0	65.2
1 to 24.....	3.0	4.1	3.7	3.9	3.7	3.2	2.8	3.4	3.3	3.1	2.5	3.0	2.9	3.4	3.2	2.5	3.3	2.2	3.0	2.6	2.8	3.2	3.1	2.4	2.6
25 to 44.....	26.7	26.3	24.8	25.9	23.8	23.7	25.3	24.2	24.4	24.8	23.6	21.7	23.8	22.0	19.5	23.8	20.8	20.0	23.1	23.8	24.7	22.5	23.7	22.5	21.4
45 to 74.....	401.6	402.0	418.5	392.0	392.3	375.2	377.3	370.5	379.9	381.0	361.0	350.1	359.8	348.5	347.6	328.3	302.6	299.0	333.5	330.1	317.3	311.9	317.0	291.0	303.8
WHITE FEMALES:																									
1 to 74 years.....	89.3	90.4	89.8	91.2	88.7	86.8	89.6	88.9	88.6	91.0	88.0	87.5	89.2	86.7	88.7	88.5	87.0	89.8	93.1	90.5	92.0	91.6	90.0	94.3	89.1
1 to 24.....	3.2	2.9	3.0	3.5	3.2	2.0	3.0	2.8	2.7	2.8	2.1	2.6	2.4	2.8	3.1	2.4	3.0	2.5	2.8	2.8	2.3	2.6	2.3	3.0	3.2
25 to 44.....	48.0	48.5	48.3	49.1	48.2	47.4	50.0	49.5	48.5	49.8	48.5	49.7	47.0	50.9	50.1	51.8	53.2	54.7	56.0	53.0	57.4	59.9	58.0	58.2	56.0
45 to 74.....	388.3	394.3	389.2	395.6	384.4	370.8	380.0	384.6	384.0	394.9	383.4	377.2	390.1	371.2	381.0	380.0	371.3	381.8	390.6	387.4	390.4	383.5	378.7	399.3	374.4
COLORED MALES:																									
1 to 74 years.....	62.8	58.0	55.3	63.1	52.4	49.2	52.0	51.9	49.6	50.8	43.3	46.1	42.7	41.8	43.2	40.4	35.1	32.3	36.8	36.8	32.7	29.9	36.9	33.4	33.1
1 to 24.....	2.1	3.0	1.3	2.7	6.0	3.6	2.6	3.7	1.6	3.4	3.8	2.5	2.0	1.9	3.0	4.7	17.0	12.8	12.8	1.8	1.1	1.8	1.8	0.4	0.4
25 to 44.....	23.8	21.5	19.1	20.0	14.0	20.9	21.0	20.9	21.6	21.2	21.0	21.8	14.6	15.2	22.1	20.7	17.0	14.0	10.4	20.8	16.7	16.8	23.0	15.3	14.5
45 to 74.....	288.9	294.8	268.7	285.2	237.2	217.5	235.0	231.2	224.0	225.8	185.5	202.8	197.0	191.8	185.5	177.3	151.1	138.0	161.0	157.0	143.7	126.5	154.2	148.1	161.1
COLORED FEMALES:																									
1 to 74 years.....	95.0	90.0	96.2	95.0	89.2	86.0	91.0	87.2	89.5	89.0	80.5	85.3	85.2	83.1	82.2	86.0	87.7	84.1	81.7	80.2	83.0	83.0	80.8	82.5	80.0
1 to 24.....	2.0	5.1	2.5	4.4	2.6	4.0	5.0	3.8	4.3	2.4	2.5	3.1	3.1	2.1	3.2	3.8	2.9	2.2	8.6	3.3	2.5	3.1	1.7	3.7	1.4
25 to 44.....	70.4	72.4	81.8	78.1	75.2	70.0	73.9	70.4	68.1	69.5	73.3	70.6	74.1	64.6	67.6	67.5	60.2	73.4	70.1	67.1	74.8	76.3	78.7	71.2	72.8
45 to 74.....	384.9	399.3	373.2	367.9	342.9	321.0	365.0	329.7	350.0	342.9	340.4	332.1	328.5	329.4	317.8	341.7	349.0	323.7	297.3	310.5	316.1	310.9	350.8	314.6	304.8

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; Color, Sex, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
CANCER OF THE BUC- CAL CAVITY—																									
Total Persons:	2.9	2.8	3.3	3.1	3.0	2.8	3.3	3.2	3.1	3.0	3.3	3.5	3.4	3.1	3.6	3.3	2.9	3.2	3.8	3.3	3.2	3.3	3.9	3.4	3.1
1 to 74 years:	14.3	13.6	15.8	15.0	14.3	13.3	15.8	15.4	14.5	14.1	15.3	16.7	16.3	14.2	17.4	15.2	13.8	14.8	17.8	14.8	15.3	15.5	18.0	18.0	14.2
45 to 74:																									
WHITE MALES:																									
1 to 74 years:	5.3	5.4	6.1	5.9	5.5	5.3	6.2	5.9	5.7	5.6	6.2	6.4	6.7	6.1	6.7	6.3	5.4	5.7	7.1	6.1	5.9	6.0	7.3	6.2	5.9
45 to 74:	26.7	26.8	30.4	29.3	27.2	26.0	30.5	28.0	28.0	27.2	28.6	31.4	32.2	28.3	33.5	30.1	26.6	27.8	33.9	28.5	28.4	30.0	35.0	29.0	27.4
WHITE FEMALES:																									
1 to 74 years:	0.8	0.8	0.8	0.7	0.8	0.7	0.8	0.9	0.8	0.8	0.7	1.0	0.7	0.7	0.9	0.8	0.8	1.0	1.0	0.9	0.8	0.9	0.9	1.2	0.8
45 to 74:	4.0	3.5	3.6	3.3	3.7	2.9	3.6	3.9	3.5	3.5	3.3	4.9	3.3	2.8	4.2	3.2	3.1	4.1	4.9	3.7	3.4	3.8	3.8	5.6	3.5
COLORS MALES:																									
1 to 74 years:	3.2	2.0	3.3	2.7	2.7	1.5	3.2	3.6	2.6	2.4	3.2	3.4	2.8	1.6	3.5	2.6	3.0	2.4	3.0	3.0	2.9	1.5	3.5	2.4	2.3
45 to 74:	15.3	9.6	17.3	12.6	12.2	7.5	16.2	18.1	10.5	10.0	14.9	15.2	14.2	8.6	16.2	10.0	13.7	11.9	8.5	10.7	14.3	5.5	17.8	11.7	12.1
COLORS FEMALES:																									
1 to 74 years:	1.0	0.8	1.1	0.7	0.9	1.4	1.0	1.4	1.0	0.8	1.3	0.6	0.7	1.1	0.7	0.8	1.4	1.1	2.1	1.0	1.8	1.9	1.6	1.1	0.7
45 to 74:	4.8	3.4	4.5	2.8	3.5	5.6	4.5	5.5	4.1	3.4	5.4	1.3	3.2	4.2	2.6	2.9	5.8	5.9	6.7	3.4	7.8	8.8	6.9	4.9	2.7
CANCER OF THE STOM- ACH, LIVER (exclud- ing the pharynx) —																									
Total Persons:	24.8	25.3	26.0	26.4	26.7	26.1	27.8	28.4	29.0	30.0	28.9	29.3	30.3	28.6	29.4	28.9	28.1	27.8	30.7	31.7	30.8	31.0	31.1	32.0	30.3
1 to 74 years:	5.8	5.4	5.7	6.3	6.3	6.2	7.1	7.5	7.1	7.8	7.2	7.7	9.5	7.4	7.3	8.3	8.1	7.9	9.8	10.0	10.2	10.8	11.2	11.4	9.5
25 to 44:	120.9	124.5	127.1	128.8	130.2	128.2	135.4	137.8	141.2	145.9	141.3	142.4	145.4	130.1	143.8	140.0	135.5	135.0	147.3	152.1	147.0	147.3	146.6	151.7	145.0
45 to 74:																									
WHITE MALES:																									
1 to 74 years:	31.1	30.8	32.5	32.0	32.2	31.3	32.5	34.2	34.3	35.9	33.6	34.5	34.8	33.1	33.3	32.0	30.4	29.2	33.7	34.7	34.2	34.2	34.3	33.7	32.3
25 to 44:	6.4	5.7	5.8	7.1	7.1	6.4	7.6	8.5	7.6	8.3	7.4	7.8	10.0	6.9	6.8	9.4	8.2	7.6	9.3	10.3	10.2	10.7	11.7	11.5	9.1
45 to 74:	153.9	153.3	161.8	157.3	158.1	155.0	159.4	166.7	168.3	170.3	165.3	169.7	167.3	163.2	164.4	153.8	146.4	141.8	163.3	168.7	163.6	160.7	162.0	159.0	155.5
WHITE FEMALES:																									
1 to 74 years:	19.6	20.7	20.6	21.9	22.7	22.7	24.6	24.3	25.1	25.9	26.0	25.9	27.9	25.9	27.5	27.7	27.7	28.3	30.0	31.3	30.1	31.2	30.0	33.0	30.3
25 to 44:	5.0	4.8	5.3	5.2	5.4	5.8	6.3	6.3	6.6	7.3	7.1	7.3	9.0	7.9	7.4	7.5	8.2	7.8	10.0	9.8	10.6	12.2	11.0	11.8	10.0
45 to 74:	95.2	101.6	99.7	106.9	110.6	110.7	119.6	117.9	121.8	124.7	125.9	124.9	132.0	123.7	133.1	134.3	132.7	136.3	141.5	148.7	142.0	144.7	140.8	155.1	143.6
COLORS MALES:																									
1 to 74 years:	22.1	25.8	24.3	26.2	22.9	21.3	22.8	23.0	25.1	24.8	21.4	22.7	22.4	20.7	20.3	21.4	17.3	16.5	18.0	20.0	14.9	16.4	20.1	17.1	18.2
25 to 44:	7.8	8.0	8.0	8.4	6.4	6.4	9.0	8.4	8.8	7.8	7.3	9.7	6.7	7.1	9.4	5.9	7.4	7.5	7.5	9.4	7.2	8.0	9.5	6.1	8.2
45 to 74:	104.9	122.3	116.7	127.7	108.4	97.4	105.0	104.4	122.0	115.5	100.4	105.0	106.2	98.2	91.4	102.2	78.9	73.8	83.3	90.8	66.7	73.4	90.4	79.8	88.8
COLORS FEMALES:																									
1 to 74 years:	18.4	18.9	18.9	18.2	16.4	14.5	18.9	16.8	20.2	20.0	20.1	18.3	16.6	19.0	18.8	17.5	18.0	20.0	20.3	16.5	17.0	19.5	19.1	17.8	18.4
25 to 44:	8.0	6.3	7.3	9.3	7.8	5.0	10.0	8.9	8.4	8.6	6.0	10.5	11.9	6.6	10.2	8.4	7.4	12.2	13.3	10.0	8.0	13.4	10.3	9.8	10.3
45 to 74:	84.6	90.0	88.7	81.1	74.2	67.0	84.4	80.2	62.9	92.1	94.2	79.2	84.4	90.1	83.3	78.0	80.7	86.0	83.9	69.5	70.8	81.2	84.6	74.2	81.7

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1917 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917
CANCER OF THE STOMACH—																			
Total Persons:																			
1 to 74 years.....	16.4	16.8	17.3	17.7	17.4	17.3	18.5	18.9	19.5	19.7	19.4	19.1	19.3	18.7	18.7	18.6	18.3	18.0	19.7
45 to 74.....	79.4	82.1	84.7	85.9	85.1	84.9	90.5	91.0	95.3	95.4	94.6	93.4	92.4	91.6	91.2	89.8	88.4	86.2	93.9
WHITE MALES:																			
1 to 74 years.....	21.3	21.0	22.3	21.8	21.9	21.4	22.2	23.4	23.5	24.0	23.5	23.4	22.9	22.8	22.2	21.9	21.4	19.9	23.0
45 to 74.....	105.7	103.6	111.1	106.7	107.0	106.1	108.4	113.6	115.6	117.5	115.1	116.0	110.3	112.6	109.4	105.4	103.3	96.0	110.6
WHITE FEMALES:																			
1 to 74 years.....	11.9	12.9	12.9	14.1	13.8	14.2	15.7	15.0	16.4	16.2	16.4	15.8	16.7	15.7	16.2	16.5	16.3	16.9	17.7
45 to 74.....	57.0	63.9	62.8	68.6	68.1	69.2	77.0	73.1	79.4	78.2	79.2	77.2	79.5	75.8	78.9	79.7	78.9	81.4	83.7
COLORED MALES:																			
1 to 74 years.....	16.1	18.9	17.9	19.6	17.4	15.9	18.0	18.2	18.9	18.0	15.0	16.7	17.5	15.3	15.1	15.4	13.3	12.5	11.2
45 to 74.....	75.9	90.3	83.7	96.4	83.9	72.6	85.4	83.1	91.3	85.7	70.5	75.6	83.1	71.9	69.4	73.2	61.2	55.1	53.3
COLORED FEMALES:																			
1 to 74 years.....	14.6	13.4	13.3	12.9	11.6	10.9	13.8	15.0	14.6	15.3	16.1	12.3	13.3	14.2	12.7	12.0	13.0	13.9	15.3
45 to 74.....	68.9	63.9	62.9	60.6	51.7	51.2	60.6	67.7	67.7	70.4	76.9	54.1	58.8	67.5	55.0	51.8	60.1	58.3	64.3
CANCER OF THE LIVER AND GALL BLADDER—																			
Total Persons:																			
1 to 74 years.....	6.0	6.1	6.5	6.4	6.9	6.8	7.0	7.2	7.1	7.4	7.2	7.8	8.7	7.8	8.8	8.3	8.2	8.5	9.5
45 to 74.....	29.7	30.0	31.1	31.7	33.7	33.6	34.3	35.0	34.6	36.9	35.3	38.1	41.5	37.7	42.5	40.4	39.2	41.9	45.9
WHITE MALES:																			
1 to 74 years.....	5.6	5.4	6.1	6.1	6.2	6.3	6.4	6.4	6.5	6.5	6.0	7.0	7.3	6.7	7.3	6.3	6.0	6.7	7.9
45 to 74.....	26.8	27.0	29.2	30.3	30.1	30.7	31.1	30.5	31.2	31.9	29.2	34.0	34.6	32.0	35.8	29.1	28.5	33.0	38.2
WHITE FEMALES:																			
1 to 74 years.....	6.8	7.0	7.2	7.0	8.1	7.9	8.2	8.5	8.0	8.9	8.9	9.2	10.7	9.5	10.7	10.8	10.8	10.9	11.8
45 to 74.....	34.0	33.6	33.8	34.5	38.8	38.6	39.4	41.3	39.1	43.3	43.1	43.9	50.4	45.0	51.1	52.8	51.1	52.5	55.8
COLORED MALES:																			
1 to 74 years.....	4.3	4.5	4.6	4.3	4.0	3.6	2.8	3.5	4.7	4.9	4.1	4.3	3.9	3.9	3.9	4.4	3.3	3.2	6.0
45 to 74.....	21.8	22.5	23.1	20.6	18.4	16.6	10.7	16.6	23.8	22.2	18.6	20.6	17.8	18.8	17.2	21.7	14.5	15.1	24.7
COLORED FEMALES:																			
1 to 74 years.....	3.0	5.1	5.2	4.8	4.5	3.2	5.0	4.3	5.3	4.5	3.6	5.7	5.9	4.7	6.0	4.9	5.9	6.2	5.9
45 to 74.....	13.0	24.3	23.1	18.2	21.3	14.4	22.7	19.3	23.8	21.2	15.7	23.8	23.2	22.5	27.5	23.9	26.5	28.0	19.6

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
CANCER OF THE PERI- TONÆUM, INTESTINES AND RECTUM—																									
Total Persons:																									
1 to 74 years.....	14.4	14.8	13.7	13.3	12.4	11.4	11.9	11.6	11.9	11.2	11.3	10.5	10.0	10.3	10.7	9.2	9.6	9.8	10.0	10.0	9.7	9.6	9.5	8.8	9.3
25 to 44.....	6.0	6.9	6.5	5.5	5.7	5.0	5.3	4.9	5.4	5.1	4.9	5.1	4.3	5.1	5.3	4.2	4.7	5.3	5.0	5.1	5.2	4.4	4.4	4.0	4.7
45 to 74.....	65.7	66.8	62.0	61.1	55.9	52.0	54.1	53.6	53.8	53.1	51.7	47.2	45.9	46.1	47.1	41.6	42.0	43.3	44.7	44.4	43.3	42.9	39.3	41.6	
WHITE MALES:																									
1 to 74 years.....	15.0	15.9	15.1	13.3	12.1	11.7	11.7	11.5	11.8	10.9	10.7	10.0	9.3	9.9	10.8	7.9	8.5	8.8	8.5	8.5	9.0	8.9	9.7	9.7	8.4
25 to 44.....	5.2	6.6	7.1	4.5	4.4	4.5	4.5	4.3	4.8	4.7	4.2	4.6	3.9	4.1	4.2	3.2	3.4	4.0	3.4	4.3	4.7	3.6	3.2	3.6	3.7
45 to 74.....	69.9	72.2	67.8	62.2	55.7	53.7	53.6	52.8	52.8	48.4	48.9	44.4	42.2	45.0	48.8	35.5	37.9	38.4	38.5	43.1	39.2	39.4	45.3	34.2	38.0
WHITE FEMALES:																									
1 to 74 years.....	14.4	14.6	13.3	14.0	13.2	11.8	12.8	12.7	12.7	12.2	12.9	11.8	11.4	11.3	11.3	11.0	11.2	11.4	11.9	11.2	11.2	11.3	10.1	10.2	10.9
25 to 44.....	7.0	7.2	6.0	6.2	6.7	5.5	6.0	5.3	5.9	5.6	5.8	5.7	4.7	6.1	6.6	4.9	5.7	6.1	6.2	5.7	5.6	5.2	5.1	4.3	5.7
45 to 74.....	64.2	65.3	60.0	63.5	58.6	53.6	57.4	58.2	57.5	59.9	58.0	52.6	52.0	49.5	48.6	49.4	49.4	49.9	52.7	49.1	50.1	50.4	44.3	45.7	47.8
COLORED MALES:																									
1 to 74 years.....	9.6	8.4	7.6	8.1	7.3	6.4	7.4	5.5	6.7	6.0	3.6	3.3	4.1	4.1	5.8	3.5	4.3	3.7	6.6	3.6	4.8	2.9	2.2	4.5	2.9
25 to 44.....	2.6	3.5	3.3	4.0	3.6	2.6	4.4	3.0	5.7	3.0	2.9	2.7	2.3	1.3	2.4	2.2	3.1	1.7	3.9	3.2	3.4	2.6	2.7	1.8	2.5
45 to 74.....	47.0	37.7	35.0	36.4	32.0	28.9	31.0	23.8	26.3	26.6	12.5	13.0	17.7	18.9	25.1	15.2	17.0	15.3	25.7	13.0	20.0	10.1	7.5	21.2	10.5
COLORED FEMALES:																									
1 to 74 years.....	11.9	11.3	10.4	9.7	11.0	8.1	8.5	7.2	9.1	7.1	8.1	8.4	8.0	9.2	6.4	8.6	7.9	8.9	7.7	6.7	5.8	6.4	7.5	7.3	6.9
25 to 44.....	6.3	9.1	8.7	8.6	10.8	7.8	6.2	8.3	6.3	6.3	6.3	5.5	6.8	7.3	5.7	8.8	8.4	6.9	8.2	8.4	7.6	7.1	9.3	5.8	6.4
45 to 74.....	50.7	44.5	41.1	35.3	40.8	29.3	33.3	24.2	37.5	26.9	32.6	34.8	31.6	35.0	24.0	30.4	27.9	35.4	25.7	21.3	17.7	20.6	23.1	28.7	26.2
CANCER OF THE INTESTINES—																									
Total Persons:																									
1 to 74 years.....	8.8	9.1	8.8	8.0	7.7	7.0	7.4	7.4	7.6	7.1	6.9	6.5	6.1	6.4	6.7	5.7	5.8	6.5	5.8	*	*	*	*	*	*
45 to 74.....	40.1	41.7	40.2	37.4	36.3	32.5	34.4	34.6	34.8	33.2	31.9	29.2	28.4	29.2	30.1	26.3	26.2	29.0	26.6						
WHITE MALES:																									
1 to 74 years.....	8.5	9.3	9.2	7.4	7.1	6.7	6.8	6.7	7.2	6.2	5.8	5.9	5.3	5.8	6.3	4.4	5.2	5.5	4.9	*	*	*	*	*	*
45 to 74.....	39.5	42.1	41.5	34.4	34.1	31.1	32.4	30.2	32.9	28.7	26.6	26.6	24.4	26.7	28.8	20.5	23.9	24.2	22.2						
WHITE FEMALES:																									
1 to 74 years.....	9.5	9.5	9.1	9.2	8.8	7.9	8.5	8.9	8.6	8.5	8.5	7.7	7.4	7.5	7.8	7.4	6.9	8.0	7.2	*	*	*	*	*	*
45 to 74.....	42.1	43.5	41.5	42.7	40.4	35.9	38.3	41.3	38.9	39.5	39.1	33.8	34.2	33.0	33.4	33.4	30.3	35.4	32.5						
COLORED MALES:																									
1 to 74 years.....	6.0	4.8	4.5	3.7	4.4	3.5	4.9	2.8	3.2	3.1	2.1	1.6	1.9	2.7	3.4	1.8	2.7	2.7	2.4	*	*	*	*	*	*
45 to 74.....	29.3	23.2	21.5	16.6	20.0	16.4	20.8	12.4	13.9	14.9	8.8	6.5	8.3	11.8	14.9	7.1	11.1	11.5	8.5						
COLORED FEMALES:																									
1 to 74 years.....	6.0	5.7	4.8	4.4	5.4	3.6	3.6	3.5	4.8	3.9	4.1	4.0	3.1	4.6	2.2	4.2	2.8	3.4	3.2	*	*	*	*	*	*
45 to 74.....	28.4	26.3	20.4	18.8	20.0	15.5	14.8	13.4	20.0	10.9	17.5	17.4	13.6	21.3	8.9	15.6	11.6	14.4	12.8						

*Not available.

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods

Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
CANCER OF THE RECTUM AND ANUS—																									
Total Persons:																									
1 to 74 years.....	5.0	5.0	4.4	4.7	3.9	3.8	3.9	3.6	3.6	3.6	3.6	3.3	3.4	3.2	3.1	3.0	3.1	2.9	3.5	•	•	•	•	•	•
45 to 74.....	23.4	22.5	19.7	21.4	17.2	17.2	17.4	16.8	16.6	16.6	16.8	15.2	15.0	14.2	14.0	12.9	13.8	12.4	15.2	•	•	•	•	•	•
WHITE MALES:																									
1 to 74 years.....	5.9	6.0	5.3	5.5	4.3	4.4	4.4	4.3	4.1	3.9	4.0	3.4	3.5	3.5	3.8	3.1	2.8	3.0	3.1	•	•	•	•	•	•
45 to 74.....	28.7	28.1	24.4	26.4	19.8	20.4	19.8	20.6	18.9	18.6	19.4	15.2	16.0	16.3	18.2	13.7	12.7	13.2	14.0	•	•	•	•	•	•
WHITE FEMALES:																									
1 to 74 years.....	4.3	4.3	3.6	4.0	3.5	3.4	3.6	3.2	3.4	3.6	3.4	3.4	3.3	3.1	2.5	2.9	3.4	2.8	3.8	•	•	•	•	•	•
45 to 74.....	19.3	18.6	16.9	17.6	15.2	15.2	16.1	14.3	15.1	15.9	16.7	16.7	14.3	13.0	10.6	12.6	15.2	11.7	16.6	•	•	•	•	•	•
COLORED MALES:																									
1 to 74 years.....	3.5	3.3	3.0	3.8	2.4	2.1	2.1	2.5	2.2	2.2	1.2	1.4	1.9	1.4	2.3	1.4	1.4	0.9	2.6	•	•	•	•	•	•
45 to 74.....	10.7	13.5	13.0	18.2	11.5	0.6	9.2	11.4	8.4	8.3	3.0	5.9	8.2	7.1	10.2	6.7	5.9	3.8	11.8	•	•	•	•	•	•
COLORED FEMALES:																									
1 to 74 years.....	5.1	4.9	5.2	4.3	4.8	3.0	3.5	3.6	3.9	2.9	3.1	4.0	4.0	4.0	3.5	3.8	4.0	5.0	4.4	•	•	•	•	•	•
45 to 74.....	20.1	16.7	10.1	14.1	18.3	12.4	12.6	10.1	10.4	9.0	11.7	10.2	17.2	12.0	13.2	12.6	14.2	18.8	12.8	•	•	•	•	•	•
CANCER OF THE FEMALE GENITAL ORGANS—																									
WHITE FEMALES:																									
1 to 74 years.....	23.8	24.6	25.2	24.7	23.5	24.2	23.0	24.3	24.0	25.3	24.3	23.5	24.2	25.0	25.1	25.4	25.2	20.4	20.7	25.0	27.1	20.7	27.4	20.9	24.2
25 to 44.....	17.9	19.5	19.0	20.3	18.3	20.0	20.1	21.0	20.9	23.7	21.3	21.2	20.1	21.8	21.8	23.3	23.8	24.7	23.4	23.4	24.4	24.4	25.9	20.4	20.3
45 to 74.....	90.9	99.9	100.9	97.2	94.3	95.9	93.1	94.4	92.8	96.8	94.0	90.2	95.7	96.7	90.9	90.4	94.1	90.8	102.8	94.7	103.8	100.1	102.7	99.8	89.0
COLORED FEMALES:																									
1 to 74 years.....	38.0	39.1	38.3	39.4	36.6	36.0	37.5	35.7	37.2	36.4	36.8	34.4	37.5	32.1	35.0	34.8	38.4	33.4	32.2	35.3	33.0	36.6	40.2	34.3	28.8
25 to 44.....	38.0	39.0	42.0	39.0	35.4	40.3	38.7	39.3	37.0	35.4	42.1	36.0	41.6	36.7	33.9	31.8	39.5	37.6	34.7	33.7	40.3	41.0	41.2	40.2	37.9
45 to 74.....	138.8	142.3	133.1	146.1	136.0	123.4	135.1	126.4	134.8	130.6	126.7	122.8	132.9	111.8	127.3	131.0	140.6	115.5	113.3	131.7	115.5	122.5	147.8	116.6	92.0

*Not available.

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
CANCER OF THE																									
OVARY AND FALLO-																									
PIAN TUBE—																									
WHITE FEMALES:																									
1 to 74 years.....	3.7	3.5	3.1	2.9	2.5	2.6	2.2	2.1	1.8	2.3	1.5	1.7	1.5	1.7	1.1	1.4	1.1	1.2	1.4	*	*	*	*	*	*
25 to 44.....	2.6	2.9	2.7	2.3	2.3	2.0	1.7	2.4	2.0	2.2	1.4	1.9	1.2	1.4	0.8	1.7	1.1	1.5	1.3	*	*	*	*	*	*
45 to 74.....	14.7	13.5	11.4	11.1	8.9	9.9	8.2	6.8	5.9	7.9	5.3	5.7	5.7	6.1	3.8	4.4	4.0	3.5	4.7	*	*	*	*	*	*
COLORED FEMALES:																									
1 to 74 years.....	3.2	3.5	3.2	1.8	1.6	1.4	1.7	1.6	1.5	1.3	1.3	1.2	1.1	0.9	1.1	0.7	1.2	0.5	0.8	*	*	*	*	*	*
25 to 44.....	2.1	2.6	3.3	1.0	1.3	1.5	1.6	1.8	2.2	2.6	1.4	1.0	1.5	0.8	1.7	...	2.4	0.3	1.8	*	*	*	*	*	*
45 to 74.....	13.2	12.9	10.9	6.8	6.3	5.1	6.5	6.1	4.4	2.7	4.2	4.9	3.3	3.0	2.4	3.6	2.0	1.9	0.6	*	*	*	*	*	*
CANCER OF THE																									
UTERUS—																									
WHITE FEMALES:																									
1 to 74 years.....	19.4	20.5	21.3	21.0	20.3	20.9	20.9	21.5	21.4	22.4	22.0	21.3	22.1	22.4	23.1	23.2	23.2	24.5	24.7	*	*	*	*	*	*
25 to 44.....	14.9	16.2	16.5	17.8	15.8	17.8	17.9	18.2	18.8	20.2	18.4	19.1	18.6	19.9	20.1	21.1	22.2	22.7	21.1	*	*	*	*	*	*
45 to 74.....	79.7	82.7	85.7	82.2	82.1	82.0	81.3	84.6	83.5	86.1	85.9	82.1	87.2	86.9	89.8	89.2	86.7	93.9	96.1	*	*	*	*	*	*
COLORED FEMALES:																									
1 to 74 years.....	34.1	34.8	34.8	37.2	34.1	34.0	34.8	33.2	34.9	34.5	34.7	32.9	35.5	31.0	32.9	33.8	37.1	31.8	31.2	*	*	*	*	*	*
25 to 44.....	35.3	36.1	35.2	37.5	33.4	38.1	35.7	36.5	34.6	31.9	39.9	35.4	38.9	34.6	30.7	31.2	36.8	30.3	32.6	*	*	*	*	*	*
45 to 74.....	123.9	126.5	121.1	136.5	126.5	116.4	124.9	117.6	127.9	132.1	119.5	117.1	127.2	108.3	123.2	127.7	136.1	109.5	111.9	*	*	*	*	*	*
CANCER OF THE																									
BREAST—																									
WHITE FEMALES:																									
1 to 74 years.....	15.3	14.7	15.3	14.7	14.1	12.8	12.8	12.5	12.8	12.8	12.1	12.2	13.1	12.2	12.5	11.9	12.0	11.1	12.5	12.6	12.5	11.9	12.5	12.3	10.5
25 to 44.....	10.6	9.5	9.8	8.7	10.2	8.8	9.0	8.5	8.5	7.3	7.7	8.5	8.0	7.7	8.4	8.0	7.9	8.9	8.9	8.0	10.6	9.8	10.8	9.4	9.5
45 to 74.....	64.0	62.7	65.5	63.9	58.3	53.4	53.3	52.5	54.4	56.0	51.8	51.0	55.4	52.4	52.9	48.4	51.0	44.5	50.4	53.8	46.8	47.4	48.9	50.3	40.8
COLORED FEMALES:																									
1 to 74 years.....	14.3	15.0	15.3	14.8	12.8	14.9	13.2	12.3	13.1	11.9	12.8	13.8	11.3	13.0	12.5	14.7	13.9	13.6	11.9	14.2	16.1	12.2	13.2	16.0	14.5
25 to 44.....	11.2	9.9	14.0	12.8	12.3	12.9	9.4	11.8	10.2	9.2	8.6	9.1	9.1	7.5	10.5	12.1	8.9	11.3	10.3	10.5	10.0	9.9	12.0	10.7	11.6
45 to 74.....	58.4	64.5	59.1	57.8	47.6	58.1	54.8	45.8	53.0	47.7	54.2	57.9	45.2	56.9	49.5	58.6	59.7	54.1	46.7	58.8	67.9	48.7	51.0	67.0	58.3

*Not available.

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
CANCER OF THE SKIN—																									
Total Persons:																									
1 to 74 years.....	1.3	1.3	1.1	1.3	1.3	1.3	1.2	1.2	1.4	1.8	1.5	1.6	1.8	1.8	1.7	1.9	1.9	1.9	2.3	2.0	1.9	2.1	1.9	1.8	1.9
45 to 74 years.....	5.6	6.4	5.4	6.0	5.9	6.2	5.9	6.0	6.9	8.7	7.4	8.0	8.4	8.4	8.4	9.2	9.0	9.1	10.7	9.4	9.1	10.0	9.5	8.9	9.3
WHITE MALES:																									
1 to 74 years.....	1.7	1.8	1.5	1.8	1.8	1.9	1.8	1.7	2.0	2.5	2.2	2.3	2.6	2.6	2.2	2.7	2.7	2.4	3.1	2.9	2.7	3.3	2.8	2.1	2.4
45 to 74 years.....	7.5	9.1	7.4	8.2	8.7	9.2	8.9	8.4	9.9	12.6	10.9	11.6	12.7	12.2	11.0	13.2	13.3	11.9	13.9	13.8	12.6	15.8	13.3	10.1	12.0
WHITE FEMALES:																									
1 to 74 years.....	1.0	0.9	0.8	0.9	0.9	0.8	0.8	0.9	1.0	1.3	1.1	1.1	1.2	1.2	1.5	1.4	1.4	1.6	1.8	1.4	1.4	1.2	1.3	1.7	1.6
45 to 74 years.....	4.2	4.4	4.0	4.6	4.0	3.7	3.8	4.4	5.0	6.1	4.9	5.5	5.4	5.5	7.0	6.4	6.0	7.6	8.0	6.3	6.8	5.8	6.5	8.7	7.7
COLORED MALES:																									
1 to 74 years.....	0.8	0.4	0.4	0.7	0.5	0.9	0.3	0.3	0.6	0.8	1.1	0.5	0.5	0.5	0.8	0.2	0.5	0.7	0.6	0.8	0.5	1.0	1.1	0.6	1.1
45 to 74 years.....	3.1	2.3	1.9	0.9	2.1	3.4	1.7	1.3	3.1	2.8	1.3	2.1	2.4	3.7	0.8	2.1	1.8	2.9	4.4	3.5	2.9	5.3	3.2	2.3	4.8
COLORED FEMALES:																									
1 to 74 years.....	0.7	0.7	1.0	0.9	0.5	1.1	0.6	0.8	0.5	0.6	1.0	1.1	0.6	1.5	0.7	0.7	0.6	0.2	0.9	0.4	0.8	0.4	1.7	0.3	0.7
45 to 74 years.....	2.5	3.0	3.5	1.8	1.7	5.0	2.4	2.7	2.4	2.7	4.5	4.5	2.7	5.0	3.1	3.9	2.4	1.3	2.5	2.3	2.7	1.6	9.1	1.7	2.9
CANCER OF OTHER OR UNSPECIFIED OR- GANS (including thyroid, pharynx, Total Persons—)																									
1 to 74 years.....	22.5	22.8	22.4	22.0	21.6	20.7	20.2	19.6	18.0	18.1	10.6	10.7	10.1	15.9	14.5	15.3	13.1	13.2	13.3	12.3	12.3	11.5	10.9	10.7	12.9
45 to 74 years.....	96.9	98.5	97.6	91.9	93.3	89.0	89.4	83.8	80.3	77.5	71.5	71.2	71.3	66.6	61.4	65.0	53.3	55.8	55.8	51.2	50.5	46.8	44.8	44.0	53.9
WHITE MALES:																									
1 to 74 years.....	32.0	33.2	33.0	30.9	31.5	29.2	28.0	27.2	26.9	25.0	23.9	22.6	23.1	22.6	20.1	21.3	18.1	17.9	19.0	17.4	16.8	15.7	14.6	13.1	16.0
45 to 74 years.....	141.4	148.8	150.2	136.1	141.7	130.2	123.9	121.6	119.9	114.5	100.4	100.6	104.7	99.2	89.5	94.7	77.2	78.1	83.2	77.0	71.3	64.5	61.6	57.9	69.8
WHITE FEMALES:																									
1 to 74 years.....	14.4	14.0	13.7	14.3	13.5	13.8	13.9	13.4	12.1	11.8	10.7	12.0	10.7	10.5	10.0	10.4	9.3	10.1	9.0	8.2	8.9	8.3	7.9	9.1	10.7
45 to 74 years.....	59.8	57.9	55.4	56.1	56.0	57.0	56.7	53.7	49.5	48.1	44.5	48.3	45.6	40.8	30.4	41.0	35.1	30.5	34.9	31.1	34.5	31.4	31.8	34.0	41.8
COLORED MALES:																									
1 to 74 years.....	20.7	21.1	19.7	25.3	18.7	10.0	17.9	19.3	14.0	16.8	13.9	10.0	12.7	14.2	13.6	12.1	9.3	0.1	0.8	0.3	0.3	0.3	8.1	9.1	8.4
45 to 74 years.....	117.0	91.7	88.3	106.3	80.7	79.9	79.2	83.3	61.6	70.9	53.9	60.4	56.2	61.5	52.2	40.1	36.8	34.6	42.0	38.2	39.8	32.1	33.4	31.2	35.0
COLORED FEMALES:																									
1 to 74 years.....	10.6	13.2	11.1	11.4	11.0	10.2	11.3	10.2	8.4	9.2	9.3	8.8	7.5	7.1	8.0	8.9	6.0	6.0	6.0	6.0	6.8	7.1	7.0	5.8	10.1
45 to 74 years.....	45.1	49.0	43.2	43.9	39.3	32.9	40.9	30.2	34.8	33.6	31.8	31.3	28.8	26.4	27.4	35.1	20.1	25.4	18.4	23.5	23.8	27.8	28.4	21.0	41.1

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1917 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917
CANCER OF THE LUNG AND PLEURA—																			
Total Persons:																			
1 to 74 years.....	3.2	3.0	2.6	2.5	2.2	1.6	1.7	1.9	1.9	1.6	1.4	1.2	1.1	1.2	0.8	0.9	0.7	0.6	0.8
45 to 74.....	13.6	12.8	10.9	9.9	9.1	6.6	6.8	7.6	7.1	5.9	5.5	5.0	4.9	4.8	3.3	3.1	2.4	2.2	2.9
WHITE MALES:																			
1 to 74 years.....	4.7	4.5	4.2	3.5	3.4	2.3	2.4	2.2	2.8	1.9	1.6	1.3	1.3	1.6	1.1	1.2	1.0	0.7	0.9
45 to 74.....	21.2	19.7	17.9	14.0	14.6	9.5	10.1	9.7	10.8	7.1	6.5	5.0	5.9	6.5	4.1	3.8	3.2	2.6	3.4
WHITE FEMALES:																			
1 to 74 years.....	1.9	1.7	1.4	1.6	1.3	1.1	1.2	1.7	1.2	1.4	1.3	1.2	1.0	1.0	0.7	0.6	0.6	0.6	0.7
45 to 74.....	7.6	7.3	5.5	6.6	4.9	4.4	4.2	6.1	4.6	5.1	5.1	5.1	4.3	3.7	2.8	2.6	1.9	2.0	2.7
COLORED MALES:																			
1 to 74 years.....	3.5	2.8	1.9	2.6	1.2	1.5	1.6	1.5	0.8	0.9	0.9	0.7	0.8	0.7	0.6	0.6	0.2	0.3	0.1
45 to 74.....	12.6	11.8	7.5	10.5	4.1	5.4	5.8	4.8	2.8	3.2	2.3	3.7	2.2	1.8	2.8	1.5	0.7	0.7	....
COLORED FEMALES:																			
1 to 74 years.....	0.8	1.6	1.0	1.1	0.7	1.0	0.8	0.8	0.3	1.0	0.7	0.9	0.7	0.3	0.1	0.4	....	....	0.5
45 to 74.....	3.9	4.7	3.4	4.0	2.7	2.2	2.4	3.5	1.1	3.7	2.0	4.0	3.1	1.5	....	1.9	....	....	1.1
CANCER OF THE PANCREAS—																			
Total Persons:																			
1 to 74 years.....	2.7	2.5	2.4	2.3	2.2	2.0	2.2	1.6	1.8	1.8	1.4	1.5	1.3	1.4	1.2	1.1	0.8	1.0	0.8
45 to 74.....	12.8	12.5	11.7	11.0	10.1	9.3	10.0	8.0	8.5	7.8	6.6	7.2	6.4	6.6	5.5	5.2	3.8	4.3	3.8
WHITE MALES:																			
1 to 74 years.....	3.2	2.9	2.9	2.4	2.5	2.1	2.3	1.9	2.1	1.9	1.6	1.7	1.5	1.6	1.2	1.3	1.2	0.9	0.8
45 to 74.....	14.7	14.4	13.4	11.0	11.8	9.6	10.1	9.2	9.4	8.2	7.2	8.2	7.4	8.0	5.8	6.3	5.8	3.7	3.4
WHITE FEMALES:																			
1 to 74 years.....	2.3	2.3	2.2	2.3	2.0	1.9	2.2	1.5	1.7	1.8	1.3	1.4	1.3	1.3	1.2	1.0	0.6	1.1	0.9
45 to 74.....	11.4	11.2	10.9	11.4	9.1	9.3	10.5	7.2	8.3	8.0	6.3	6.7	6.0	5.5	5.4	4.6	2.5	5.1	4.2
COLORED MALES:																			
1 to 74 years.....	2.9	1.8	1.7	2.4	1.2	2.2	1.5	1.3	0.3	1.0	0.8	1.0	0.7	1.3	1.4	0.6	0.5	0.7	1.0
45 to 74.....	13.7	8.4	7.9	10.1	5.9	10.8	7.6	6.2	1.6	3.6	3.5	3.2	3.0	6.3	4.4	1.5	1.8	3.0	5.4
COLORED FEMALES:																			
1 to 74 years.....	1.6	2.0	0.9	1.1	1.6	0.9	1.1	1.0	1.3	0.7	1.3	1.2	0.5	0.8	0.9	0.8	....	0.5	0.3
45 to 74.....	7.8	9.4	4.6	5.5	7.6	4.2	4.7	5.1	6.4	3.2	6.0	5.1	2.3	3.6	3.9	3.1	....	2.0	0.8

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1917 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917
CANCER OF THE																			
PROSTATE—																			
WHITE MALES:																			
1 to 74 years.....	5.9	5.9	5.3	5.8	5.3	5.2	4.6	4.9	4.3	4.1	3.6	3.6	2.9	3.4	2.6	3.0	2.1	2.9	2.7
45 to 74.....	30.8	30.9	27.8	30.2	27.6	27.5	24.1	25.6	21.5	21.1	18.6	18.7	15.4	17.0	13.0	15.2	10.6	14.7	14.0
COLORED MALES:																			
1 to 74 years.....	8.0	6.2	5.6	7.9	5.7	4.0	4.1	4.2	3.6	4.6	4.2	3.2	2.2	2.2	2.6	3.3	2.2	1.9	1.1
45 to 74.....	41.6	31.0	29.6	40.6	29.9	20.4	21.2	21.5	18.6	23.6	21.9	14.6	11.8	11.8	13.8	15.6	11.4	9.8	5.2
CANCER OF THE																			
BLADDER—																			
Total Persons:																			
1 to 74 years.....	2.9	2.8	2.9	2.7	2.9	2.7	2.6	2.8	2.7	2.7	2.6	2.4	2.6	2.4	2.3	2.6	1.9	1.7	1.9
45 to 74.....	13.9	14.2	14.4	12.6	14.1	12.8	12.7	13.7	13.1	13.7	12.3	11.5	12.6	11.1	11.2	12.5	8.8	8.7	9.0
WHITE MALES:																			
1 to 74 years.....	4.1	4.3	4.3	3.8	4.7	4.0	3.9	4.0	3.8	4.3	4.1	3.4	3.6	3.4	3.4	3.6	2.7	2.3	2.9
45 to 74.....	20.2	21.8	21.7	18.1	23.4	19.0	19.1	20.0	18.6	21.9	20.3	16.6	17.8	16.5	17.4	17.4	12.4	11.9	14.2
WHITE FEMALS:																			
1 to 74 years.....	1.7	1.6	1.8	1.8	1.5	1.5	1.5	1.7	1.9	1.4	1.3	1.5	1.7	1.4	1.3	1.9	1.4	1.3	1.2
45 to 74.....	8.4	8.1	8.7	8.3	7.0	7.7	7.5	8.3	9.2	7.0	6.1	7.3	8.2	6.4	5.9	8.8	6.2	6.4	5.3
COLORED MALES:																			
1 to 74 years.....	3.4	2.3	1.6	1.2	1.7	2.9	2.1	4.1	2.0	2.7	1.4	2.8	3.1	3.1	2.2	1.9	0.7	1.6	0.3
45 to 74.....	15.4	11.4	8.5	5.6	9.1	14.6	8.9	20.4	9.5	12.4	5.6	13.8	16.0	15.6	10.8	9.3	2.5	6.9	0.8
COLORED FEMALS:																			
1 to 74 years.....	2.4	2.1	1.8	2.4	0.9	0.9	1.4	1.8	0.6	1.4	1.4	1.2	1.4	1.4	1.7	1.0	1.2	0.8	0.9
45 to 74.....	10.6	9.0	8.2	11.4	3.1	6.2	8.6	4.8	2.7	6.0	5.8	6.1	5.5	4.7	7.9	5.1	5.1	3.5	4.1

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
PRINCIPAL CARDIO- VASCULAR-RENAL DISEASES—																									
Total Persons:																									
1 to 74 years....	286.7	299.4	299.9	299.4	298.0	304.5	317.2	317.3	305.9	319.8	305.9	302.3	311.0	297.2	284.0	290.4	300.0	353.0	373.2	369.1	357.2	370.1	373.2	381.9	376.0
1 to 24 years....	16.5	16.7	17.8	18.4	18.2	19.6	22.4	23.2	23.3	23.4	24.3	24.8	23.8	26.2	27.0	26.4	25.9	34.5	31.1	31.2	31.7	32.7	32.1	33.4	36.8
25 to 44 years....	102.2	106.1	105.2	108.6	110.7	111.2	110.9	118.8	118.4	119.6	117.7	117.4	117.0	109.5	108.3	113.4	124.9	159.2	159.3	169.7	162.9	170.2	184.1	187.6	187.6
45 to 74 years....	1,288.5	1,352.0	1,352.0	1,345.2	1,334.5	1,361.6	1,414.1	1,409.8	1,361.2	1,421.4	1,350.1	1,332.0	1,385.9	1,316.2	1,246.9	1,306.5	1,307.6	1,506.0	1,622.3	1,585.9	1,531.5	1,586.6	1,581.7	1,619.4	1,581.2
WHITE MALES:																									
1 to 74 years....	315.5	333.7	329.0	324.7	322.0	325.6	341.2	340.6	326.6	341.7	322.7	321.0	328.1	306.5	286.3	297.4	305.3	368.1	408.9	400.1	380.5	400.8	409.2	415.9	411.0
1 to 24 years....	15.8	16.0	17.5	17.4	17.2	18.4	20.8	21.1	21.7	22.6	22.5	23.7	22.8	25.1	25.7	25.0	22.4	31.8	29.2	29.3	29.3	30.1	28.8	29.6	34.9
25 to 44 years....	109.5	115.1	110.6	112.2	110.0	111.7	116.3	118.0	117.0	116.4	114.9	117.1	118.0	105.9	100.4	104.4	121.5	154.9	171.8	182.1	170.8	180.6	201.8	207.2	206.4
45 to 74 years....	1,453.5	1,540.0	1,517.9	1,493.0	1,482.5	1,495.5	1,564.0	1,557.3	1,483.1	1,561.3	1,463.5	1,448.3	1,480.7	1,385.0	1,285.6	1,340.0	1,361.7	1,615.9	1,811.9	1,749.4	1,662.9	1,753.2	1,767.3	1,792.8	1,753.4
WHITE FEMALES:																									
1 to 74 years....	233.0	240.1	244.5	249.3	247.5	251.5	264.9	266.4	260.1	271.9	264.4	261.0	275.3	268.3	263.5	274.7	273.2	311.9	316.9	319.7	312.8	322.6	318.9	330.6	326.7
1 to 24 years....	16.1	16.3	17.2	18.4	19.1	19.2	21.7	23.7	23.7	24.6	24.9	24.0	23.5	26.1	28.4	26.2	26.8	35.6	30.9	31.9	32.1	34.0	32.9	35.4	36.3
25 to 44 years....	76.9	79.0	81.0	85.1	89.5	85.0	92.8	95.3	97.7	101.3	100.4	97.9	99.0	95.4	97.2	103.3	109.7	142.1	129.1	138.8	136.3	143.4	149.5	151.5	154.4
45 to 74 years....	1,067.0	1,101.1	1,118.4	1,134.3	1,115.8	1,143.4	1,195.0	1,193.7	1,166.8	1,216.3	1,171.9	1,160.5	1,235.5	1,197.1	1,162.9	1,218.5	1,198.6	1,328.5	1,388.4	1,384.9	1,351.8	1,387.5	1,361.4	1,413.1	1,385.7
COLORED MALES:																									
1 to 74 years....	447.1	481.5	479.2	471.2	477.5	519.8	499.0	494.0	463.4	490.5	494.4	434.8	421.0	400.4	367.3	408.3	427.3	519.5	528.1	488.5	508.4	505.1	518.2	519.6	483.6
1 to 24 years....	21.2	19.3	20.7	22.5	23.2	25.0	28.0	32.0	26.0	26.2	27.4	31.3	33.2	29.5	28.2	30.6	33.5	32.5	42.1	35.3	38.5	37.4	42.3	33.7	50.7
25 to 44 years....	211.0	214.1	225.2	224.7	244.1	275.3	261.0	260.1	237.0	239.4	229.3	224.0	207.8	198.5	195.1	216.2	226.8	276.2	274.6	262.6	281.6	277.1	303.2	305.5	276.3
45 to 74 years....	1,974.9	2,156.8	2,124.0	2,077.5	2,073.2	2,247.6	2,151.8	2,115.7	2,006.9	2,145.2	2,020.0	1,861.6	1,805.5	1,724.5	1,558.4	1,735.4	1,811.5	2,224.2	2,455.7	2,096.9	2,140.8	2,133.2	2,148.6	2,175.5	1,984.9
COLORED FEMALES:																									
1 to 74 years....	406.8	425.6	440.5	428.6	450.8	468.0	474.4	471.2	447.5	459.2	440.6	439.5	430.9	421.6	406.6	419.2	421.2	493.0	479.1	480.1	461.8	447.7	461.8	464.8	456.7
1 to 24 years....	23.5	23.7	24.6	24.9	25.0	26.3	28.5	30.0	28.5	29.0	30.0	31.6	32.6	30.2	28.4	30.9	37.0	43.9	52.2	41.2	43.7	40.7	45.2	49.2	46.6
25 to 44 years....	211.7	219.5	213.3	231.1	234.5	252.0	263.5	261.3	256.6	248.5	238.1	243.0	227.4	224.1	234.4	225.7	238.7	288.3	264.7	278.7	273.2	267.4	283.2	285.0	288.0
45 to 74 years....	1,754.8	1,841.3	1,927.5	1,855.8	1,927.1	2,119.6	2,069.7	2,001.5	1,874.0	1,939.2	1,804.6	1,839.3	1,881.2	1,782.5	1,680.9	1,759.6	1,732.3	2,011.3	2,005.1	1,993.9	1,893.6	1,830.1	1,874.1	1,875.9	1,835.4

*Heart diseases (1909 classification, International List of Causes of Death), chronic nephritis, cerebral hemorrhage, and paralysis without specified cause; diseases of the arteries, angina pectoris, diseases of the coronary arteries, and embolism and thrombosis.

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; Color, Sex, and Age	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
CEREBRAL HEMOR- RHAGE AND PARAL- YSIS WITH OUT- SPECIFIED CAUSE†— Total Persons:																									
1 to 74 years.....	47.9	51.2	52.7	54.1	55.4	58.2	60.8	60.8	60.2	63.1	62.0	70.4	70.6	68.9	67.2	70.3	69.8	75.0	78.0	78.8	79.6	80.8	80.0	84.1	83.3
45 to 74.....	220.3	244.5	254.5	260.4	260.0	280.1	292.8	292.3	290.4	305.2	299.9	341.4	344.4	335.7	320.4	339.8	335.4	300.1	374.9	377.1	370.5	388.5	378.8	399.1	393.0
WHITE MALES:																									
1 to 74 years.....	45.4	50.0	51.9	52.9	55.1	57.0	60.5	60.5	60.1	65.1	62.0	71.4	69.4	68.5	64.3	67.4	66.3	73.3	70.1	70.0	82.1	81.0	81.0	86.4	87.8
45 to 74.....	223.9	243.0	257.6	261.0	270.2	280.8	298.0	291.8	295.7	321.5	304.1	351.3	345.2	338.8	318.0	330.9	318.3	354.3	382.8	388.2	390.3	390.9	390.5	410.4	417.1
WHITE FEMALES:																									
1 to 74 years.....	42.9	45.0	46.2	47.8	47.9	50.6	53.3	54.2	53.2	54.4	56.3	63.7	66.0	63.8	64.9	67.2	68.0	70.0	71.0	72.0	71.3	75.2	73.0	77.4	74.1
45 to 74.....	210.9	220.4	227.1	234.0	236.3	251.5	262.6	267.3	262.1	290.0	277.4	314.2	325.4	316.8	317.6	330.8	332.1	340.4	350.8	340.5	340.5	360.5	362.5	371.0	355.8
COLORED MALES:																									
1 to 74 years.....	85.0	90.2	88.8	96.7	80.0	103.8	98.2	98.6	88.0	92.7	84.0	80.8	80.7	84.1	73.8	90.1	92.0	95.5	90.3	98.2	105.6	100.1	103.8	101.7	104.8
45 to 74.....	393.6	416.1	419.4	437.3	410.8	471.7	434.0	462.0	407.6	423.4	387.2	417.7	414.4	382.3	341.3	398.0	417.8	430.4	454.5	430.2	483.7	409.0	405.3	451.1	407.2
COLORED FEMALES:																									
1 to 74 years.....	92.2	94.7	97.7	95.0	108.8	110.0	112.2	110.4	113.1	108.8	103.6	114.5	114.6	114.7	116.1	115.8	114.2	122.2	117.7	123.5	120.4	113.0	116.7	115.8	110.2
45 to 74.....	410.8	447.3	460.4	444.5	508.9	509.1	525.4	513.6	522.3	510.3	491.1	530.3	544.1	538.0	538.1	650.6	525.3	502.2	547.3	574.7	544.3	524.7	530.7	530.1	552.3

†Excludes cerebral embolism and thrombosis.

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
ORGANIC DISEASES OF THE HEART (1909 classification)—																									
Total Persons:																									
1 to 74 years.....	138.0	145.5	145.8	144.0	142.7	143.7	151.2	149.0	141.0	146.0	138.7	134.4	138.7	131.1	121.0	125.3	124.9	156.5	158.4	154.1	148.2	152.5	155.1	157.1	157.7
1 to 24 years.....	11.8	11.7	12.7	12.5	13.8	13.7	15.8	16.4	18.9	16.6	17.3	18.4	18.1	19.1	20.5	18.9	18.1	25.1	22.2	21.4	21.9	23.2	21.5	22.2	24.5
25 to 44.....	52.4	55.3	57.0	56.0	57.3	56.5	60.8	59.8	58.9	60.9	59.3	59.7	58.8	53.7	53.9	56.3	62.4	85.1	76.0	77.7	76.6	79.0	85.0	86.2	84.3
45 to 74.....	611.0	642.3	639.0	632.5	619.5	625.4	653.2	645.6	600.4	624.1	586.1	561.0	586.5	532.0	496.9	519.0	509.2	619.1	650.8	628.6	598.6	614.8	622.2	628.8	630.6
WHITE MALES:																									
1 to 74 years.....	152.8	163.7	161.2	157.2	153.8	153.7	164.6	163.0	152.2	156.2	147.2	142.0	145.8	133.8	119.7	121.6	124.6	159.9	169.6	161.0	162.2	160.6	163.0	163.0	165.0
1 to 24.....	11.6	10.9	12.5	12.0	12.0	12.8	15.1	14.5	15.8	16.1	16.1	17.1	17.6	18.5	19.7	18.4	16.3	22.7	20.7	20.5	20.6	20.7	19.7	19.8	22.1
25 to 44.....	55.6	60.4	59.8	58.5	56.8	57.9	61.9	60.8	60.6	59.8	56.6	60.2	59.7	51.6	49.5	49.0	60.3	78.6	78.2	80.5	79.1	82.1	88.5	90.7	86.8
45 to 74.....	688.8	740.7	724.4	706.3	691.2	686.6	731.7	727.8	666.2	687.8	645.2	609.4	628.9	575.8	601.6	515.7	519.8	659.8	711.3	668.8	624.3	663.9	668.7	665.5	675.9
WHITE FEMALES:																									
1 to 74 years.....	114.6	117.1	119.7	121.7	120.3	120.5	126.4	125.7	120.0	125.6	119.6	116.9	123.1	120.8	115.1	120.2	115.9	142.3	137.0	138.1	135.7	136.8	138.1	140.8	143.1
1 to 24.....	11.2	12.0	12.0	12.5	14.1	13.6	15.1	17.3	17.2	16.2	17.7	18.5	17.9	19.4	20.7	18.7	18.4	26.9	22.8	22.0	23.2	25.4	22.6	24.4	25.9
25 to 44.....	41.5	41.6	45.0	44.4	47.7	42.7	48.3	47.4	46.7	51.5	51.0	48.4	48.7	46.8	48.2	53.8	54.8	80.8	63.5	64.4	64.4	66.5	72.0	71.0	72.0
45 to 74.....	510.2	521.0	529.3	539.1	522.3	532.7	551.0	542.9	513.9	538.6	503.6	491.5	526.3	512.4	476.5	499.3	476.0	552.1	562.7	568.7	552.9	549.8	555.2	566.5	572.8
COLORLED MALES:																									
1 to 74 years.....	211.0	297.1	293.2	295.1	297.1	295.2	225.7	216.8	208.8	218.9	213.0	196.1	184.8	175.3	159.0	168.1	175.5	239.0	232.5	207.3	197.6	212.2	218.0	229.7	199.5
1 to 24.....	13.9	11.4	14.5	13.9	18.3	17.6	19.3	22.5	18.8	16.8	18.4	21.2	23.9	18.7	21.2	18.3	22.3	20.1	24.7	22.0	18.1	24.8	20.9	14.9	27.1
25 to 44.....	108.5	106.9	116.5	106.6	122.6	138.2	131.4	127.7	120.4	121.0	123.1	127.7	114.2	99.0	98.2	109.9	117.6	147.2	141.2	147.2	135.5	138.0	146.8	155.5	137.4
45 to 74.....	907.6	1,002.0	957.3	878.8	958.1	978.5	934.2	884.6	863.6	921.6	892.8	778.8	732.6	720.4	628.8	666.6	682.6	925.2	940.4	805.0	783.0	837.5	865.5	929.7	765.7
COLORLED FEMALES:																									
1 to 74 years.....	188.0	194.0	201.2	196.0	196.1	208.9	215.1	209.7	193.2	196.2	190.9	190.3	192.9	174.1	164.5	179.0	179.6	209.6	207.7	207.7	196.6	188.8	201.6	207.7	204.1
1 to 24.....	17.9	16.2	18.7	15.7	23.0	18.6	25.1	19.1	22.0	25.6	23.9	26.4	18.8	23.1	24.7	25.7	28.3	34.2	28.8	24.4	25.0	23.5	27.7	30.0	31.1
25 to 44.....	91.5	110.1	108.5	115.6	111.0	122.7	126.3	125.4	121.9	122.3	121.5	119.0	111.7	110.5	122.3	110.3	118.0	143.9	134.1	135.7	133.3	138.3	133.1	146.7	148.7
45 to 74.....	801.7	808.8	842.4	812.2	799.8	860.9	870.6	859.6	770.3	775.9	753.5	747.6	763.3	684.0	610.8	703.3	687.3	789.1	809.1	818.7	782.3	725.2	773.2	788.2	761.4

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1921 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921
ORGANIC DISEASES OF THE HEART (1920 classification)—Total Persons.															
1 to 74 years.....	143.4	150.8	151.2	150.1	149.1	151.3	158.9	156.6	147.8	152.6	144.8	140.0	144.1	135.6	123.9
1 to 24.....	11.8	11.7	12.7	12.6	13.8	13.7	15.8	16.4	16.9	16.7	17.3	18.4	18.2	19.2	20.5
25 to 44.....	52.6	55.5	57.3	56.3	57.5	57.0	61.4	60.0	59.0	61.2	59.6	59.9	59.1	54.0	54.1
45 to 74.....	635.4	669.0	666.6	663.6	652.0	664.2	693.0	681.3	635.2	658.2	617.6	590.3	613.9	575.6	511.2
WHITE MALES:															
1 to 74 years.....	158.1	169.6	167.2	164.2	161.4	162.2	173.2	170.5	159.8	163.6	154.3	148.6	151.8	138.9	123.0
1 to 24.....	11.6	11.0	12.5	12.1	12.0	12.8	15.1	14.5	15.8	16.2	16.1	17.2	17.7	18.6	19.7
25 to 44.....	55.9	60.7	60.0	58.8	57.0	58.4	62.6	61.0	60.6	60.3	56.8	60.3	59.9	51.8	49.9
45 to 74.....	716.4	771.3	755.5	742.7	731.0	730.6	776.1	765.8	706.0	725.9	682.5	644.0	660.3	602.3	518.0
WHITE FEMALES:															
1 to 74 years.....	118.2	120.9	123.8	126.2	124.7	126.6	132.7	131.5	125.3	130.9	124.5	121.2	127.3	124.4	117.3
1 to 24.....	41.2	41.7	45.4	44.7	44.2	43.7	48.8	47.3	46.9	46.3	47.7	48.7	48.0	49.4	50.8
25 to 44.....	41.7	540.7	550.5	562.6	545.0	563.6	583.7	573.2	541.6	51.6	51.4	48.7	48.9	47.1	48.2
45 to 74.....	528.9	540.7	550.5	562.6	545.0	563.6	583.7	573.2	541.6	51.6	51.4	48.7	48.9	47.1	48.2
COLORED MALES:															
1 to 74 years.....	221.3	238.4	233.8	215.4	238.3	248.2	238.3	228.0	220.6	230.1	218.7	205.3	192.8	183.2	162.4
1 to 24.....	13.9	11.4	14.5	13.9	18.3	17.6	19.3	22.5	19.1	16.8	18.6	22.3	24.0	18.7	21.5
25 to 44.....	108.8	106.9	116.5	106.6	122.6	138.3	127.7	127.7	120.6	121.8	123.4	120.6	116.5	100.9	99.0
45 to 74.....	961.6	1,061.7	1,013.6	933.2	1,017.5	1,047.2	1,001.2	943.9	924.7	979.7	911.7	825.3	771.1	759.3	644.7
COLORED FEMALES:															
1 to 74 years.....	195.7	203.3	210.7	206.1	206.5	220.1	225.9	221.6	202.1	205.9	199.9	198.7	202.2	180.0	169.5
1 to 24.....	17.9	16.2	19.3	15.9	23.0	18.6	25.2	19.2	22.0	25.6	23.8	26.4	24.8	23.1	24.7
25 to 44.....	91.7	110.6	108.5	115.9	111.0	123.0	126.3	125.9	122.0	122.3	122.0	119.2	113.1	111.1	122.5
45 to 74.....	842.3	857.5	891.0	864.0	854.9	919.4	927.4	921.6	817.2	826.7	800.2	791.6	840.1	714.2	637.1

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1921 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921
CHRONIC MYOCARDIAL DISEASE—															
Total Persons:															
1 to 74 years.....	75.0	80.0	82.5	82.3	78.9	78.9	85.6	80.8	72.8	72.2	64.5	56.4	54.4	47.5	34.9
1 to 24.....	1.0	1.2	1.3	1.4	1.5	1.7	2.4	2.3	2.1	1.8	1.6	1.6	1.5	1.6	1.0
25 to 44.....	15.8	15.5	16.9	16.2	17.5	17.6	20.7	19.6	17.7	17.0	15.2	13.8	12.6	10.1	7.0
45 to 74.....	366.7	392.6	403.6	403.6	383.0	383.2	411.4	388.2	349.9	348.6	311.7	271.8	263.7	231.3	171.1
WHITE MALES:															
1 to 74 years.....	86.6	93.0	95.8	93.5	90.3	88.3	98.5	91.9	83.0	81.6	72.8	63.7	60.9	51.8	36.7
1 to 24.....	1.0	1.1	1.2	1.5	1.2	1.4	2.3	2.2	1.7	1.7	1.5	1.8	1.6	1.3	1.0
25 to 44.....	19.4	18.5	20.0	17.6	18.7	19.4	23.1	20.5	19.0	18.0	14.3	15.1	14.0	10.1	6.6
45 to 74.....	424.3	459.4	471.6	462.1	444.5	432.4	478.0	447.4	403.9	398.2	358.1	308.2	295.1	254.3	181.0
WHITE FEMALES:															
1 to 74 years.....	62.8	66.3	67.8	70.6	66.2	68.0	72.3	69.0	62.5	62.8	56.6	50.3	49.5	45.1	34.1
1 to 24.....	1.0	1.2	1.1	1.3	1.6	1.6	2.1	2.1	2.3	1.8	1.6	1.3	1.3	1.8	1.1
25 to 44.....	10.4	11.1	11.0	12.4	13.4	12.4	15.4	15.0	13.3	13.5	13.7	11.3	10.2	9.1	6.5
45 to 74.....	313.0	329.4	338.0	349.9	324.3	335.5	352.1	335.2	303.2	305.6	273.2	244.3	242.0	218.8	167.2
COLORED MALES:															
1 to 74 years.....	86.3	96.2	100.3	90.7	99.2	93.3	95.9	93.3	82.2	81.1	72.8	55.7	44.3	38.9	29.6
1 to 24.....	0.8	1.4	1.3	1.1	2.3	3.5	1.8	3.8	3.1	1.1	2.2	1.6	2.4	1.9	0.6
25 to 44.....	29.9	26.7	33.3	29.8	38.8	41.3	40.2	43.9	35.8	27.5	30.9	21.9	17.5	13.8	8.7
45 to 74.....	406.9	462.7	474.2	429.7	457.4	418.8	438.8	413.5	369.8	382.5	330.0	255.4	200.3	179.0	141.3
COLORED FEMALES:															
1 to 74 years.....	78.0	81.8	91.3	87.2	82.6	89.9	87.9	84.3	71.9	69.8	58.1	48.9	52.1	37.8	29.4
1 to 24.....	1.0	2.4	3.5	1.5	3.3	3.5	6.0	2.9	2.6	2.9	2.3	2.9	2.6	2.2	0.7
25 to 44.....	27.0	25.0	36.3	32.6	32.8	35.7	36.7	40.7	36.5	35.5	26.6	20.8	21.9	18.2	16.0
45 to 74.....	367.4	386.4	415.7	405.7	376.4	409.7	390.4	373.6	315.4	305.1	258.9	217.7	233.6	165.6	128.5

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1921 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921
CHRONIC ENDOCARDITIS AND VALVULAR HEART DISEASE—															
Total Persons:															
1 to 74 years.....	32.1	36.3	39.1	40.6	44.8	49.4	53.2	55.3	56.0	60.6	60.9	65.5	70.5	68.2	67.8
25 to 44.....	6.9	7.3	8.4	8.4	9.7	10.0	11.4	12.0	12.9	13.1	13.9	15.0	14.7	15.9	17.3
45 to 74.....	21.1	25.5	27.2	27.2	28.1	29.0	32.1	31.5	32.4	34.6	33.0	37.3	37.8	35.9	37.2
115.3		129.1	138.4	146.4	162.9	183.8	196.0	205.8	206.2	226.3	228.0	242.5	269.2	257.5	251.0
WHITE MALES:															
1 to 74 years.....	32.1	37.2	39.9	41.0	43.3	48.1	52.5	55.1	55.6	60.3	60.4	65.4	69.2	65.6	63.4
25 to 44.....	6.9	7.0	8.5	8.1	8.4	9.6	11.0	10.3	12.3	12.6	13.0	13.7	14.2	15.4	16.8
45 to 74.....	21.6	27.1	27.3	27.4	26.1	28.0	31.9	31.4	31.9	32.5	31.4	35.7	37.4	34.0	32.3
117.3		135.1	145.0	151.7	165.2	184.1	198.8	213.8	210.5	233.4	234.6	252.2	268.5	251.2	238.9
WHITE FEMALES:															
1 to 74 years.....	27.8	30.5	33.4	34.8	39.7	42.0	45.6	47.6	49.0	53.3	54.0	56.8	64.1	63.5	65.8
25 to 44.....	6.9	7.6	8.2	8.5	10.5	10.1	11.4	13.3	13.1	13.1	14.4	15.7	15.3	16.1	17.3
45 to 74.....	19.4	21.0	24.6	23.3	26.1	23.6	27.1	26.7	27.9	31.3	30.9	31.2	32.5	32.3	35.0
97.7		107.7	115.5	124.4	140.5	157.7	167.7	173.5	179.5	197.2	197.8	208.5	246.0	241.0	245.9
COLORED MALES:															
1 to 74 years.....	59.8	66.5	69.0	74.2	85.4	106.3	99.3	98.6	96.7	104.8	106.0	113.0	114.9	108.0	98.3
25 to 44.....	5.8	4.9	7.3	7.9	10.9	10.8	12.3	14.3	12.5	12.4	12.5	14.2	17.5	14.5	17.2
45 to 74.....	30.8	36.8	44.8	49.5	52.6	69.3	64.9	58.1	58.1	65.8	70.8	85.5	76.6	63.6	68.3
252.7		280.3	274.8	293.4	339.2	423.9	389.7	384.7	386.0	417.0	415.5	424.7	439.6	431.6	365.7
COLORED FEMALES:															
1 to 74 years.....	53.7	61.6	66.5	69.7	78.0	88.8	101.9	101.4	98.0	101.9	99.0	117.3	112.7	110.6	106.9
25 to 44.....	8.7	8.8	10.3	10.1	13.6	11.2	14.0	13.4	16.1	19.5	19.1	20.6	11.8	19.7	21.8
45 to 74.....	26.7	49.1	39.2	49.6	49.6	62.9	67.9	58.3	64.6	65.6	38.9	20.6	66.5	77.5	71.5
218.4		224.9	262.1	263.1	297.5	340.2	393.8	407.8	373.0	382.6	410.1	442.6	459.2	418.7	375.1

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1918	1917	1916	1915	1914	1913	1912	1911
ANGINA PECTORIS—																								
Total Persons:																								
1 to 74 years.....	9.3	10.3	11.2	11.4	11.5	11.1	11.3	11.4	10.7	10.3	8.2	7.3	7.2	6.4	6.3	5.5	5.2	5.1	4.4	5.0	5.0	5.2	5.1	4.4
45 to 74.....	44.1	48.6	52.7	53.4	53.8	52.2	51.4	53.1	50.2	47.5	37.0	32.9	33.2	28.2	29.1	25.5	23.0	23.4	20.5	22.9	21.5	23.2	22.9	19.3
WHITE MALES:																								
1 to 74 years.....	14.1	15.8	16.6	17.4	17.4	16.0	16.8	16.7	15.9	15.1	11.4	10.8	9.9	9.1	8.8	7.6	7.4	6.3	5.8	6.7	6.5	6.8	6.7	4.8
45 to 74.....	66.8	74.6	77.3	80.6	82.4	76.3	76.9	77.5	76.1	69.9	51.5	48.5	44.9	41.0	40.4	34.8	32.8	28.5	27.4	32.2	28.0	31.6	31.2	22.7
WHITE FEMALES:																								
1 to 74 years.....	5.3	5.6	6.6	6.3	6.5	6.9	6.7	7.0	6.4	6.2	5.4	4.5	5.1	3.8	4.3	3.8	3.3	4.3	3.2	3.4	3.5	3.5	3.6	3.9
45 to 74.....	26.3	27.7	33.1	31.3	31.3	33.5	31.9	34.6	30.2	29.8	25.8	20.8	24.2	17.9	20.9	17.9	15.8	20.3	15.1	15.3	15.1	15.7	16.4	16.2
COLORS MALES:																								
1 to 74 years.....	7.8	9.7	10.4	9.4	8.6	10.4	8.9	10.0	8.1	7.7	6.4	5.2	5.4	6.4	5.1	5.2	3.4	4.3	3.5	4.9	4.8	6.3	5.4	4.3
45 to 74.....	28.7	38.4	41.8	41.8	34.4	38.6	33.9	36.0	29.5	33.4	24.6	19.4	23.1	22.0	18.9	18.2	8.6	20.0	11.0	14.4	22.6	25.4	17.4	16.5
COLORS FEMALES:																								
1 to 74 years.....	6.2	6.5	7.1	8.1	7.5	6.7	6.6	6.9	7.1	7.8	6.8	5.4	5.6	5.4	3.9	4.9	3.8	6.1	4.5	5.6	6.1	6.3	5.0	6.2
45 to 74.....	25.7	26.6	30.3	34.4	31.3	26.4	22.8	24.2	20.7	28.1	24.8	21.6	21.7	17.4	13.6	21.6	16.0	23.3	17.4	22.7	25.5	22.5	16.2	24.0

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
DISEASES OF THE																									
ARTERIES—																									
Total Persons:																									
1 to 74 years.....	8.5	10.0	10.1	10.7	10.7	11.5	12.5	12.7	11.9	12.4	12.3	12.7	12.7	12.2	12.0	13.0	14.4	15.0	17.9	16.3	14.7	20.2	20.8	19.8	19.3
45 to 74.....	41.3	40.8	49.6	52.5	53.2	50.8	61.2	62.7	58.5	61.0	59.6	61.5	62.7	60.6	65.2	67.2	72.3	78.4	90.4	81.1	72.2	101.7	103.3	98.1	95.5
WHITE MALES:																									
1 to 74 years.....	10.2	12.3	12.4	13.1	12.6	14.7	15.7	16.4	15.1	16.0	15.9	15.9	16.3	14.6	16.0	17.2	18.6	22.3	20.6	17.3	25.3	20.1	25.2	24.7	
45 to 74.....	50.0	52.0	62.4	66.6	64.1	74.7	78.5	82.8	75.0	80.2	78.1	78.2	80.1	73.9	81.0	85.2	84.0	95.2	113.3	103.4	86.4	128.0	129.3	126.3	
WHITE FEMALES:																									
1 to 74 years.....	5.8	6.6	6.7	7.2	7.7	7.5	8.0	8.4	8.0	8.2	8.0	8.7	9.0	9.2	9.7	9.8	11.9	12.0	13.6	11.6	11.2	15.4	15.7	14.9	14.2
45 to 74.....	29.4	34.2	34.3	30.6	30.8	37.8	41.4	42.8	40.8	42.2	40.8	44.3	40.4	47.4	49.8	50.4	61.6	61.8	70.1	60.1	57.5	79.1	81.4	75.8	72.5
COLORLED MALES:																									
1 to 74 years.....	18.2	20.9	21.1	22.0	20.1	20.7	26.0	19.5	22.2	18.6	20.9	21.4	19.3	19.0	17.1	17.0	19.8	23.8	23.5	24.0	23.3	25.1	20.0	21.7	24.2
45 to 74.....	82.6	101.0	97.8	98.5	89.0	93.2	115.3	80.8	99.6	81.2	90.3	92.9	76.2	82.3	70.5	78.1	89.0	100.1	104.5	108.4	97.0	111.1	107.2	88.8	98.9
COLORLED FEMALES:																									
1 to 74 years.....	11.3	13.2	13.1	12.8	15.2	14.8	15.9	15.9	13.5	14.2	14.5	14.2	13.0	13.2	14.2	15.6	13.4	15.8	15.0	10.3	16.8	16.3	17.4	15.1	14.1
45 to 74.....	52.7	65.9	63.0	60.7	73.8	69.3	77.0	75.6	60.1	67.6	60.7	60.0	63.9	60.7	71.6	71.0	61.7	77.7	78.4	76.6	80.0	74.7	84.1	68.0	68.0
ARTERIO-SCLEROSIS—																									
Total Persons:																									
1 to 74 years.....	0.0	8.3	8.3	8.0	9.1	10.0	10.5	10.8	9.0	10.5	10.1	10.6	10.9	10.7	•	•	•	•	•	•	•	•	•	•	•
45 to 74.....	35.1	43.0	42.4	43.4	46.8	50.7	52.0	55.0	50.3	53.8	51.6	64.2	53.8	58.1	•	•	•	•	•	•	•	•	•	•	•
WHITE MALES:																									
1 to 74 years.....	8.1	10.0	10.0	10.8	10.4	12.9	13.1	13.9	12.5	13.4	13.1	13.2	13.0	12.7	•	•	•	•	•	•	•	•	•	•	•
45 to 74.....	42.1	52.0	52.4	53.8	54.3	67.3	67.3	71.8	64.1	68.8	67.4	68.1	70.2	65.8	•	•	•	•	•	•	•	•	•	•	•
WHITE FEMALES:																									
1 to 74 years.....	5.2	6.0	6.1	6.6	7.3	6.8	7.2	7.7	7.1	7.6	7.1	8.0	8.3	8.7	•	•	•	•	•	•	•	•	•	•	•
45 to 74.....	27.1	31.7	31.4	34.1	37.8	34.9	37.3	39.5	36.0	39.6	36.8	41.0	43.1	45.3	•	•	•	•	•	•	•	•	•	•	•
COLORLED MALES:																									
1 to 74 years.....	11.1	14.3	13.2	15.0	13.5	12.0	17.2	11.9	13.6	12.4	12.1	12.8	11.2	12.9	•	•	•	•	•	•	•	•	•	•	•
45 to 74.....	50.1	74.4	67.0	76.5	68.5	60.8	87.5	59.6	70.1	64.3	60.4	65.6	58.0	60.5	•	•	•	•	•	•	•	•	•	•	•
COLORLED FEMALES:																									
1 to 74 years.....	8.4	10.3	10.0	10.0	12.2	11.7	12.4	11.9	10.6	11.2	11.2	11.0	10.2	10.3	•	•	•	•	•	•	•	•	•	•	•
45 to 74.....	42.9	53.7	50.6	48.0	61.9	57.5	62.9	60.8	52.5	57.6	56.5	50.7	52.9	50.3	•	•	•	•	•	•	•	•	•	•	•

*Not available.
 †Prior to 1915, arterial disease was a preferred cause when reported jointly with bronchopneumonia, endocarditis, and a number of other conditions; beginning with 1915, the preference was reversed. For the years 1930 to 1935 the rates for diseases of the arteries, comprising titles 96 and 97 of the 1930 International List, were not strictly comparable with those of prior years. The resulting difference, however, is negligible.

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; Color, Sex, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
CHRONIC NEPHRITIS*																									
Total Persons:																									
1 to 74 years....	52.9	57.7	61.0	64.7	65.9	70.1	73.9	76.2	76.3	83.0	80.2	74.5	79.1	75.7	73.4	78.2	83.0	98.2	111.5	112.7	107.2	109.0	110.3	113.7	109.1
1 to 24.....	3.1	3.0	3.3	4.1	3.5	4.1	4.4	4.4	4.4	4.9	4.7	4.0	4.1	5.2	5.2	5.6	5.6	6.7	6.5	7.6	7.3	7.0	8.2	8.5	9.1
25 to 44.....	22.8	23.5	25.1	28.0	29.5	31.8	31.7	34.9	36.9	35.9	36.0	34.3	36.7	34.9	34.5	34.4	39.8	51.2	58.9	66.2	59.9	64.3	69.0	71.5	72.7
45 to 74.....	23.1	24.6	26.7	28.1	28.7	30.2	32.3	33.0	32.8	36.6	34.9	32.2	34.4	32.6	31.7	34.0	35.6	41.3	47.1	46.4	44.0	45.7	47.6	46.1	43.9
WHITE MALES:																									
1 to 74 years....	52.3	56.8	60.4	64.2	66.3	71.1	74.4	77.7	77.0	83.0	81.3	77.3	83.2	77.2	74.4	80.8	88.7	107.5	120.0	130.3	119.4	124.4	129.7	132.9	126.4
1 to 24.....	2.6	2.7	3.2	3.8	3.0	3.8	3.7	4.1	4.3	4.4	4.3	4.6	3.6	4.4	4.6	5.0	4.4	6.5	6.1	7.1	6.8	6.8	7.0	7.7	9.7
25 to 44.....	22.1	21.5	24.2	25.4	26.4	30.0	28.6	31.9	34.0	33.2	33.9	32.1	37.1	33.7	32.5	33.4	38.8	52.6	68.3	76.0	64.2	70.6	80.3	86.5	87.3
45 to 74.....	23.7	25.0	27.7	28.8	30.6	31.8	33.7	34.6	34.2	37.0	36.4	34.5	37.1	34.3	32.9	36.1	39.5	40.7	55.9	65.2	51.2	52.8	54.7	54.3	50.5
WHITE FEMALES:																									
1 to 74 years....	45.0	49.5	52.4	56.1	56.4	58.5	63.9	64.9	67.4	72.8	70.7	64.6	68.8	67.6	66.5	69.5	71.0	80.3	88.6	91.7	89.0	89.2	87.1	91.4	89.4
1 to 24.....	3.4	3.0	3.4	4.2	3.7	4.1	4.7	4.4	4.4	5.0	5.0	4.2	4.2	5.5	5.5	5.9	6.2	6.3	6.1	7.7	6.8	6.4	8.3	8.4	7.9
25 to 44.....	18.8	20.2	20.9	25.5	26.3	27.2	27.3	31.3	34.3	33.1	33.6	31.9	32.7	32.9	32.4	31.8	36.9	43.9	47.4	53.9	51.8	54.9	55.3	55.9	58.0
45 to 74.....	20.2	21.6	23.6	24.5	24.9	25.5	28.2	28.7	29.0	31.3	30.7	27.9	30.1	29.7	28.5	30.6	30.6	33.1	37.6	37.2	37.0	36.7	35.1	37.2	35.9
COLORED MALES:																									
1 to 74 years....	104.7	113.3	117.3	123.5	121.2	140.0	136.2	143.8	130.9	147.8	137.0	118.7	122.6	113.0	109.8	125.5	133.2	164.5	166.2	150.5	174.1	162.1	160.9	159.1	147.6
1 to 24.....	6.1	3.8	1.5	3.8	4.7	4.2	3.9	5.8	4.0	6.8	4.9	5.9	6.3	7.0	5.3	7.4	6.5	12.7	8.9	12.3	8.7	16.2	12.8	14.9	
25 to 44.....	41.4	45.0	51.4	48.1	59.4	62.3	62.0	66.6	59.7	60.9	52.0	46.0	47.8	44.2	48.8	51.7	53.1	81.1	77.6	83.1	92.6	87.7	81.2	75.1	
45 to 74.....	47.4	51.9	53.4	56.7	53.8	63.8	61.9	63.6	58.1	66.7	62.8	53.3	55.6	50.5	48.9	50.3	60.3	72.4	72.1	64.1	75.7	68.7	68.8	67.2	62.5
COLORED FEMALES:																									
1 to 74 years....	91.6	103.9	108.4	108.0	113.4	120.9	119.1	122.0	115.6	128.4	120.8	112.1	107.4	112.2	105.8	101.3	108.4	136.9	129.7	125.2	120.1	118.9	118.1	118.7	110.5
1 to 24.....	3.3	5.8	4.3	6.8	5.1	6.9	8.5	6.8	5.4	7.5	6.1	8.1	6.0	7.8	8.1	6.9	10.5	11.8	9.1	11.2	12.5	11.2	13.2	10.1	
25 to 44.....	59.0	61.8	58.6	65.4	69.7	74.0	85.3	76.7	76.1	73.2	69.1	73.8	67.7	62.0	64.9	58.3	69.8	90.5	75.4	88.3	82.0	78.8	90.1	84.4	86.4
45 to 74.....	382.5	436.6	469.2	449.8	476.3	503.3	472.6	506.2	477.2	543.3	513.8	455.1	445.0	474.7	435.5	425.2	435.0	549.3	542.6	497.2	475.3	470.8	452.5	464.8	420.9

*Includes deaths from "nephritis" unqualified for decedents under 10 years of age for the years 1911 to 1920.

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
DIABETES MELLITUS—																									
Total Persons:																									
1 to 74 years.....	20.5	20.7	20.8	20.7	19.9	18.3	18.9	18.5	18.1	18.3	10.8	16.5	17.8	18.3	10.7	15.0	15.1	15.8	17.1	17.5	10.0	15.7	15.3	15.2	15.1
1 to 24.....	1.0	1.5	1.7	2.0	2.0	2.2	2.0	2.4	1.9	2.4	2.1	2.3	2.3	3.0	3.5	3.3	3.1	3.4	3.2	3.1	3.1	2.0	3.3	2.8	3.0
25 to 44.....	4.0	5.4	6.1	6.4	6.4	6.0	6.2	6.2	5.8	6.1	5.7	5.9	7.3	8.3	8.2	8.9	7.2	7.8	7.3	7.4	7.8	7.0	6.9	7.2	7.3
45 to 74.....	90.8	97.7	96.7	95.2	91.0	84.4	86.3	83.0	81.8	81.9	75.1	72.3	77.2	74.9	96.0	63.2	60.8	63.0	70.7	73.7	68.0	65.1	62.1	62.4	61.1
WHITE MALES:																									
1 to 74 years.....	14.1	14.0	14.4	14.1	13.3	13.1	13.4	13.5	12.8	13.0	12.4	12.3	14.5	14.4	13.0	12.7	12.5	14.3	14.2	14.5	13.2	13.2	13.3	12.0	14.1
1 to 24.....	1.9	1.4	2.0	1.9	1.7	2.0	1.9	2.3	1.7	2.0	2.4	2.3	3.0	4.0	4.1	3.5	3.0	4.0	3.5	3.0	2.0	3.1	3.0	2.9	3.8
25 to 44.....	4.1	4.5	5.5	6.0	6.0	4.9	5.7	5.4	4.0	5.2	5.0	5.9	7.3	8.2	8.0	8.0	8.2	9.1	7.4	7.9	8.4	7.3	8.4	8.1	9.5
45 to 74.....	82.7	93.1	92.1	90.1	86.4	80.4	86.0	80.0	55.8	56.0	51.1	49.4	57.2	62.4	40.7	46.7	43.3	50.4	53.7	50.3	49.0	49.8	47.4	47.3	49.3
WHITE FEMALES:																									
1 to 74 years.....	20.7	27.0	26.7	26.9	26.2	23.3	24.0	23.5	23.0	23.0	21.3	20.7	21.7	22.0	20.3	10.1	18.3	18.1	20.5	21.1	20.8	10.0	18.2	18.4	17.2
1 to 24.....	1.8	1.7	1.4	2.1	2.0	2.1	2.0	2.5	2.2	2.4	1.9	2.4	2.0	3.7	3.3	3.5	2.9	3.1	3.0	3.2	3.7	2.0	3.3	3.1	2.7
25 to 44.....	4.9	5.3	5.7	5.9	6.2	4.4	5.8	6.3	6.2	6.2	5.7	5.4	6.8	8.3	7.1	0.8	6.2	6.8	7.1	7.2	7.3	7.0	6.0	6.5	5.5
45 to 74.....	128.5	129.5	128.7	127.4	123.1	110.6	112.1	107.9	105.3	108.5	98.5	94.5	98.4	97.0	87.0	80.0	78.0	70.4	88.9	92.0	88.2	81.7	78.0	78.9	75.2
COLORED MALES:																									
1 to 74 years.....	13.2	12.6	11.9	13.7	12.0	11.4	12.7	11.5	13.7	10.3	11.2	10.4	8.1	8.3	8.0	9.8	10.4	10.3	12.2	11.0	8.3	10.4	9.5	9.7	9.7
1 to 24.....	2.5	0.6	1.2	1.1	4.3	3.0	2.0	2.4	1.8	1.7	3.0	1.0	0.6	1.2	0.0	1.4	2.0	1.8	1.5	3.3	1.2	1.9	1.0	0.8	1.3
25 to 44.....	5.9	9.2	6.4	8.1	6.0	5.5	7.0	5.2	6.5	7.0	6.0	6.8	0.2	5.6	7.7	8.0	6.9	7.1	7.2	6.4	6.4	7.3	6.5	9.1	0.0
45 to 74.....	53.7	55.3	49.5	57.0	44.4	43.3	50.0	40.2	50.9	37.7	41.7	41.0	31.3	31.8	30.6	34.2	37.9	38.5	47.5	44.2	30.7	38.2	35.8	34.5	37.4
COLORED FEMALES:																									
1 to 74 years.....	26.0	27.2	29.4	26.7	26.1	24.0	23.9	23.0	21.6	22.1	18.3	17.0	17.7	17.2	16.0	11.7	11.4	12.8	13.1	14.4	13.0	10.4	9.0	9.7	7.5
1 to 24.....	1.8	1.3	3.2	2.3	2.1	3.0	2.2	2.3	1.9	2.1	1.3	1.8	0.9	1.0	1.7	0.8	1.3	2.7	2.0	2.1	1.1	1.3	2.2	1.1	0.8
25 to 44.....	11.0	14.1	17.4	13.5	13.3	11.8	15.3	14.7	12.3	13.1	12.0	11.0	14.0	12.2	13.2	6.7	8.3	5.3	9.3	6.8	8.3	2.0	7.2	4.0	4.8
45 to 74.....	113.8	118.3	110.7	113.0	111.2	101.0	96.3	95.2	90.4	90.9	74.5	71.7	90.3	98.0	89.1	49.5	43.4	51.7	47.3	60.0	52.0	47.0	35.1	42.2	30.0

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
DISEASES OF THE																									
PUERPERAL STATE—																									
WHITE FEMALES:																									
1 to 74 years.....	15.7	16.1	17.0	19.2	21.2	21.4	23.1	24.6	26.3	26.9	29.4	29.6	31.1	32.9	34.3	40.4	35.5	50.3	32.6	31.8	32.3	35.6	36.3	32.1	36.1
15 to 44.....	31.3	31.9	33.9	38.3	42.1	42.3	45.8	48.6	52.2	53.3	58.3	58.6	61.8	65.4	68.0	80.3	70.7	100.2	64.9	63.2	64.5	70.4	72.2	64.0	72.2
COLOR FEMALE:																									
1 to 74 years.....	27.0	24.5	26.7	28.4	32.0	31.3	37.7	34.3	40.8	37.3	39.6	40.6	39.3	43.2	43.9	49.9	41.6	50.1	40.8	36.9	40.0	45.4	40.7	48.9	44.7
15 to 44.....	52.5	48.9	52.0	55.4	62.9	60.9	73.9	67.6	80.5	73.0	77.6	76.2	76.4	84.5	86.5	98.5	81.5	99.4	79.6	71.7	79.8	89.0	80.5	93.1	87.7
PUERPERAL SEPTI-																									
CEMIA—																									
WHITE FEMALES:																									
1 to 74 years.....	6.3	6.3	6.5	6.9	7.9	7.8	8.2	8.3	10.3	10.0	11.2	11.3	11.7	12.3	14.9	14.5	11.0	12.8	13.0	12.8	12.5	14.5	16.3	13.7	15.5
15 to 44.....	12.5	12.6	12.9	13.7	15.8	15.4	16.3	16.3	20.3	19.8	22.2	22.4	23.2	24.5	28.5	28.8	21.9	25.5	26.0	25.4	25.0	28.8	32.5	27.3	31.0
COLOR FEMALE:																									
1 to 74 years.....	13.4	10.8	11.3	13.1	13.4	13.7	16.4	14.4	20.3	16.8	17.6	16.0	17.2	19.7	18.2	22.8	20.0	18.2	19.6	16.9	18.1	22.1	19.8	20.8	21.7
15 to 44.....	26.5	21.7	21.9	25.2	26.2	26.0	32.1	28.2	40.4	33.2	35.0	31.6	33.5	38.4	35.1	44.8	39.2	36.2	37.5	32.9	36.3	43.4	39.4	41.0	43.2
PUERPERAL ALBUMI-																									
URIA AND CON-																									
VULSION†—																									
WHITE FEMALES:																									
1 to 74 years.....	3.2	3.2	3.1	3.9	4.8	4.9	5.2	5.6	5.4	6.2	6.7	7.5	7.4	8.3	8.1	8.7	8.5	8.5	9.4	9.2	8.5	9.3	9.8	8.9	8.9
15 to 44.....	6.3	6.4	6.1	7.7	9.5	9.0	10.3	11.0	10.7	12.3	13.3	14.9	14.6	16.4	16.2	17.4	16.9	16.8	18.7	18.4	17.0	18.6	19.4	17.7	17.8
COLOR FEMALE:																									
1 to 74 years.....	3.7	5.3	4.7	6.4	7.8	7.3	9.1	7.4	7.9	9.3	9.6	10.8	9.5	9.9	13.2	10.9	8.6	12.4	10.2	9.8	11.2	11.4	9.7	10.2	10.5
15 to 44.....	7.0	10.7	9.2	12.5	15.2	13.9	17.8	14.4	15.4	18.2	17.8	21.1	18.2	19.0	26.3	21.3	16.7	24.3	20.4	18.4	22.1	22.8	19.3	20.5	20.2
OTHER DISEASES OF																									
THE PUERPERAL																									
STATE—																									
WHITE FEMALES:																									
1 to 74 years.....	6.2	6.5	7.4	8.5	8.4	8.7	9.7	10.8	10.7	10.7	11.5	10.8	12.0	12.2	11.3	17.1	16.0	29.1	10.2	9.7	11.3	11.8	10.2	9.5	11.7
15 to 44.....	12.3	12.9	14.8	16.8	16.8	17.2	19.2	21.3	21.2	21.3	22.8	21.4	24.0	24.3	22.4	34.0	31.7	55.0	20.3	19.4	22.5	23.0	20.3	19.0	23.4
COLOR FEMALE:																									
1 to 74 years.....	9.8	8.4	10.6	8.9	10.8	10.3	12.1	12.5	12.5	11.1	12.5	13.8	12.6	13.7	12.5	16.2	13.0	19.5	11.0	10.2	10.7	11.9	11.3	15.8	12.5
15 to 44.....	19.0	16.5	20.9	17.7	21.5	20.5	24.0	25.0	24.7	21.6	24.8	26.5	24.8	27.1	25.0	32.4	25.6	39.0	21.8	20.3	21.4	22.8	21.8	31.6	24.3

† Does not include puerperal tetanus.

‡ Includes puerperal tetanus for the entire 25-year period.

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
TYPHOID AND PARATYPHOID FEVER—																									
TOTAL PERSONS:																									
1 to 74 years....	1.1	1.5	1.6	1.8	2.3	2.4	2.4	2.6	4.0	4.1	4.5	4.4	5.0	5.7	6.6	6.6	7.1	11.1	12.0	12.8	12.6	15.7	18.0	18.6	22.1
WHITE MALES:																									
1 to 74 years....	1.1	1.5	1.6	1.7	2.1	2.3	2.6	2.5	4.3	4.2	4.2	4.2	5.0	6.0	6.8	6.6	6.1	11.0	11.9	12.4	12.4	15.8	18.3	18.7	22.2
WHITE FEMALES:																									
1 to 74 years....	0.9	1.0	1.1	1.5	1.7	1.7	1.6	2.2	4.2	3.1	3.3	3.4	4.1	4.2	5.1	5.4	6.4	8.6	9.3	10.2	9.8	12.1	14.2	14.6	17.6
COLORED MALES:																									
1 to 74 years....	3.7	5.4	5.9	3.7	7.5	8.5	6.1	6.3	9.4	10.3	12.8	12.4	9.7	13.1	14.7	13.2	17.1	28.0	31.1	26.7	32.0	30.3	39.1	38.8	46.1
COLORED FEMALES:																									
1 to 74 years....	2.0	3.6	3.1	3.2	5.0	4.5	5.3	5.0	8.8	10.0	13.3	9.3	12.2	11.0	14.5	12.5	15.2	24.0	23.0	30.7	26.3	33.8	37.4	42.2	47.7
ACUTE POLYOMYELITIS																									
TOTAL PERSONS:																									
1 to 74 years....	0.8	0.5	0.6	0.9	2.5	1.0	0.6	1.1	1.7	0.6	1.3	0.9	0.6	0.9	1.5	0.8	0.5	1.0	1.4	12.1	1.2	1.2	1.8	2.0	1.5
WHITE MALES:																									
1 to 14.....	2.1	1.2	1.4	2.6	6.6	2.4	1.5	2.0	4.3	1.6	3.1	2.4	1.9	2.5	4.4	2.6	1.0	2.8	4.3	36.8	3.1	3.3	3.3	6.6	4.7
1 to 74 years....	1.1	0.9	0.8	1.1	3.1	1.2	0.7	1.3	2.0	0.7	1.5	1.1	0.7	1.0	1.7	1.0	0.8	1.1	1.5	14.3	1.1	1.2	2.2	2.2	1.6
WHITE FEMALES:																									
1 to 14.....	2.7	1.5	1.7	3.0	8.4	3.0	1.8	3.2	5.5	1.7	3.5	2.8	1.9	2.7	4.9	2.8	1.8	2.9	4.4	43.1	2.8	3.1	3.2	5.9	4.6
1 to 74 years....	0.6	0.4	0.5	0.8	2.1	0.8	0.5	1.0	1.5	0.6	1.2	0.9	0.6	0.8	1.6	0.9	0.5	1.0	1.3	10.6	1.2	1.0	1.4	1.6	1.5
COLORED MALES:																									
1 to 14.....	1.1	0.4	0.3	1.2	1.3	1.1	0.7	0.7	1.7	0.7	1.2	1.3	0.6	0.6	1.1	0.3	0.6	0.8	2.7	10.1	1.2	1.8	1.8	2.7	2.6
1 to 74 years....	2.9	0.4	0.5	2.4	2.0	2.6	2.0	1.2	5.5	1.6	3.1	4.1	1.2	1.5	3.9	0.8	1.4	2.2	8.5	30.5	2.3	4.9	4.1	7.2	8.4
COLORED FEMALES:																									
1 to 14.....	0.3	0.1	0.4	0.8	0.7	0.7	0.3	1.1	1.8	0.8	0.6	1.5	0.9	1.2	0.4	0.3	0.3	1.2	1.2	9.8	1.7	2.1	2.0	2.6	1.4
1 to 74 years....	0.7	....	1.0	2.4	2.1	1.3	0.7	3.4	4.3	2.1	1.8	4.4	2.0	3.3	0.7	0.6	0.8	3.0	3.8	21.2	4.3	6.1	3.0	7.3	4.6

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
SYPHILIS, LOCOMOTOR ATAxia, AND GEN- ERAL PARALYSIS OF THE INSANE—																									
TOTAL PERSONS:	10.1	10.6	10.2	10.8	10.5	10.5	11.8	12.1	12.7	13.6	13.7	14.6	14.9	14.1	14.2	14.4	14.1	10.6	19.1	17.5	17.6	16.4	15.5	15.2	12.5
1 to 74 years....	10.0	20.2	19.1	20.1	20.0	19.7	22.3	22.9	24.2	25.9	25.9	27.8	29.0	27.2	27.2	27.5	26.3	31.7	36.8	33.4	33.6	31.1	29.5	29.5	24.0
25 to 74 years....																									
WHITE MALES:	11.5	11.9	11.4	12.5	12.3	12.7	14.5	14.9	16.0	17.7	17.4	19.6	20.2	18.4	18.9	19.5	19.1	23.3	26.2	23.5	23.3	22.2	21.6	21.1	17.8
1 to 74 years....	23.2	23.8	22.8	24.9	24.7	25.3	29.1	29.9	32.1	35.5	35.0	39.1	40.6	37.0	37.7	39.0	36.9	46.3	53.0	47.0	46.6	44.1	43.1	42.0	35.4
25 to 74 years....																									
WHITE FEMALES:	3.7	4.0	3.9	4.0	4.2	4.2	4.7	5.4	5.3	5.6	6.0	6.0	6.7	6.0	6.7	6.4	6.6	7.3	8.8	7.9	8.6	7.5	7.0	7.5	6.1
1 to 74 years....	7.1	7.3	7.3	7.4	8.4	7.7	8.9	10.1	10.2	10.7	11.1	11.5	13.2	11.6	13.2	12.2	12.7	13.6	16.9	15.2	16.7	14.5	13.2	14.5	11.9
25 to 74 years....																									
COLORLED MALES:	54.9	57.9	54.0	54.3	49.6	45.3	53.1	49.1	49.5	47.8	51.7	47.1	44.8	48.8	43.7	46.1	36.8	45.6	55.9	51.6	51.1	46.3	37.0	35.6	26.6
1 to 74 years....	106.4	116.4	105.1	105.0	93.6	88.6	101.9	94.1	94.9	91.5	98.6	89.1	84.3	94.0	82.6	85.0	85.6	87.2	102.5	98.3	94.6	85.8	72.2	67.4	47.8
25 to 74 years....																									
COLORLED FEMALES:	23.6	26.3	25.1	27.5	24.7	25.7	23.3	23.2	25.0	26.7	24.8	27.5	22.9	27.1	21.6	21.7	23.7	24.2	24.5	27.3	25.1	24.1	24.1	23.4	14.9
1 to 74 years....	40.5	47.7	45.3	47.3	43.3	44.0	40.4	38.9	44.2	45.9	42.4	48.4	43.9	49.7	33.0	36.4	40.1	43.0	42.3	49.1	40.6	43.5	40.8	40.8	24.0
25 to 74 years....																									
ACUTE RHEUMATIC FEVER—																									
TOTAL PERSONS:	2.5	2.3	2.8	2.6	2.7	3.0	3.0	2.9	3.2	3.2	3.3	3.3	3.9	3.8	4.0	4.5	3.9	4.7	5.6	5.0	5.9	6.0	6.4	6.7	7.5
1 to 74 years....																									
WHITE MALES:	2.5	2.1	2.6	2.5	2.4	2.7	3.0	2.6	3.0	2.9	2.9	3.5	3.5	3.5	3.6	4.0	3.5	4.4	5.7	5.6	5.8	5.5	6.7	6.3	7.0
1 to 74 years....																									
WHITE FEMALES:	2.4	2.1	2.7	2.3	2.7	2.8	2.6	2.9	3.0	2.9	3.2	3.6	3.8	3.6	4.0	4.3	3.8	4.6	4.7	4.4	5.6	5.9	5.7	6.2	7.3
1 to 74 years....																									
COLORLED MALES:	3.6	3.1	4.6	3.9	4.1	3.8	4.7	2.8	3.9	5.0	4.7	5.5	4.4	5.6	6.8	7.4	4.1	7.0	8.1	4.6	6.3	8.3	8.1	13.1	8.0
1 to 74 years....																									
COLORLED FEMALES:	3.4	5.3	4.9	4.8	4.8	6.2	6.6	5.4	6.1	7.5	5.7	5.9	7.2	6.1	6.1	7.7	7.8	7.3	11.1	6.2	9.2	9.0	9.9	10.2	12.7
1 to 74 years....																									

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
EXOPHTHALMIC GOITER																									
TOTAL PERSONS:																									
1 to 74 years....	2.4	2.3	2.3	2.7	2.6	2.6	2.8	2.8	3.1	3.2	2.4	2.1	2.1	2.0	2.0	2.0	1.6	1.5	1.8	1.5	1.4	1.1	1.4	1.2	1.2
WHITE MALES:																									
1 to 74 years....	0.8	0.6	0.6	0.8	0.7	0.7	1.0	0.8	1.0	0.8	0.4	0.4	0.4	0.3	0.5	0.4	0.3	0.3	0.6	0.2	0.2	0.1	0.3	0.3	0.2
WHITE FEMALES:																									
1 to 74 years....	3.9	3.8	3.7	4.3	4.2	4.3	4.5	4.7	5.1	5.5	4.2	3.7	3.6	3.6	3.4	3.6	2.9	2.7	3.0	2.7	2.5	2.1	2.5	2.1	
COLORED MALES:																									
1 to 74 years....	0.3	0.4	0.9	1.2	1.0	0.6	1.2	0.7	0.6	0.8	0.5	0.2	0.6	0.3	0.5	0.2	0.2	0.7	0.3	0.1	0.5	....	0.2	0.2	0.4
COLORED FEMALES:																									
1 to 74 years....	4.4	5.0	5.1	5.3	5.8	4.8	4.5	5.0	4.7	4.1	4.6	3.4	3.8	4.0	3.8	2.8	2.7	2.5	2.1	3.3	3.1	2.2	1.1	2.6	2.3
PERNICIOUS ANEMIA																									
TOTAL PERSONS:																									
1 to 74 years....	1.3	1.7	2.0	2.3	2.3	2.4	2.2	2.4	3.2	4.2	3.9	3.6	3.3	3.2	3.2	•	•	•	•	•	•	•	•	•	•
45 to 74 years....	5.5	7.2	8.0	9.1	9.6	10.1	8.6	9.1	12.7	17.5	15.7	14.2	13.5	11.8	12.4	•	•	•	•	•	•	•	•	•	•
WHITE MALES:																									
1 to 74 years....	1.2	1.7	2.1	2.1	2.3	2.3	1.8	2.3	2.7	3.5	3.2	3.0	2.9	2.4	2.5	•	•	•	•	•	•	•	•	•	•
45 to 74 years....	4.5	6.7	9.3	8.4	10.7	10.4	7.8	8.4	10.8	15.2	12.0	11.9	12.0	9.6	10.2	•	•	•	•	•	•	•	•	•	•
WHITE FEMALES:																									
1 to 74 years....	1.5	1.8	2.1	2.7	2.4	2.7	2.7	2.6	4.0	5.2	5.1	4.6	4.1	4.3	4.3	•	•	•	•	•	•	•	•	•	•
45 to 74 years....	6.4	7.9	8.5	10.5	9.3	10.7	10.3	10.2	15.5	21.2	20.5	17.6	16.1	14.9	15.6	•	•	•	•	•	•	•	•	•	•
COLORED MALES:																									
1 to 74 years....	1.6	0.9	1.1	0.9	1.0	0.9	0.6	1.8	1.1	1.3	0.6	1.4	0.8	0.9	1.3	•	•	•	•	•	•	•	•	•	•
45 to 74 years....	6.3	4.5	5.1	4.0	5.0	3.5	2.3	6.0	4.2	6.7	2.0	3.7	2.3	2.4	4.1	•	•	•	•	•	•	•	•	•	•
COLORED FEMALES:																									
1 to 74 years....	1.0	2.0	1.1	1.1	1.6	1.8	0.9	1.7	1.6	1.6	1.8	2.2	1.7	1.4	1.0	•	•	•	•	•	•	•	•	•	•
45 to 74 years....	3.9	6.0	3.3	1.8	4.0	4.4	1.0	4.7	5.4	3.3	6.2	4.5	4.7	3.5	3.1	•	•	•	•	•	•	•	•	•	•

*Not available.

*Not available.

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
ULCER OF THE STOMACH—																									
TOTAL PERSONS:																									
1 to 74 years....	4.3	4.3	4.2	3.7	4.2	4.0	4.0	4.2	4.3	4.0	4.0	3.9	3.6	3.6	3.4	3.3	3.3	3.9	4.5	4.0	4.2	4.6	4.5	4.6	4.5
35 to 74 years....	11.5	11.5	11.6	9.7	11.1	10.5	10.1	10.7	11.6	10.1	10.4	10.1	8.8	9.0	8.1	7.9	8.4	9.4	10.8	11.3	10.2	11.3	10.7	11.7	10.2
WHITE MALES:																									
1 to 74 years....	7.2	7.3	7.0	5.7	6.8	6.3	6.3	6.7	6.8	6.1	5.7	5.8	5.1	5.2	4.5	4.2	4.3	5.4	5.7	5.9	4.9	6.2	5.4	6.0	4.8
35 to 74 years....	19.6	20.1	20.0	15.6	18.8	16.8	16.1	17.5	18.9	15.7	14.9	15.0	12.8	13.3	11.5	10.1	11.4	12.8	14.1	15.0	12.8	16.0	13.3	15.7	11.6
WHITE FEMALES:																									
1 to 74 years....	1.3	1.3	1.3	1.5	1.6	1.5	1.7	1.6	1.8	1.9	2.0	1.9	1.9	2.0	1.9	2.3	2.2	2.3	2.9	3.2	3.1	3.0	3.0	3.1	4.0
35 to 74 years....	3.5	3.5	3.6	3.9	3.9	4.0	4.2	4.2	4.6	4.6	5.6	6.0	4.4	4.8	4.4	5.4	5.2	6.0	7.3	7.8	7.1	8.8	7.4	7.7	8.6
COLORED MALES:																									
1 to 74 years....	8.5	6.8	7.5	7.5	6.9	7.5	6.8	6.5	6.9	5.8	7.2	7.2	6.3	3.8	6.2	5.6	5.1	5.2	7.7	4.9	6.4	6.1	7.5	5.5	6.0
35 to 74 years....	23.0	17.0	20.4	19.4	17.1	19.2	15.9	15.7	15.7	12.6	19.3	20.2	17.2	10.8	14.7	14.2	13.5	14.0	18.6	12.1	16.7	13.3	19.2	13.4	15.4
COLORED FEMALES:																									
1 to 74 years....	3.4	3.3	4.1	3.2	4.1	4.9	3.8	4.3	4.6	5.2	4.5	3.2	4.8	5.2	4.8	4.2	4.6	4.7	4.6	5.9	6.0	5.5	7.0	8.0	5.3
35 to 74 years....	8.3	8.0	8.6	6.6	9.5	11.8	10.1	10.6	12.6	13.0	11.1	8.5	11.3	10.4	9.5	9.1	9.7	9.9	11.4	13.4	12.7	11.9	15.1	14.3	10.0
ULCER OF THE DUODENUM—																									
TOTAL PERSONS:																									
1 to 74 years....	1.8	1.6	1.7	1.9	1.6	1.8	1.6	1.5	1.4	1.4	1.3	1.1	1.2	1.2	1.1	•	•	•	•	•	•	•	•	•	•
35 to 74 years....	4.8	4.1	4.5	4.7	3.7	4.8	4.0	3.7	3.5	3.0	3.1	2.3	3.1	3.1	2.5	•	•	•	•	•	•	•	•	•	•
WHITE MALES:																									
1 to 74 years....	3.3	3.0	3.0	3.3	2.8	3.1	2.9	2.7	2.6	2.2	2.4	1.8	1.8	2.2	1.5	•	•	•	•	•	•	•	•	•	•
35 to 74 years....	9.1	7.8	8.1	8.1	6.5	8.1	7.3	6.7	6.7	5.2	5.7	4.1	4.8	5.6	3.6	•	•	•	•	•	•	•	•	•	•
WHITE FEMALES:																									
1 to 74 years....	0.5	0.4	0.5	0.5	0.6	0.7	0.5	0.5	0.4	0.6	0.4	0.4	0.7	0.4	0.7	•	•	•	•	•	•	•	•	•	•
35 to 74 years....	1.2	1.2	1.2	1.5	1.5	1.8	1.3	1.3	0.8	1.2	1.1	0.8	1.8	1.0	1.6	•	•	•	•	•	•	•	•	•	•
COLORED MALES:																									
1 to 74 years....	2.0	1.6	2.9	3.2	1.3	1.3	1.2	1.3	1.0	1.2	0.9	1.1	1.4	1.3	0.9	•	•	•	•	•	•	•	•	•	•
35 to 74 years....	5.6	2.5	6.5	8.2	3.0	3.4	2.6	2.7	2.7	1.9	1.7	2.0	3.2	4.2	2.8	•	•	•	•	•	•	•	•	•	•
COLORED FEMALES:																									
1 to 74 years....	0.4	0.4	1.0	0.8	0.5	0.5	0.6	0.6	0.2	0.6	0.3	0.2	0.6	0.2	0.6	•	•	•	•	•	•	•	•	•	•
35 to 74 years....	1.2	0.8	1.9	1.9	1.3	0.8	1.1	1.6	0.5	1.5	0.6	0.5	0.9	0.6	1.4	•	•	•	•	•	•	•	•	•	•

•Not available.

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH: Color, Sex, and Age	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
DIARRHEA AND ENTERITIS*																									
TOTAL PERSONS: 1 to 74 years...	3.4	4.7	4.8	4.8	5.9	8.0	7.6	8.1	8.1	9.9	11.2	10.6	11.1	10.9	14.1	15.8	16.6	22.6	24.6	26.6	24.9	25.1	28.5	28.9	28.7
WHITE MALES: 1 to 74 years...	3.4	4.9	5.0	4.9	5.3	7.8	7.5	7.7	8.0	9.0	11.3	10.3	11.2	10.7	13.7	16.5	16.9	23.0	24.6	26.3	24.2	24.6	28.2	27.8	27.9
WHITE FEMALES: 1 to 74 years...	2.8	3.8	4.0	4.0	5.6	7.2	6.8	7.2	7.1	8.8	9.5	9.8	9.8	9.9	13.9	14.2	14.5	20.2	22.0	25.7	23.4	23.8	27.3	26.6	27.3
COLORED MALES: 1 to 74 years...	5.4	10.6	7.1	8.3	11.5	12.7	13.0	15.0	14.6	16.8	20.6	17.3	18.8	16.1	16.2	21.0	27.7	30.2	30.1	31.5	37.0	36.8	37.2	47.8	38.4
COLORED FEMALES: 1 to 74 years...	8.1	7.8	9.6	9.8	10.6	13.6	13.8	15.0	15.0	18.2	20.5	17.8	17.0	17.0	10.1	21.1	26.2	37.7	41.0	35.0	36.6	36.3	37.1	46.6	42.7
APPENDIX—																									
TOTAL PERSONS: 1 to 74 years...	11.5	13.2	13.4	13.5	14.3	14.3	14.4	13.7	14.4	13.0	14.0	14.4	14.5	13.8	14.0	12.8	11.1	10.8	11.6	12.3	11.7	12.1	11.8	11.3	10.8
WHITE MALES: 1 to 74 years...	13.5	15.6	16.0	16.0	16.4	16.1	16.9	15.0	16.7	15.9	16.3	16.7	16.8	15.7	16.2	14.8	12.1	12.0	13.1	14.4	13.4	13.7	13.5	11.0	11.0
WHITE FEMALES: 1 to 74 years...	9.0	10.8	10.7	10.0	12.1	12.3	11.9	12.1	12.0	11.0	11.2	11.6	12.0	11.8	11.4	10.5	10.0	9.5	10.0	10.0	10.0	10.6	10.1	10.5	9.5
COLORED MALES: 1 to 74 years...	16.4	14.1	15.0	16.8	17.8	19.1	14.9	16.6	17.7	17.4	17.6	17.5	15.5	16.8	19.0	16.1	10.4	12.5	10.6	12.8	15.1	11.8	12.0	14.5	13.9
COLORED FEMALES: 1 to 74 years...	13.1	13.7	13.5	12.6	13.7	14.9	10.0	14.8	13.0	14.6	16.1	17.5	17.8	14.1	15.2	14.8	13.5	11.7	14.7	15.4	10.5	11.4	13.5	10.6	9.3

*Includes ulcer of the duodenum for the years 1911 to 1920.

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
HERNIA—																									
TOTAL PERSONS: 1 to 74 years....	3.7	3.6	4.0	4.1	3.8	3.5	3.7	3.7	3.7	3.9	3.9	3.8	4.1	4.1	4.0	4.5	4.3	5.2	5.0	4.6	4.3	4.7	4.9	4.8	5.0
WHITE MALES: 1 to 74 years....	4.0	3.6	4.3	4.6	3.6	3.6	3.6	3.8	4.0	4.5	4.2	4.3	3.9	3.8	4.3	4.8	4.1	5.5	5.2	4.4	4.3	4.6	4.4	4.4	4.8
WHITE FEMALES: 1 to 74 years....	3.3	3.5	3.5	3.7	3.9	3.4	3.8	3.7	3.4	3.4	3.7	3.6	4.4	4.5	3.8	4.5	4.5	5.1	5.1	4.8	4.4	4.8	5.3	5.4	5.2
COLORLED MALES: 1 to 74 years....	5.6	5.3	7.7	4.4	5.0	4.2	5.0	6.0	5.9	5.5	4.1	4.5	5.0	3.4	5.2	5.2	6.1	5.9	4.7	6.8	5.2	6.5	6.6	4.2	7.3
COLORLED FEMALES: 1 to 74 years....	2.4	3.2	2.2	2.5	2.5	2.5	2.0	2.6	2.6	2.6	2.0	2.1	1.8	2.7	2.5	2.2	2.0	2.2	2.5	3.5	2.3	2.4	2.7	3.7	3.0
INTESTINAL OBSTRUCTION—																									
TOTAL PERSONS: 1 to 74 years....	3.9	3.9	4.2	4.1	4.4	4.3	4.8	4.5	4.3	4.8	4.7	4.4	4.4	4.3	*	*	*	*	*	*	*	*	*	*	*
WHITE MALES: 1 to 74 years....	3.6	3.1	3.8	3.4	4.2	3.9	4.1	4.3	3.8	3.9	4.1	4.0	4.2	4.2	*	*	*	*	*	*	*	*	*	*	*
WHITE FEMALES: 1 to 74 years....	3.6	3.9	4.0	4.1	3.9	3.9	4.6	4.1	4.1	4.8	4.6	4.0	4.0	3.9	*	*	*	*	*	*	*	*	*	*	*
COLORLED MALES: 1 to 74 years....	5.6	7.1	6.9	6.6	7.4	5.4	9.3	6.9	6.5	7.8	7.0	8.2	7.0	7.2	*	*	*	*	*	*	*	*	*	*	*
COLORLED FEMALES: 1 to 74 years....	8.4	9.4	8.5	9.2	9.5	10.9	8.6	8.9	8.3	10.1	9.1	8.5	9.2	8.2	*	*	*	*	*	*	*	*	*	*	*

*Death rates for the years 1911 to 1921, inclusive, not comparable with those for subsequent years.

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
CAUSES OF THE																									
LIVER—																									
TOTAL PERSONS:																									
1 to 74 years...	7.8	8.2	7.9	8.1	7.8	7.5	7.7	8.0	8.0	8.4	8.3	7.0	7.0	7.0	7.5	7.5	7.4	12.4	15.8	17.1	17.4	17.4	20.1	20.8	20.5
35 to 74 years...	22.9	23.8	23.1	23.8	22.7	22.4	23.0	23.1	23.3	24.5	24.5	20.2	20.7	20.4	22.2	21.8	20.1	36.0	46.3	49.6	50.1	50.3	58.4	59.2	58.6
WHITE MALES:																									
1 to 74 years...	11.4	12.1	11.2	12.0	10.6	10.3	10.8	11.1	11.3	12.1	11.5	9.5	9.7	10.0	9.8	10.1	13.4	18.0	23.4	25.9	26.0	26.1	30.1	30.8	30.3
35 to 74 years...	34.0	35.9	32.9	35.9	31.0	31.1	32.5	33.2	33.4	36.3	34.7	28.0	29.3	29.8	30.0	30.3	40.3	53.0	70.1	75.7	76.5	76.8	88.1	87.8	88.1
WHITE FEMALES:																									
1 to 74 years...	4.9	4.9	5.0	4.9	5.3	4.0	5.0	5.0	5.0	5.1	5.4	4.2	4.3	4.1	5.0	4.8	5.4	7.3	9.2	9.9	9.8	9.9	11.8	12.2	12.5
35 to 74 years...	13.7	13.8	14.5	14.2	16.1	14.0	14.7	14.4	14.4	14.6	15.8	12.7	12.8	11.9	14.7	13.9	16.1	21.4	29.0	28.4	27.6	28.2	34.0	35.3	35.6
COLORED MALES:																									
1 to 74 years...	8.5	7.5	8.0	8.0	8.7	8.4	10.5	9.7	10.2	9.5	9.3	10.3	9.5	8.4	12.2	10.1	11.0	15.0	17.2	10.4	20.6	21.2	17.1	22.4	20.3
35 to 74 years...	20.2	20.9	25.9	19.2	20.6	23.8	31.7	27.4	30.0	20.9	24.8	28.7	27.4	23.5	30.3	27.8	33.0	42.1	48.5	45.7	54.4	56.7	47.0	61.6	55.1
COLORED FEMALES:																									
1 to 74 years...	5.1	4.5	6.1	4.5	5.8	7.4	4.1	5.4	5.2	4.0	4.3	7.2	5.9	0.2	7.3	7.0	8.7	7.1	7.1	8.2	10.2	7.9	11.3	10.9	7.6
35 to 74 years...	14.1	12.9	15.9	11.8	13.3	20.4	11.4	14.3	13.5	12.2	17.0	18.8	10.1	17.3	19.8	10.3	18.8	20.2	17.2	20.7	27.4	20.2	20.6	30.5	15.8
BURIAL CALCULI—																									
TOTAL PERSONS:																									
1 to 74 years...	2.7	3.1	3.3	3.1	3.1	2.7	2.6	2.8	2.7	3.1	3.0	3.2	3.5	3.3	3.4	3.0	3.0	2.8	2.8	3.1	3.2	3.0	2.9	2.8	3.0
45 to 74 years...	11.8	12.9	13.6	12.2	12.0	11.0	10.9	12.0	11.3	12.0	12.0	12.7	14.0	13.5	14.2	12.4	12.8	11.8	12.0	13.1	14.1	13.0	12.1	11.3	12.0
WHITE MALES:																									
1 to 74 years...	1.5	1.0	1.8	1.5	1.3	1.4	1.5	1.2	1.3	1.4	1.3	1.3	1.4	1.3	1.4	1.2	1.2	1.4	1.5	1.2	1.0	1.0	1.3	1.2	1.3
45 to 74 years...	6.0	7.1	7.7	6.0	6.3	5.9	6.4	4.8	6.0	6.0	6.1	6.6	6.4	5.4	6.8	5.1	4.0	6.5	6.7	4.8	6.5	4.3	4.8	6.2	6.3
WHITE FEMALES:																									
1 to 74 years...	4.2	4.0	5.2	5.0	5.1	4.4	4.1	4.7	4.4	4.8	4.9	5.4	5.9	5.4	5.7	4.8	5.1	4.3	4.2	5.1	4.8	5.1	4.8	4.4	4.7
45 to 74 years...	17.4	10.4	20.0	18.0	18.7	10.6	15.8	10.3	17.1	18.1	18.5	20.3	23.2	21.0	22.0	19.4	20.8	17.5	17.5	21.2	21.8	21.7	10.6	17.9	18.7
COLORED MALES:																									
1 to 74 years...	0.5	0.4	1.1	0.3	1.0	0.6	0.2	0.4	0.3	0.9	0.6	0.4	0.3	0.7	1.2	0.7	0.4	0.8	0.8	1.0	2.0	1.2	0.8	0.8	1.2
45 to 74 years...	1.4	1.7	4.1	1.8	4.9	2.6	0.8	1.7	1.7	1.5	1.5	1.5	0.6	3.1	4.0	2.1	1.0	1.0	1.9	1.0	6.8	4.0	3.0	....	4.4
COLORED FEMALES:																									
1 to 74 years...	1.8	1.7	1.1	1.0	1.8	1.5	1.7	2.0	1.0	2.3	1.2	1.8	2.1	2.0	1.8	2.0	2.2	1.0	1.9	3.0	2.2	2.0	1.3	1.8	2.8
45 to 74 years...	7.0	4.6	4.5	7.4	0.0	4.4	6.6	7.5	3.0	8.8	3.0	6.5	8.3	8.8	4.0	12.0	7.5	4.3	8.1	12.7	6.4	5.1	0.1	3.5	9.5

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
Suicide—all forms—																									
Total Persons:																									
1 to 74 years.....	10.6	11.2	11.9	12.8	12.3	12.3	10.8	10.7	10.6	9.8	9.0	9.3	9.4	9.2	9.3	7.3	8.4	9.3	11.7	12.3	15.4	15.5	17.0	15.5	16.5
25 to 44.....	14.9	14.0	15.5	16.7	16.5	15.4	14.5	14.2	13.2	13.2	11.9	12.9	12.4	12.7	12.9	10.4	12.2	14.2	15.6	17.8	21.6	21.8	24.1	22.2	23.0
45 to 74.....	26.8	29.7	32.4	35.2	32.6	33.6	27.4	28.6	28.7	24.5	23.0	23.4	24.1	21.9	22.5	17.0	19.4	19.6	28.3	29.5	38.4	36.7	38.9	35.8	36.4
WHITE MALES:																									
1 to 74 years.....	10.9	18.2	19.4	21.5	20.4	20.4	17.9	17.9	17.2	15.6	14.9	15.3	15.1	14.4	15.1	11.1	12.6	14.1	18.9	20.0	25.6	26.5	29.4	26.7	28.0
25 to 44.....	22.0	22.1	23.7	26.4	26.0	24.2	22.2	22.6	20.1	19.5	18.1	20.0	19.4	19.8	20.1	15.2	18.1	21.6	23.6	27.9	34.2	35.5	40.6	36.8	38.1
45 to 74.....	46.8	54.6	59.0	65.3	59.7	61.7	50.9	52.5	52.4	44.7	43.3	42.8	43.1	37.9	40.6	28.6	32.4	32.8	52.4	53.2	72.2	71.3	75.4	69.1	70.7
WHITE FEMALES:																									
1 to 74 years.....	5.4	5.6	5.6	5.8	5.8	5.6	5.1	4.8	5.2	5.1	4.3	4.5	4.9	5.3	4.7	4.6	5.1	5.6	6.1	6.4	7.6	6.6	7.1	6.6	7.4
25 to 44.....	8.0	8.6	8.9	9.2	8.9	8.3	7.3	7.5	8.3	7.1	7.1	6.8	7.4	7.2	7.1	7.5	8.5	9.8	10.3	11.9	11.1	11.3	10.3	11.2	9.7
45 to 74.....	11.3	10.6	11.2	11.4	11.5	11.7	9.1	9.6	10.4	8.7	7.2	8.6	9.6	9.8	8.7	8.4	9.7	9.7	9.7	11.5	12.7	9.9	10.1	10.3	9.7
COLORED MALES:																									
1 to 74 years.....	9.4	7.3	10.8	10.7	8.6	10.2	8.3	9.1	9.0	7.0	6.3	6.5	5.9	4.9	7.5	4.3	6.4	7.3	7.7	7.4	6.7	10.5	10.9	11.5	8.8
25 to 44.....	16.1	12.7	14.4	13.0	13.7	15.6	12.0	14.1	14.0	12.5	9.5	11.4	10.4	7.1	9.0	6.5	12.2	12.2	10.4	13.4	12.9	17.0	14.3	24.0	13.2
45 to 74.....	18.0	9.7	26.0	23.8	16.9	21.2	14.8	19.3	15.2	14.2	11.1	8.3	11.1	11.1	11.7	7.0	7.9	10.4	12.0	10.3	9.2	15.4	20.6	11.1	13.2
COLORED FEMALES:																									
1 to 74 years.....	4.2	3.8	3.8	3.1	4.6	3.2	3.3	3.4	3.9	3.8	2.4	3.0	3.1	3.2	3.4	2.6	3.0	2.7	2.8	3.0	5.0	4.6	4.2	2.9	5.6
25 to 44.....	7.3	5.6	6.0	5.5	7.5	4.2	5.4	5.0	5.7	5.0	4.9	5.5	4.6	4.5	5.6	4.6	5.8	4.1	3.7	3.5	9.1	6.5	7.3	4.4	9.2
45 to 74.....	2.5	4.0	4.5	2.8	5.8	2.9	2.8	4.3	1.9	4.0	1.5	2.7	2.5	3.0	1.1	1.6	2.5	1.8	2.5	2.8	2.2	1.5	4.0	0.8	2.7

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; Color, Sex, and Age	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
Homicide—all																									
Total Persons:																									
1 to 74 years.....	5.0	5.8	6.1	6.0	6.3	6.3	5.7	5.7	6.3	6.1	6.5	6.3	6.6	5.7	6.3	5.3	6.3	5.7	6.7	6.2	6.1	6.3	6.1	5.9	6.3
15 to 44.....	8.8	9.2	8.5	9.6	10.8	9.8	9.2	9.1	10.1	10.0	10.8	10.0	11.3	9.3	10.2	8.9	10.5	9.2	10.5	9.6	10.0	10.0	9.9	9.2	10.4
45 to 74.....	5.3	5.2	6.0	5.3	6.1	5.6	4.7	5.8	5.5	5.3	4.9	5.0	4.7	4.7	4.9	3.8	4.6	4.6	5.7	5.7	4.9	5.4	4.8	5.4	5.2
WHITE MALES:																									
1 to 74 years.....	5.0	6.1	6.5	6.3	7.0	6.6	5.7	5.5	6.4	6.2	6.9	6.2	6.9	6.2	7.1	6.0	6.7	6.3	6.6	6.3	6.4	6.5	6.5	6.2	7.0
15 to 44.....	7.7	9.2	9.2	9.3	11.2	9.5	8.3	7.8	8.9	8.9	10.4	8.0	11.0	9.5	10.3	9.0	10.3	9.4	9.2	9.1	9.0	9.0	8.2	8.7	10.5
45 to 74.....	8.2	7.1	8.0	7.7	9.5	8.2	7.1	7.9	7.8	8.3	7.4	8.5	7.1	7.1	8.0	5.4	0.9	6.0	8.0	7.9	7.2	8.0	6.3	8.0	8.7
WHITE FEMALES:																									
1 to 74 years.....	1.6	1.5	1.6	1.6	1.8	1.9	1.6	1.9	1.7	1.9	2.1	1.7	1.9	1.7	2.2	1.8	2.1	1.0	2.5	2.0	2.0	2.0	2.2	1.7	2.0
15 to 44.....	2.5	2.1	2.3	2.3	2.8	2.0	2.5	2.7	2.5	2.7	3.6	2.5	3.2	2.6	3.6	3.0	3.6	2.9	3.8	2.9	3.3	2.9	3.1	2.5	3.4
45 to 74.....	1.0	1.5	1.3	1.5	1.4	1.9	1.0	2.5	1.6	1.0	1.0	1.5	1.2	1.2	1.0	1.1	1.1	1.3	1.0	1.9	1.3	1.6	2.0	1.1	1.4
COLORED MALES:																									
1 to 74 years.....	47.0	47.2	49.7	47.4	50.0	40.8	45.3	45.0	51.2	53.2	46.3	52.8	50.0	40.0	38.7	35.5	45.0	38.4	51.4	47.4	44.7	48.0	52.2	40.7	41.0
15 to 44.....	81.7	80.5	83.2	83.2	87.2	81.8	78.0	78.7	87.8	92.7	79.2	89.5	88.5	69.5	67.5	59.7	77.0	65.0	88.3	81.1	75.5	83.8	93.7	79.9	73.3
45 to 74.....	31.8	33.7	40.7	29.5	33.2	28.7	27.7	30.2	33.8	34.0	33.1	38.5	29.5	20.4	22.0	22.0	30.3	18.1	31.0	32.4	29.2	30.7	27.3	25.1	21.1
COLORED FEMALES:																									
1 to 74 years.....	10.1	10.6	11.5	12.4	12.0	12.0	13.6	13.8	14.1	11.7	14.8	14.4	14.8	11.8	13.1	11.5	12.0	12.3	12.2	12.6	13.4	11.0	11.2	11.1	13.0
15 to 44.....	17.7	17.0	20.8	21.5	20.0	21.2	24.8	24.7	25.2	21.5	27.8	20.1	27.4	21.4	23.0	20.3	23.2	20.3	21.0	10.0	24.0	10.0	20.2	19.2	25.3
45 to 74.....	5.1	8.3	4.4	7.9	4.9	6.4	6.1	5.1	6.2	3.6	4.2	5.7	3.6	2.4	0.3	5.0	2.0	0.2	0.4	7.7	6.5	4.5	4.8	7.7	2.0

APPENDIX TABLE C—Continued

Standardized Annual Death Rates per 100,000 for Specified Causes

By Color, Sex, and Broad Age Periods

Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
ACCIDENTAL AND UN- SPECIFIED VIO- LENCE†—																									
Total Persons:																									
1 to 74 years.....	57.5	61.4	59.3	58.9	58.9	68.7	72.2	69.0	71.0	68.5	70.9	68.6	69.8	62.4	61.5	63.7	68.5	82.0	84.3	81.2	73.2	76.5	86.1	81.5	86.6
5 to 14.....	28.0	31.3	30.2	31.7	35.0	37.3	42.1	41.5	45.3	42.3	45.3	46.9	44.9	47.0	47.9	48.0	52.2	53.4	53.9	46.6	45.1	44.9	46.5	43.5	44.3
5 to 14.....	56.1	59.7	57.0	54.1	64.2	65.9	66.7	63.7	65.9	63.0	65.2	61.8	62.2	55.2	53.3	53.6	58.5	74.7	80.0	77.4	68.1	72.4	81.5	78.7	85.1
20 to 54.....	100.6	173.7	161.0	163.1	168.5	183.3	188.6	180.2	178.2	169.9	181.1	162.9	169.8	131.9	128.1	139.1	161.3	189.0	203.5	200.3	166.7	183.3	211.5	195.2	222.1
55 to 74.....																									
WHITE MALES:																									
1 to 74 years.....	88.6	95.3	91.4	90.4	102.1	105.6	112.8	105.5	110.0	105.3	109.3	104.8	108.5	95.5	94.4	97.2	106.8	130.4	133.1	132.0	115.3	120.0	137.7	127.9	138.7
5 to 14.....	39.5	46.0	42.9	44.2	49.9	53.4	59.7	57.6	62.5	60.1	63.8	66.1	65.0	69.8	67.8	70.5	77.0	77.2	75.8	70.0	67.3	63.8	69.5	65.2	64.8
5 to 14.....	96.7	102.4	96.7	93.4	111.9	113.5	117.0	109.4	114.4	108.5	112.2	105.7	109.8	96.0	92.8	93.5	100.7	131.8	143.3	142.0	123.1	129.2	146.5	140.1	155.7
20 to 54.....	227.9	247.1	230.5	230.8	235.4	253.8	274.4	258.6	265.6	244.7	264.9	234.3	245.0	186.6	178.5	195.0	224.2	288.4	299.6	307.6	237.6	263.6	314.9	282.1	317.9
55 to 74.....																									
WHITE FEMALES:																									
1 to 74 years.....	27.8	28.7	28.3	28.5	30.9	32.5	32.4	33.5	33.2	32.7	33.7	33.4	33.1	30.5	29.7	30.8	31.9	35.5	37.7	33.7	33.3	35.5	37.0	37.0	38.5
5 to 14.....	15.0	14.6	15.3	16.8	18.0	19.0	21.4	23.7	25.5	23.0	24.1	25.7	23.4	25.5	24.3	26.4	26.4	26.4	27.6	21.1	21.4	24.2	21.6	20.1	19.9
5 to 14.....	18.0	19.9	19.5	17.8	19.6	20.7	19.7	20.8	20.7	20.1	21.2	21.2	18.2	17.5	16.3	19.4	21.6	21.6	23.2	18.9	19.4	20.2	22.1	22.5	23.7
20 to 54.....	106.9	113.7	104.6	109.0	113.7	121.8	118.2	115.5	107.3	108.3	114.7	104.4	106.1	87.6	87.4	91.8	92.0	105.4	124.2	117.3	107.7	120.4	128.1	126.3	147.9
55 to 74.....																									
COLORED MALES:																									
1 to 74 years.....	91.6	101.7	98.7	94.1	108.0	117.0	123.6	115.8	119.0	111.7	114.0	108.1	115.2	96.9	99.5	103.7	109.7	143.7	134.3	120.9	109.8	117.5	138.4	130.1	119.1
5 to 14.....	50.0	59.4	65.4	65.8	68.2	66.7	63.5	73.8	86.7	73.0	84.7	78.4	75.3	68.7	68.8	77.1	82.1	100.3	101.8	82.2	74.0	69.5	77.6	71.9	86.5
5 to 14.....	103.5	109.0	106.3	91.7	111.1	126.0	121.7	119.5	119.4	114.2	114.3	104.1	107.6	98.3	90.2	98.0	105.4	136.0	129.2	129.5	98.7	124.5	137.8	131.5	114.2
20 to 54.....	182.6	225.3	178.4	176.3	199.5	224.0	241.2	229.5	222.0	209.0	185.0	192.5	224.8	149.6	133.5	169.3	179.3	275.3	248.8	162.3	211.5	197.7	246.2	233.5	198.9
55 to 74.....																									
COLORED FEMALES:																									
1 to 74 years.....	31.5	33.5	32.8	34.2	39.6	41.5	42.5	37.8	37.8	43.9	43.5	43.3	42.5	38.9	37.2	43.0	35.6	50.0	44.8	43.0	43.3	40.1	45.3	46.4	46.8
5 to 14.....	20.8	23.6	16.7	21.3	22.9	29.4	32.2	26.2	29.8	25.8	31.6	36.0	29.2	32.1	32.9	38.8	32.3	37.5	48.6	31.6	31.7	37.6	33.5	31.8	39.5
5 to 14.....	24.4	27.5	26.6	25.4	33.0	30.3	29.0	26.4	27.1	32.1	33.2	30.5	27.8	22.1	25.0	22.5	21.9	30.4	24.8	24.5	24.8	29.0	30.6	33.6	26.4
20 to 54.....	83.6	92.5	103.7	93.5	109.9	106.5	104.6	106.9	86.7	103.7	96.9	101.9	121.9	80.0	89.4	110.2	84.7	122.1	125.2	110.2	109.7	82.1	108.4	78.6	121.9
55 to 74.....																									

†Excludes deaths from wounds of war.

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
POISONING BY FOOD— Total Persons:																									
1 to 74 years.....	0.2	0.3	0.4	0.4	0.4	0.5	0.5	0.5	0.0	0.6	0.6	0.6	0.6	0.5	0.6	0.4	0.7	0.7	0.9	1.2	0.8	1.2	1.4	1.3	1.2
WHITE MALES:																									
1 to 74 years.....	0.1	0.2	0.4	0.5	0.4	0.3	0.5	0.6	0.6	0.4	0.5	0.5	0.6	0.3	0.6	0.4	0.6	0.7	1.0	1.0	1.1	1.2	1.6	1.5	1.2
WHITE FEMALES:																									
1 to 74 years.....	0.2	0.2	0.2	0.3	0.2	0.4	0.4	0.3	0.5	0.5	0.6	0.6	0.4	0.5	0.6	0.4	0.8	0.7	0.7	1.1	0.6	1.1	1.1	1.0	1.0
COLORED MALES:																									
1 to 74 years.....	0.5	1.4	1.1	0.9	1.0	1.7	1.3	1.1	0.9	1.7	1.1	1.4	1.4	0.6	1.0	0.5	0.8	1.0	2.4	1.8	0.3	2.0	1.3	2.0	1.5
COLORED FEMALES:																									
1 to 74 years.....	1.0	0.6	1.1	1.0	1.3	1.4	1.2	1.4	0.9	1.9	1.6	1.8	1.2	1.7	0.9	0.6	1.1	1.4	1.3	2.7	0.9	0.8	1.9	2.5	3.0
OTHER ACUTE AC- CIDENTAL POISONINGS (gas excluded)— Total Persons:																									
1 to 74 years.....	0.9	1.1	1.1	1.1	1.4	1.2	1.3	1.5	1.3	1.5	1.5	1.3	1.5	1.7	2.2	2.1	1.9	1.7	1.8	1.8	2.1	2.0	2.4	2.5	2.3
WHITE MALES:																									
1 to 74 years.....	1.0	1.4	1.4	1.5	2.1	1.5	1.4	1.9	1.7	1.8	1.8	1.5	1.9	1.8	3.0	2.6	2.3	1.9	1.9	2.0	2.4	3.6	2.8	2.8	2.4
WHITE FEMALES:																									
1 to 74 years.....	0.6	0.8	0.7	0.7	0.7	0.8	1.0	1.0	0.9	1.1	1.1	1.0	1.1	1.6	1.3	1.5	1.4	1.4	1.5	1.0	1.0	2.2	2.0	2.2	2.3
COLORED MALES:																									
1 to 74 years.....	2.0	1.8	1.8	1.4	2.5	2.4	2.5	1.7	1.9	2.2	1.9	2.8	2.4	1.7	3.6	5.0	4.7	2.5	2.9	1.9	4.6	4.1	3.8	3.4	2.5
COLORED FEMALES:																									
1 to 74 years.....	1.2	1.0	1.5	1.6	2.0	1.8	2.0	1.7	1.3	1.3	1.7	1.4	2.0	2.0	3.0	1.2	1.6	2.8	1.9	2.0	2.7	2.4	1.8	3.0	1.5

*Includes poisoning by venomous animals for the years 1911 to 1921.

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
CONFLAGRATION—																									
Total Persons:																									
1 to 74 years.....	0.9	1.0	1.0	1.0	1.0	1.3	1.0	1.0	1.3	1.2	1.1	1.5	1.0	1.1	0.6	0.9	0.8	1.0	1.3	0.9	0.9	1.4	1.3	1.1	1.3
WHITE MALES:																									
1 to 74 years.....	0.9	1.3	1.2	1.5	1.2	1.8	1.0	1.0	1.7	1.4	1.5	2.1	1.1	1.2	0.8	1.2	1.1	1.1	1.3	1.3	1.0	1.6	1.9	1.2	1.3
WHITE FEMALES:																									
1 to 74 years.....	0.7	0.6	0.6	0.4	0.6	0.6	0.6	0.7	0.6	0.7	0.5	0.8	0.7	0.6	0.4	0.6	0.5	0.6	0.9	0.5	0.6	0.8	0.6	0.8	0.9
COLOR MALES:																									
1 to 74 years.....	1.2	2.4	2.5	2.1	2.9	2.8	3.2	3.3	3.2	3.1	2.6	2.5	2.7	3.2	0.6	0.8	1.8	1.7	2.7	1.4	2.3	3.3	2.4	1.7	3.0
COLOR FEMALES:																									
1 to 74 years.....	1.7	1.6	1.5	1.3	1.5	2.2	2.5	1.8	3.1	2.4	1.8	3.0	2.3	2.9	1.0	1.9	0.9	2.6	3.3	1.6	2.3	3.3	2.0	2.5	3.6
ACCIDENTAL BURNS (conflagration ex- cepted)—																									
Total Persons:																									
1 to 74 years.....	3.2	3.5	3.3	3.7	3.7	4.5	4.8	4.2	4.3	5.8	5.8	6.1	6.3	6.1	6.5	7.9	7.8	8.9	8.5	9.0	8.6	8.3	9.2	9.2	9.0
20 to 54.....	1.9	2.0	2.1	2.0	2.2	2.5	2.3	2.9	2.6	2.9	2.9	3.2	3.0	2.8	2.9	3.6	3.4	4.0	4.3	3.9	4.1	3.3	4.0	4.2	3.6
55 to 74.....	6.0	7.9	6.5	7.2	6.0	7.2	8.3	7.8	7.9	8.9	9.6	9.4	10.4	8.2	7.9	11.2	11.8	13.7	12.7	14.7	10.8	11.1	11.8	12.6	12.7
WHITE MALES:																									
1 to 74 years.....	2.9	2.9	3.1	3.2	3.5	3.8	4.1	4.2	4.3	5.2	4.6	5.0	5.2	4.2	5.2	6.3	6.4	8.0	7.3	7.6	6.8	6.3	7.6	7.3	6.1
20 to 54.....	2.2	2.0	2.6	2.1	2.4	3.0	2.8	3.1	2.8	3.2	2.4	2.6	2.9	2.5	2.6	3.5	3.0	5.1	4.4	4.2	3.4	1.6	2.3	2.8	1.9
55 to 74.....	4.6	6.8	5.2	5.6	4.3	4.7	4.0	3.9	6.5	6.2	9.1	7.7	8.6	4.4	3.3	6.4	7.3	11.6	7.9	9.7	4.2	6.7	9.0	5.3	5.9
WHITE FEMALES:																									
1 to 74 years.....	3.1	3.4	3.0	3.6	3.6	4.3	4.4	5.3	5.0	5.4	5.9	6.4	6.5	6.9	7.0	8.3	8.5	8.6	8.9	9.2	9.1	9.4	9.6	9.8	10.3
20 to 54.....	1.3	1.6	1.5	1.6	1.7	1.9	1.6	2.4	2.2	2.3	3.0	3.3	3.0	2.9	2.8	3.3	3.6	3.6	4.1	3.7	4.5	4.4	5.2	5.0	4.9
55 to 74.....	6.1	7.7	5.9	7.5	7.0	7.7	10.3	9.5	8.0	9.8	8.8	9.5	10.5	10.5	11.3	13.5	14.2	13.8	16.1	16.2	14.1	14.9	13.9	17.6	17.3
COLOR MALES:																									
1 to 74 years.....	4.9	5.2	4.6	7.8	4.1	7.6	9.7	8.6	7.3	7.9	9.0	8.3	8.0	7.0	7.2	8.9	8.9	11.1	9.7	12.3	11.0	9.1	12.0	11.7	13.3
20 to 54.....	4.6	3.2	3.9	3.0	4.0	4.1	3.5	5.9	3.8	5.2	5.6	5.3	4.0	3.5	2.6	6.9	4.4	8.4	3.2	3.1	4.0	3.9	4.4	3.3	3.4
55 to 74.....	15.5	19.1	17.6	22.7	3.6	16.1	26.7	21.3	15.7	5.7	13.6	7.4	15.0	11.4	5.4	14.2	15.6	24.3	7.3	23.0	11.2	3.5	6.1	22.6	13.3
COLOR FEMALES:																									
1 to 74 years.....	6.5	8.3	6.9	6.6	7.4	10.9	10.5	8.6	9.6	13.9	13.3	12.7	13.4	15.9	14.3	20.5	12.6	18.5	15.1	18.7	19.4	15.3	18.9	20.6	18.7
20 to 54.....	2.4	4.8	3.1	3.2	3.8	3.4	4.8	3.5	4.4	4.8	4.4	5.5	3.1	4.0	6.2	6.0	4.9	7.3	6.8	4.3	6.9	8.8	7.3	10.4	6.7
55 to 74.....	15.2	17.7	25.4	12.8	16.2	26.3	22.4	23.7	19.3	34.9	27.7	34.1	31.0	22.5	18.2	39.7	31.7	33.8	30.0	53.3	48.2	16.4	20.2	24.1	31.0

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
ACCIDENTAL ASPHOXY- TION OF POISONOUS GAS—																									
Total Persons:	1.4	1.5	1.6	1.9	2.1	2.3	2.8	3.1	3.0	3.6	3.0	3.4	3.3	2.7	*	*	*	*	*	*	*	*	*	*	*
1 to 74 years.....	2.3	2.4	2.5	2.9	3.3	3.8	4.3	4.7	4.8	5.8	4.8	5.3	5.1	4.3	*	*	*	*	*	*	*	*	*	*	*
20 to 74.....																									
WHITE MALES:																									
1 to 74 years.....	2.4	2.4	2.6	3.1	3.4	3.8	4.6	4.7	4.6	5.5	5.0	5.3	5.0	4.0	*	*	*	*	*	*	*	*	*	*	*
20 to 74.....	3.9	4.0	4.2	5.1	5.0	5.3	7.4	7.5	7.7	8.9	8.0	8.0	8.1	7.4	*	*	*	*	*	*	*	*	*	*	*
WHITE FEMALES:																									
1 to 74 years.....	0.6	0.8	0.8	0.9	1.0	1.1	1.3	1.7	1.6	2.3	1.4	1.8	1.0	1.4	*	*	*	*	*	*	*	*	*	*	*
20 to 74.....	1.0	1.2	1.2	1.3	1.5	1.8	1.8	2.0	2.5	3.5	2.2	2.7	2.7	2.0	*	*	*	*	*	*	*	*	*	*	*
COLORED MALES:																									
1 to 74 years.....	1.0	1.1	1.3	0.8	1.8	2.0	1.6	2.8	3.1	2.5	2.3	2.5	2.5	1.4	*	*	*	*	*	*	*	*	*	*	*
20 to 74.....	2.5	1.8	1.8	1.4	2.0	3.2	2.5	4.3	4.9	4.1	3.8	4.0	3.8	1.8	*	*	*	*	*	*	*	*	*	*	*
COLORED FEMALES:																									
1 to 74 years.....	0.6	0.8	0.4	0.4	1.0	0.6	0.7	1.2	0.8	1.6	0.7	1.2	1.3	0.6	*	*	*	*	*	*	*	*	*	*	*
20 to 74.....	0.5	0.6	0.3	0.3	1.7	1.0	0.8	1.2	0.8	2.4	1.3	1.5	1.0	1.0	*	*	*	*	*	*	*	*	*	*	*
ACCIDENTAL DROWN- ING—																									
Total Persons:	5.4	5.7	6.0	6.5	6.9	6.7	6.9	7.5	7.1	6.7	7.0	7.7	7.1	7.5	8.4	6.7	8.8	9.7	9.1	10.1	12.5	10.5	12.4	10.4	10.5
1 to 74 years.....																									
WHITE MALES:																									
1 to 74 years.....	9.7	10.3	12.0	11.0	12.0	12.2	12.3	13.3	12.6	12.0	12.8	14.1	13.3	13.3	14.9	11.7	10.0	17.0	16.7	18.5	21.2	10.0	22.1	18.8	20.1
WHITE FEMALES:																									
1 to 74 years.....	1.1	1.0	1.4	1.4	1.4	1.2	1.4	1.0	1.0	1.5	1.4	1.5	1.5	1.0	2.0	1.0	2.0	2.0	1.5	2.0	4.1	2.5	2.8	2.2	1.7
COLORED MALES:																									
1 to 74 years.....	11.2	14.5	15.0	14.4	14.0	16.4	17.1	17.1	18.8	14.1	16.5	16.7	12.5	17.0	19.8	17.8	15.9	20.4	20.6	19.0	23.0	10.5	28.7	24.0	18.7
COLORED FEMALES:																									
1 to 74 years.....	1.8	1.3	1.3	0.6	1.8	1.0	0.9	1.5	1.3	1.0	1.0	1.8	0.9	1.5	1.1	1.5	1.0	0.5	1.0	2.3	3.0	1.0	3.4	1.6	0.9

*Not available.

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

Cause of Death; Color, Sex, and Age	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
ACCIDENTAL TRAUMA— TISM BY FIREARMS— Total Persons:																									
1 to 74 years.....	1.3	1.2	1.4	1.5	1.4	1.6	1.6	1.8	1.7	1.5	1.7	1.9	1.9	1.8	1.8	2.2	2.1	2.4	1.8	1.8	1.6	1.9	2.1	1.8	1.6
WHITE MALES:																									
1 to 74 years.....	2.3	1.9	2.4	2.6	2.4	2.5	2.9	2.9	2.8	2.3	2.6	2.9	2.9	2.9	2.9	3.4	3.2	4.0	2.8	2.8	2.5	2.7	3.2	2.9	2.6
WHITE FEMALES:																									
1 to 74 years.....	0.2	0.3	0.2	0.3	0.3	0.4	0.1	0.4	0.4	0.3	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.3	0.3	0.4	0.5	0.3	0.3
COLORED MALES:																									
1 to 74 years.....	3.9	4.3	4.1	4.9	5.1	5.8	5.3	6.9	5.9	6.6	7.1	8.1	8.7	6.9	6.6	9.8	10.5	8.2	5.8	8.0	5.6	9.7	9.0	7.3	7.5
COLORED FEMALES:																									
1 to 74 years.....	0.6	1.2	1.1	1.3	0.5	1.7	1.2	1.3	0.9	1.2	1.8	2.1	2.7	1.6	1.9	1.7	1.5	1.5	2.0	1.2	1.4	2.3	1.6	1.9	1.1
ACCIDENTAL TRAUMA— TISM BY FALL— Total Persons:																									
1 to 74 years.....	11.2	11.1	10.4	10.3	10.6	10.8	10.4	9.1	9.9	9.3	9.5	9.0	9.6	7.8	7.5	7.7	8.7	11.0	13.7	15.5	13.5	14.7	16.1	14.7	15.8
5 to 14.....	1.9	2.0	2.1	2.6	2.5	2.1	2.5	1.9	2.4	2.8	2.5	2.6	2.5	2.6	2.7	2.6	2.9	3.1	3.4	3.9	3.2	3.4	4.5	2.8	3.6
20 to 64.....	7.9	7.9	7.2	6.7	8.2	7.9	7.4	7.3	7.9	7.3	7.6	7.3	7.1	5.8	5.4	5.2	6.6	9.5	11.7	12.5	11.4	12.8	13.6	13.4	14.7
55 to 74.....	65.4	64.3	60.6	60.5	54.2	60.6	56.6	46.5	50.1	46.5	47.0	43.0	49.2	37.0	36.6	38.6	39.5	55.4	63.3	77.8	62.7	67.7	71.9	62.5	68.7
WHITE MALES:																									
1 to 74 years.....	15.3	15.5	13.7	13.7	14.3	14.8	14.6	12.8	14.6	13.8	13.7	12.8	13.5	11.2	10.6	10.2	12.4	17.7	21.2	24.9	20.4	21.6	24.0	21.7	24.8
5 to 14.....	2.6	3.1	2.9	3.3	3.5	3.4	3.9	2.4	3.4	4.2	4.0	3.6	4.1	3.9	4.3	3.8	4.4	4.8	4.7	6.4	4.5	5.0	6.8	4.0	5.6
20 to 64.....	13.6	13.8	11.8	11.5	14.0	13.8	12.8	13.0	14.3	13.6	13.0	13.3	12.4	10.4	9.7	8.7	11.3	17.3	22.4	24.0	21.1	23.8	24.7	24.0	27.8
55 to 74.....	75.1	74.7	66.3	66.5	57.9	66.4	66.9	51.5	60.3	54.3	56.5	47.9	56.3	40.0	39.2	40.8	45.0	69.0	79.4	104.9	76.9	76.8	89.0	75.9	85.9
WHITE FEMALES:																									
1 to 74 years.....	7.9	7.5	7.7	7.6	7.4	7.4	6.8	6.3	6.1	5.7	6.1	6.0	6.3	5.2	4.9	5.6	5.6	6.8	7.7	8.1	7.8	9.1	9.3	8.9	8.5
5 to 14.....	1.2	1.0	1.3	1.5	1.3	0.4	1.0	1.4	1.1	1.4	1.1	1.8	1.1	1.6	1.2	1.6	1.4	1.3	2.0	0.9	1.8	1.8	2.0	1.9	1.5
20 to 64.....	2.7	2.7	2.9	2.5	2.8	2.5	2.6	2.4	2.4	1.8	2.7	2.3	2.3	1.5	2.0	2.4	2.6	2.6	2.9	3.6	3.5	4.2	4.6	4.1	4.1
55 to 74.....	60.5	58.9	58.4	58.6	54.2	59.0	50.2	45.0	44.0	42.4	42.2	41.2	45.3	36.5	36.3	38.1	37.1	46.6	53.3	61.3	53.0	63.7	59.5	53.4	57.7
COLORED MALES:																									
1 to 74 years.....	10.9	10.9	10.8	9.9	10.9	10.5	11.8	7.5	10.3	8.6	9.2	6.4	10.5	7.0	7.5	8.2	9.3	12.6	12.9	12.0	13.0	13.8	18.2	15.1	11.5
5 to 14.....	3.7	1.3	3.5	6.7	5.4	3.3	4.9	1.1	6.3	3.4	3.6	1.3	1.4	1.5	3.5	2.9	4.7	5.7	6.0	8.8	3.8	4.2	10.1	2.0	6.9
20 to 64.....	12.2	11.4	12.8	9.0	13.0	11.7	10.2	8.4	10.2	7.5	10.5	6.5	12.2	7.5	8.6	8.6	10.1	11.6	11.8	13.2	9.5	14.3	17.2	12.9	9.7
55 to 74.....	36.6	41.5	34.0	26.2	23.5	30.8	41.7	21.8	32.3	32.1	23.0	25.4	30.5	22.9	12.1	16.9	25.7	29.5	35.6	18.3	60.0	37.5	51.4	64.8	38.6
COLORED FEMALES:																									
1 to 74 years.....	5.8	5.5	5.3	6.2	6.4	6.4	5.5	5.0	4.2	4.2	3.6	4.7	5.4	3.3	3.9	5.1	3.7	7.2	4.3	4.2	6.2	6.0	7.4	5.0	6.7
5 to 14.....	0.7	1.3	1.3	1.9	1.2	4.4	2.0	3.0	0.5	2.3	0.6	2.5	2.7	....	0.6	....	2.2	0.9	0.8	3.8	3.6	2.5	....	1.0	1.7
20 to 64.....	4.4	3.4	4.0	3.1	5.0	5.0	2.9	3.4	3.2	3.3	3.6	2.9	3.0	1.9	1.3	1.5	2.0	4.1	2.6	3.0	2.3	2.8	3.4	3.6	3.9
55 to 74.....	33.0	26.0	36.5	33.6	27.8	29.9	28.3	20.1	20.6	16.3	13.1	18.9	28.4	14.1	25.8	32.7	11.4	30.2	23.2	16.7	32.3	30.0	51.8	23.4	33.3

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
ACCIDENTAL TRAUMA— FIRM IN MINES AND QUARRIES— Total Persons:																									
1 to 74 years.....	1.0	0.8	1.0	1.0	1.1	1.3	1.0	1.5	1.8	1.5	1.5	1.6	1.6	1.3	1.4	1.8	1.6	1.0	1.0	1.3	1.2	1.5	1.5	1.7	1.7
20 to 54.....	1.5	1.2	1.7	1.5	1.6	2.1	2.0	2.3	2.0	2.4	2.3	2.1	2.2	2.1	2.1	2.5	2.2	2.0	2.0	1.9	1.9	2.2	2.1	2.2	2.5
55 to 74.....	1.0	1.2	1.6	1.7	2.1	2.2	2.1	2.2	2.2	2.2	1.8	2.3	1.9	1.3	2.4	3.2	2.1	2.0	3.4	1.0	2.1	2.4	2.3	2.7	1.4
WHITE MALES:																									
1 to 74 years.....	2.0	1.7	2.2	2.2	2.4	2.7	3.4	2.0	3.7	3.1	3.0	3.0	3.1	2.6	2.8	3.7	3.4	3.8	3.0	2.0	2.5	3.0	2.0	3.5	3.5
20 to 54.....	3.0	2.0	3.7	3.3	3.5	4.3	5.5	4.6	6.0	4.8	4.8	4.4	4.8	4.3	4.1	5.3	4.8	5.4	4.0	4.0	4.0	4.3	4.2	4.0	5.3
55 to 74.....	2.3	2.5	3.3	3.0	4.0	4.8	4.0	4.8	5.0	5.0	3.0	5.1	4.1	2.7	5.1	7.1	4.5	5.5	7.0	4.0	4.5	5.2	4.5	0.3	3.0
COLORED MALES:																									
1 to 74 years.....	1.0	2.1	1.0	1.0	1.8	3.5	4.1	4.7	4.8	3.0	3.2	2.6	2.6	3.0	3.0	2.8	2.5	5.3	4.8	2.4	2.4	3.8	5.5	3.3	3.0
20 to 54.....	2.3	2.5	1.5	1.6	2.8	5.0	6.1	7.7	7.7	7.0	6.1	4.6	3.0	4.0	3.0	3.5	3.4	7.2	7.2	3.0	2.8	6.9	6.3	5.5	4.3
55 to 74.....	1.0	6.0	1.0	2.6	3.0	3.8	4.0	5.0	6.0	3.1	3.0	2.0	4.1	0.0	8.5	3.3	4.8	0.0	5.3	5.3	0.5	4.5	12.2	....	2.7
ACCIDENTAL TRAUMA— FIRM IN MACHINES— Total Persons:																									
1 to 74 years.....	1.1	1.0	1.0	1.0	1.2	1.5	1.8	1.5	1.5	1.6	1.5	1.5	2.0	1.0	1.2	2.0	1.7	2.8	2.4	1.0	1.6	1.8	2.4	1.8	2.0
20 to 54.....	1.5	1.3	1.0	1.4	1.6	2.0	2.5	1.8	2.0	2.2	2.1	1.7	2.4	2.5	1.0	2.5	1.0	3.2	3.0	2.8	2.1	2.0	3.3	2.3	2.8
55 to 74.....	2.7	1.9	2.4	2.0	2.7	2.8	3.5	3.8	3.3	3.3	2.0	2.0	3.8	3.0	2.5	4.4	4.1	5.0	4.0	2.8	2.4	3.3	3.7	3.5	3.5
WHITE MALES:																									
1 to 74 years.....	2.3	2.1	1.8	2.1	2.5	2.0	3.8	3.0	3.1	3.2	3.1	2.0	4.1	4.0	2.4	4.2	3.3	5.5	4.0	4.0	3.3	3.0	4.0	3.0	3.0
20 to 54.....	3.0	2.0	2.1	2.0	3.5	4.1	5.1	3.7	4.1	4.4	3.4	3.4	5.0	5.1	3.3	5.3	3.9	6.4	6.3	5.8	4.5	5.7	7.0	4.0	6.4
55 to 74.....	0.2	4.2	5.3	4.4	6.1	6.0	7.0	8.2	7.3	7.3	5.6	0.4	8.2	8.6	6.1	9.0	8.7	12.3	10.2	6.1	6.2	7.4	8.2	8.1	8.0
COLORED MALES:																									
1 to 74 years.....	2.5	1.5	1.5	2.0	1.8	4.4	4.5	3.0	3.7	5.1	3.0	4.3	4.7	3.8	3.4	3.0	5.0	7.8	4.8	4.0	3.4	2.4	4.0	5.1	6.3
20 to 54.....	3.8	1.0	2.4	2.0	2.7	4.1	6.0	7.2	5.8	7.4	4.4	5.8	10.2	5.0	4.7	5.1	5.7	9.1	0.2	7.7	3.7	3.7	7.0	7.0	10.7
55 to 74.....	1.0	4.0	2.1	3.0	1.0	7.3	3.7	7.8	0.3	3.4	5.7	3.8	10.7	7.5	10.0	5.0	11.3	9.0	7.3	7.3	6.5	4.5	7.3	....	2.7

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; Color, Sex, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
RAILROAD ACCIDENTS—																									
Total Persons:																									
1 to 74 years.....	2.9	3.0	3.3	3.2	3.2	3.2	3.6	4.7	4.6	5.0	5.1	4.8	4.7	5.8	4.8	4.4	6.2	6.7	9.1	10.1	9.0	8.7	10.8	10.8	11.2
5 to 14.....	0.9	1.0	1.2	1.2	0.9	0.9	1.2	1.3	1.8	1.9	1.3	1.3	1.8	1.6	1.6	2.1	2.4	3.5	3.7	3.7	3.0	2.7	2.5	3.2	3.3
20 to 54.....	3.8	3.8	4.1	3.8	4.0	4.7	6.1	5.8	5.9	6.3	6.3	6.2	6.0	7.1	5.8	5.7	8.2	11.1	12.9	11.0	11.6	11.5	14.5	14.2	14.7
55 to 74.....	5.4	5.4	6.0	6.2	7.1	7.2	9.5	10.0	11.1	9.7	9.8	9.4	12.3	10.3	7.0	11.7	14.7	16.8	18.7	16.8	16.5	16.0	18.4	21.6	23.7
WHITE MALES:																									
1 to 74 years.....	5.1	5.2	5.9	5.4	5.7	6.4	8.4	8.0	8.9	9.3	8.6	8.3	10.8	8.7	8.0	11.5	12.3	16.9	19.0	17.3	17.2	17.3	21.5	21.1	22.2
5 to 14.....	1.1	1.6	1.9	1.9	1.4	1.2	1.5	2.1	2.3	3.0	1.9	3.0	3.1	2.9	3.0	3.4	3.7	5.6	6.7	5.1	4.8	4.4	4.5	5.7	5.6
20 to 54.....	7.1	7.0	7.6	6.9	7.3	8.7	11.5	10.5	11.0	12.0	11.6	10.8	13.7	10.8	10.6	14.7	15.6	21.3	25.1	23.1	23.8	23.5	30.7	28.9	30.2
55 to 74.....	9.9	10.0	11.2	11.3	13.9	13.6	17.5	17.9	22.2	19.5	18.6	17.1	23.1	18.6	11.7	22.5	27.5	33.1	36.8	32.9	31.7	32.1	35.5	42.8	47.9
WHITE FEMALES:																									
1 to 74 years.....	0.7	0.7	0.7	0.9	0.8	1.0	1.2	1.4	1.4	1.2	1.2	1.3	1.3	0.9	1.1	1.2	1.6	1.7	1.9	1.3	1.0	0.9	1.1	1.5	1.3
5 to 14.....	0.5	0.5	0.5	0.5	0.5	0.5	0.9	0.6	1.2	1.0	0.4	0.6	0.4	0.3	0.4	0.7	1.3	1.4	1.0	1.0	0.7	0.5	0.6	1.0	0.6
20 to 54.....	0.5	0.6	0.7	0.9	1.0	1.0	1.2	1.5	1.4	1.0	1.3	1.6	1.1	0.8	1.2	1.2	1.4	1.5	2.0	0.9	0.9	0.7	0.8	1.2	1.1
55 to 74.....	1.5	1.5	1.8	2.0	1.2	2.1	2.9	3.1	2.0	1.6	2.4	2.9	3.4	3.2	2.9	2.4	4.0	2.9	4.0	3.7	2.9	2.9	4.5	4.8	4.6
COLORS MALES:																									
1 to 74 years.....	7.3	7.4	7.4	7.4	5.8	6.2	8.6	8.7	7.9	8.9	9.6	8.0	12.0	12.3	9.1	10.3	10.9	16.9	16.3	16.6	15.7	14.8	16.6	16.2	17.6
5 to 14.....	2.9	1.3	2.2	2.0	1.8	1.6	2.1	2.2	3.4	1.1	5.5	1.3	4.8	2.8	1.4	4.3	2.3	4.3	2.6	4.3	3.8	5.4	4.7	4.0	8.9
20 to 54.....	10.3	10.2	9.3	8.0	7.4	8.8	12.5	10.3	9.1	12.8	10.3	11.0	12.8	15.8	12.1	11.0	14.4	23.4	22.0	24.0	18.5	18.5	18.5	23.4	22.6
55 to 74.....	11.0	10.8	7.4	11.3	10.8	10.0	12.9	17.9	19.5	14.3	18.3	17.4	19.7	20.9	8.9	19.9	20.9	29.1	26.8	19.5	48.6	20.4	29.1	18.8	18.5
COLORS FEMALES:																									
1 to 74 years.....	0.8	0.7	0.4	0.7	1.5	0.9	1.3	1.3	1.4	0.5	0.8	1.6	0.9	0.6	1.0	1.8	1.8	2.8	1.4	1.8	0.9	1.3	0.8	1.9	1.9
5 to 14.....	1.3	0.7	...	0.6	...	0.6	0.5	0.5	1.1	...	...	1.9	...	...	0.8	...	0.7	3.3	1.6	...	...	1.0	...	...	1.8
20 to 54.....	0.6	0.5	0.7	0.9	1.7	1.2	1.0	0.7	2.3	0.8	1.1	1.1	1.8	1.1	0.2	2.0	2.0	2.6	1.9	...	1.5	1.4	1.7	2.2	1.9
55 to 74.....	0.7	...	...	1.1	5.5	...	4.6	7.5	...	0.9	2.3	3.5	...	1.1	5.9	6.3	6.7	7.1	1.5	4.5	1.6	4.0	...	4.5	3.8

APPENDIX TABLE C—Continued
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; COLOR, SEX, AND AGE	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
STREETCAR ACCI- DENTS—																									
Total Persons:																									
1 to 74 years.....	0.8	0.8	1.0	0.0	0.0	1.1	1.2	1.4	1.4	1.7	1.6	2.3	2.1	2.1	1.9	2.0	2.7	3.0	3.5	2.9	2.4	2.0	4.4	4.2	4.1
WHITE MALES:																									
1 to 74 years.....	1.4	1.3	1.5	1.3	1.7	2.2	2.3	2.2	2.8	2.8	2.7	3.4	3.5	3.5	3.0	3.1	4.0	5.7	6.0	5.1	4.2	4.9	7.9	7.2	7.5
WHITE FEMALES:																									
1 to 74 years.....	0.3	0.4	0.5	0.5	0.5	0.5	0.0	0.0	0.7	0.6	0.0	1.2	0.8	1.0	0.9	1.1	0.9	1.6	1.2	1.1	0.0	1.0	1.4	1.5	1.2
COLORED MALES:																									
1 to 74 years.....	1.0	1.2	1.5	1.6	1.6	1.2	2.1	1.6	1.9	2.2	2.5	3.0	3.3	1.6	2.7	1.5	1.5	5.0	6.1	3.3	2.1	3.8	4.0	5.0	5.8
COLORED FEMALES:																									
1 to 74 years.....	0.1	0.1	0.5	0.3	0.7	0.3	0.9	0.4	0.7	1.2	0.9	1.1	0.9	0.3	1.7	0.0	1.0	0.5	1.7	1.1	1.0	1.3	1.5	0.5	0.4
AUTOMOBILE ACCI- DENTS—																									
Total Persons:																									
1 to 74 years.....	22.3	23.2	21.5	20.5	24.1	23.0	23.4	20.3	20.4	18.2	18.0	16.9	16.6	14.2	12.7	11.5	11.0	10.8	10.0	7.8	5.0	5.0	4.4	3.1	2.4
1 to 14.....	12.1	13.2	13.4	13.5	16.1	16.3	18.1	17.1	18.2	17.3	17.4	17.2	17.1	17.0	15.7	15.6	14.7	13.7	11.6	9.5	7.2	0.1	5.2	3.8	3.3
15 to 54.....	22.2	23.1	20.9	19.3	23.1	21.1	20.3	19.5	16.9	15.3	14.6	13.7	13.5	10.9	9.4	7.5	7.3	7.0	7.7	5.0	4.2	3.8	3.2	2.3	2.0
55 to 74.....	53.7	54.7	50.7	48.4	54.5	56.5	57.3	52.6	40.0	37.5	40.8	35.1	33.1	25.1	23.3	22.7	21.2	20.8	18.6	14.3	9.5	8.8	9.9	6.1	4.9
WHITE MALES:																									
1 to 74 years.....	35.0	37.2	33.3	31.6	37.1	35.4	35.7	30.0	31.1	27.2	27.4	25.5	25.3	22.0	19.7	18.2	17.3	17.1	15.9	12.9	9.3	8.3	7.0	4.0	4.0
1 to 14.....	10.5	10.1	18.5	16.2	22.1	22.8	25.0	23.1	24.3	23.0	24.7	24.4	24.2	24.3	22.2	23.5	21.8	19.8	19.7	13.8	11.1	9.3	7.0	4.8	4.1
15 to 54.....	30.2	38.5	33.2	31.3	37.0	33.8	33.8	20.6	27.3	24.0	23.4	21.5	22.8	18.2	15.4	12.8	12.0	13.1	13.3	10.4	7.3	0.8	0.1	3.9	3.3
55 to 74.....	87.0	87.9	81.1	70.7	80.3	86.5	81.6	79.9	76.0	64.1	60.4	53.5	53.8	38.4	37.4	34.2	35.0	33.1	29.0	25.1	10.2	14.0	17.3	10.9	8.0
WHITE FEMALES:																									
1 to 74 years.....	10.5	10.0	10.5	10.2	11.9	11.5	11.1	10.7	10.8	9.9	9.5	9.0	8.0	7.7	0.7	0.0	5.4	5.2	4.9	3.4	2.0	2.3	1.8	1.7	1.0
1 to 14.....	7.0	7.0	8.4	0.0	10.0	9.0	11.4	11.2	12.1	11.0	10.7	10.3	10.7	10.0	9.5	8.8	8.0	7.7	7.3	5.1	3.8	3.4	2.8	0.8	0.8
15 to 54.....	9.2	9.4	0.2	8.1	9.3	9.3	7.0	7.4	7.4	6.0	6.4	6.5	5.2	4.8	4.4	3.1	3.4	3.0	2.7	2.1	1.7	1.4	0.9	1.1	0.9
55 to 74.....	20.3	27.0	25.8	20.8	32.5	20.0	29.0	20.2	27.0	25.1	25.4	20.1	10.4	14.7	11.0	14.1	9.5	10.0	10.2	0.0	4.1	4.4	4.4	2.2	2.3
COLORED MALES:																									
1 to 74 years.....	33.7	32.5	33.0	29.8	37.1	35.1	33.2	31.0	27.8	25.3	23.2	24.4	21.7	15.0	15.8	10.7	13.4	14.5	12.5	8.7	5.8	4.4	3.8	3.2	2.0
1 to 14.....	14.4	18.0	10.1	17.3	19.7	23.5	25.3	24.0	25.1	21.8	22.1	20.2	21.6	17.0	22.5	13.4	10.2	22.0	12.3	14.8	7.3	6.4	0.7	5.0	0.8
15 to 54.....	37.0	32.1	37.1	30.4	37.4	34.9	31.3	25.1	26.2	21.2	20.0	20.4	19.2	11.0	0.8	7.7	8.1	7.2	10.5	5.0	4.3	2.8	2.1	1.0	2.3
55 to 74.....	75.9	81.3	59.5	69.3	91.1	74.4	70.3	87.8	46.4	01.7	40.4	43.3	37.3	24.0	31.5	20.5	27.0	32.8	24.8	11.4	9.9	8.0	4.0	5.0	3.9
COLORED FEMALES:																									
1 to 74 years.....	10.2	8.9	10.3	11.1	11.7	10.0	11.1	9.4	9.2	0.8	9.5	7.9	6.1	4.0	3.8	3.0	4.2	3.2	3.5	2.7	1.5	0.8	1.3	0.8	1.2
1 to 14.....	6.0	4.5	7.9	7.1	7.8	8.3	10.2	8.0	10.8	9.5	7.5	5.9	5.2	4.8	5.1	6.1	0.3	3.4	2.5	4.4	1.8	1.2	2.7	0.7	1.4
15 to 54.....	9.0	8.5	6.0	10.7	11.5	8.1	9.7	7.1	6.9	8.1	8.6	7.3	4.7	2.5	2.7	2.2	2.5	2.8	3.5	1.0	0.7	0.7	0.4	0.3	0.5
55 to 74.....	21.3	24.1	26.4	20.6	25.7	20.7	21.9	25.9	17.9	21.5	20.8	17.0	14.7	10.2	6.4	3.7	0.7	5.0	0.7	2.3	5.4	....	1.8	4.5	4.9

APPENDIX TABLE C—*Concluded*
Standardized Annual Death Rates per 100,000 for Specified Causes
By Color, Sex, and Broad Age Periods
Metropolitan Life Insurance Company, Industrial Department, 1911 to 1935

CAUSE OF DEATH; Color, Sex, and Age	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911
ACCIDENTAL TRAUMA— TISM BY OTHER VEHICLES— Total Persons: 1 to 74 years.....	0.9	1.0	1.1	1.0	1.0	1.1	1.3	1.2	1.3	1.3	1.6	1.5	1.9	2.0	1.7	2.0	2.5	2.8	2.8	3.2	3.3	3.3	3.9	3.8	3.4
WHITE MALES: 1 to 74 years.....	1.6	2.0	2.0	1.8	1.9	2.0	2.3	2.2	2.3	2.5	3.0	2.7	3.6	3.8	3.0	3.9	4.8	5.3	5.2	5.9	6.0	6.0	6.9	6.8	6.0
WHITE FEMALES: 1 to 74 years.....	0.3	0.1	0.3	0.3	0.2	0.2	0.3	0.2	0.3	0.3	0.4	0.3	0.3	0.3	0.4	0.3	0.5	0.7	0.6	0.7	0.8	0.9	1.4	0.9	1.0
COLORED MALES: 1 to 74 years.....	1.6	1.2	1.0	1.8	1.8	1.8	3.0	2.4	2.8	1.7	2.9	2.0	3.1	3.7	3.1	3.4	3.4	3.5	4.3	5.5	6.3	4.8	3.8	6.9	6.6
COLORED FEMALES: 1 to 74 years.....	....	0.1	0.2	0.4	0.1	0.2	0.7	0.1	....	0.2	0.1	0.2	0.6	0.4	0.3	0.5	0.4	0.4	0.4	0.2	0.1	0.9	0.7	1.4	0.8
EXCESSIVE HEAT— Total Persons: 1 to 74 years.....	0.3	1.6	0.5	0.3	1.7	1.1	0.5	0.7	0.6	0.5	2.2	0.5	0.7	0.4	1.1	0.2	0.5	1.4	3.4	3.1	0.7	1.2	2.1	2.0	7.9
WHITE MALES: 1 to 74 years.....	0.4	2.4	0.7	0.5	2.7	1.5	0.7	1.2	1.0	0.6	3.2	0.6	0.9	0.6	1.5	0.3	0.6	1.8	5.1	5.3	0.9	1.9	3.1	2.9	12.2
WHITE FEMALES: 1 to 74 years.....	0.1	0.6	0.2	0.1	0.6	0.5	0.3	0.2	0.2	0.3	1.2	0.3	0.3	0.2	0.7	0.1	0.2	0.7	1.0	1.0	0.4	0.2	1.0	1.1	4.4
COLORED MALES: 1 to 74 years.....	0.8	4.8	1.4	1.3	2.7	3.1	1.8	1.8	1.5	2.2	3.0	1.0	2.8	1.1	2.6	0.9	1.8	4.7	3.7	5.7	2.3	3.9	5.8	3.1	5.8
COLORED FEMALES: 1 to 74 years.....	0.3	1.6	0.4	0.5	1.6	1.4	0.5	0.9	0.6	0.5	1.8	0.6	0.9	0.5	0.8	0.3	0.6	1.1	1.9	1.8	0.3	1.3	1.2	0.7	3.1
ELECTRICITY (light- ning excepted)— Total Persons: 1 to 74 years.....	0.4	0.4	0.4	0.5	0.6	0.9	1.0	0.8	0.9	1.0	1.1	1.1	0.9	0.9	1.0	1.0	1.1	1.2	0.8	1.2	0.7	0.9	1.2	1.0	0.9
WHITE MALES: 1 to 74 years.....	0.8	0.9	0.7	1.0	1.3	1.9	2.1	1.7	2.0	2.1	2.4	2.4	1.9	2.0	2.1	2.1	2.4	2.5	1.7	2.0	1.6	1.9	2.6	2.2	1.9
COLORED MALES: 1 to 74 years.....	0.6	0.5	0.5	0.3	1.0	0.5	0.7	0.8	0.5	0.9	0.9	0.4	1.0	0.1	0.8	1.3	0.6	1.1	1.1	0.9	0.7	0.5	0.4	1.2	0.4

APPENDIX TABLE D
ACCIDENTAL AND UNSPECIFIED VIOLENCE
Percentage Distribution of Deaths by Origin of Hazard for Principal Means of Injury
By Sex and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Department, 1926 to 1935

MEANS OF INJURY AGE PERIOD	TOTAL PERSONS						MALES						FEMALES					
	ORIGIN OF HAZARD SPECIFIED				Total Number of Deaths		ORIGIN OF HAZARD SPECIFIED				Total Number of Deaths		ORIGIN OF HAZARD SPECIFIED				Total Number of Deaths	
	PERCENTAGE DISTRIBUTION			Occu- pa- tional	Number of Deaths	PERCENTAGE DISTRIBUTION			Total Number of Deaths	PERCENTAGE DISTRIBUTION			Total Number of Deaths	PERCENTAGE DISTRIBUTION			Total Number of Deaths	
	Total	Home	Public			Total	Home	Public		Total	Home	Public						
														Total	Home	Public		Total	Home	Public	Total	Home	Public
Accidental and Un- specified Violence†	102,238	92,142	100.0	23.8	61.4	14.8	71,487	64,832	100.0	15.5	63.9	20.6	30,751	27,310	100.0	43.4	55.6	1.0
1 to 74 years....	8,823	7,787	100.0	54.3	45.7	...	5,062	4,476	100.0	49.7	50.3	...	3,761	3,311	100.0	60.6	39.4	...
1 to 4.....	16,012	14,617	100.0	13.7	85.9	0.4	11,729	10,737	100.0	9.4	90.1	0.5	4,283	3,880	100.0	25.5	74.4	0.1
5 to 14.....	66,247	59,862	100.0	18.7	60.0	21.3	49,305	44,760	100.0	12.3	59.7	28.0	16,942	15,102	100.0	37.9	60.5	1.6
15 to 64.....	11,156	9,876	100.0	45.3	46.6	8.1	5,391	4,859	100.0	27.4	56.7	15.9	5,765	5,017	100.0	62.6	36.8	0.6
Poisoning by Food	810	302	100.0	95.0	5.0	.....	402	145	100.0	93.1	6.9	.....	408	157	100.0	96.8	3.2	.....
1 to 74 years....	194	99	100.0	97.0	3.0	.....	113	51	100.0	98.0	2.0	.....	81	48	100.0	95.8	4.2	.....
1 to 4.....	118	46	100.0	95.7	4.3	.....	67	21	100.0	90.5	9.5	.....	51	25	100.0	100.0	.....	.....
5 to 14.....	438	139	100.0	92.8	7.2	.....	202	66	100.0	89.4	10.6	.....	236	73	100.0	95.9	4.1	.....
15 to 64.....	60	18	100.0	100.0	.....	.....	20	7	100.0	100.0	.....	.....	40	11	100.0	100.0	.....	.....
65 to 74.....																		
Other Acute Acci- dental Poisonings (gas excepted)	1,995	1,156	100.0	91.3	7.0	1.7	1,141	583	100.0	86.3	10.3	3.4	854	573	100.0	96.3	3.7	.....
1 to 74 years....	560	458	100.0	98.5	1.5	.....	322	256	100.0	98.0	2.0	.....	238	202	100.0	99.0	1.0	.....
1 to 4.....	87	49	100.0	79.6	20.4	.....	52	27	100.0	74.1	25.9	.....	35	22	100.0	86.4	13.6	.....
5 to 14.....	1,278	608	100.0	86.9	10.0	3.1	726	276	100.0	76.8	16.3	6.9	552	332	100.0	95.2	4.8	.....
15 to 64.....	70	41	100.0	90.3	7.3	2.4	41	24	100.0	83.3	12.5	4.2	29	17	100.0	100.0	.....	.....
65 to 74.....																		

†Excludes deaths from wounds of war.

APPENDIX TABLE D—Continued
 ACCIDENTAL AND UNSPECIFIED VIOLENCE
 Percentage Distribution of Deaths by Origin of Hazard for Principal Means of Injury
 By Sex and Age. Ages 1 to 74 Years
 Metropolitan Life Insurance Company, Industrial Department, 1926 to 1935

MEANS OF INJURY AGE PERIOD	TOTAL PERSONS										MALES					FEMALES				
	ORIGIN OF HAZARD SPECIFIED					ORIGIN OF HAZARD SPECIFIED					ORIGIN OF HAZARD SPECIFIED					ORIGIN OF HAZARD SPECIFIED				
	Total Number of Deaths	Number of Deaths	PERCENTAGE DISTRIBUTION			Total Number of Deaths	Number of Deaths	PERCENTAGE DISTRIBUTION			Total Number of Deaths	Number of Deaths	PERCENTAGE DISTRIBUTION			Total Number of Deaths	Number of Deaths	PERCENTAGE DISTRIBUTION		
			Total	Home	Public			Total	Home	Public			Total	Home	Public			Total	Home	Public
Conflagration	1,758	1,705	100.0	80.5	6.8	12.7	1,044	1,009	100.0	72.8	8.3	18.9	714	696	100.0	91.8	4.6	3.6		
1 to 74 years....	307	298	100.0	99.3	0.7	.....	175	169	100.0	99.4	0.6	.....	132	129	100.0	99.2	0.8	.....		
1 to 4.....	330	321	100.0	86.3	13.7	.....	180	176	100.0	83.5	16.5	.....	150	145	100.0	89.7	10.3	.....		
5 to 14.....	990	955	100.0	71.6	6.5	21.9	628	603	100.0	60.9	8.6	30.5	362	352	100.0	90.1	2.8	7.1		
15 to 64.....	131	131	100.0	88.6	6.1	5.3	61	61	100.0	85.2	3.3	11.5	70	70	100.0	91.4	8.6	.....		
65 to 74.....																				
Accidental Burns (Con- flagration excepted)	7,459	6,419	100.0	83.5	6.5	10.0	3,135	2,640	100.0	70.0	8.0	22.0	4,324	3,779	100.0	93.0	5.5	1.5		
1 to 74 years....	2,711	2,344	100.0	95.8	4.2	.....	1,277	1,122	100.0	97.1	2.9	.....	1,434	1,222	100.0	94.6	5.4	.....		
1 to 4.....	1,286	1,013	100.0	79.7	20.1	0.2	450	333	100.0	70.9	28.5	0.6	836	680	100.0	84.0	16.0	.....		
5 to 14.....	2,863	2,527	100.0	71.8	4.0	24.2	1,242	1,045	100.0	39.6	6.9	53.5	1,621	1,482	100.0	94.5	2.0	3.5		
15 to 64.....	599	535	100.0	92.3	2.6	5.1	166	140	100.0	77.1	8.6	14.3	433	395	100.0	97.7	0.5	1.8		
65 to 74.....																				
Accidental Absorption of Poisonous Gas	3,344	3,069	100.0	88.9	4.5	6.6	2,200	1,995	100.0	85.7	4.5	9.8	1,144	1,074	100.0	95.1	4.3	0.6		
1 to 74 years....	80	78	100.0	94.9	5.1	.....	43	43	100.0	93.0	7.0	.....	37	35	100.0	97.1	2.9	.....		
1 to 4.....	105	98	100.0	83.7	16.3	.....	59	53	100.0	81.1	18.9	.....	46	45	100.0	86.7	13.3	.....		
5 to 14.....	2,704	2,468	100.0	87.8	4.6	7.6	1,831	1,653	100.0	84.5	4.5	11.0	873	815	100.0	94.5	4.7	0.8		
15 to 64.....	455	425	100.0	96.0	0.9	3.1	267	246	100.0	93.5	1.2	5.3	188	179	100.0	99.4	0.6	.....		
65 to 74.....																				

APPENDIX TABLE D—Continued
ACCIDENTAL AND UNSPECIFIED VIOLENCE
Percentage Distribution of Deaths by Origin of Hazard for Principal Means of Injury
By Sex and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Department, 1926 to 1935

MEANS OF INJURY AGE PERIOD	TOTAL PERSONS						MALES						FEMALES					
	ORIGIN OF HAZARD SPECIFIED						ORIGIN OF HAZARD SPECIFIED						ORIGIN OF HAZARD SPECIFIED					
	Total Number of Deaths	Number of Deaths	PERCENTAGE DISTRIBUTION			Total Number of Deaths	Number of Deaths	PERCENTAGE DISTRIBUTION			Total Number of Deaths	Number of Deaths	PERCENTAGE DISTRIBUTION					
			Total	Home	Public			Total	Home	Public			Total	Home	Public			
																Occu- pa- tional	Occu- pa- tional	Occu- pa- tional
Accidental Drowning	10,679	10,405	100.0	1.9	91.4	6.7	9,155	100.0	1.3	91.1	7.6	1,290	100.0	6.0	93.4	0.6		
1 to 74 years....	651	602	100.0	18.4	81.6	....	476	100.0	16.8	83.2	....	175	100.0	22.8	77.2	....		
1 to 4.....	3,321	3,223	100.0	0.5	99.4	0.1	2,921	100.0	0.4	99.5	0.1	400	100.0	1.3	98.7	....		
5 to 14.....	6,486	6,362	100.0	0.9	88.6	10.5	5,805	100.0	0.6	87.8	11.6	681	100.0	3.9	94.9	1.2		
15 to 64.....	221	218	100.0	4.6	82.1	13.3	187	100.0	1.6	82.6	15.8	34	100.0	20.6	79.4	....		
65 to 74.....																		
Accidental Trauma- tism by Firearms	2,552	1,587	100.0	50.0	47.3	2.7	2,194	100.0	44.6	52.3	3.1	358	100.0	81.0	19.0	....		
1 to 74 years....	80	50	100.0	94.0	6.0	....	57	100.0	90.9	9.1	....	23	100.0	100.0	....	....		
1 to 4.....	579	364	100.0	55.2	44.8	....	511	100.0	52.9	47.1	....	68	100.0	73.2	26.8	....		
5 to 14.....	1,861	1,150	100.0	46.2	50.2	3.6	1,601	100.0	40.1	55.6	4.3	260	100.0	80.5	19.5	....		
15 to 64.....	32	23	100.0	65.2	34.8	....	25	100.0	55.6	44.4	....	7	100.0	100.0	....	....		
65 to 74.....																		
Accidental Trauma- tism by Fall	15,918	14,300	100.0	60.3	25.3	14.4	9,021	100.0	44.0	31.5	24.5	6,897	100.0	81.6	17.1	1.3		
1 to 74 years....	688	611	100.0	89.9	10.1	....	393	100.0	88.8	11.2	....	295	100.0	91.1	8.9	....		
1 to 4.....	997	864	100.0	41.8	57.9	0.3	734	100.0	36.8	62.7	0.5	263	100.0	55.8	44.2	....		
5 to 14.....	9,558	8,608	100.0	52.0	26.8	21.2	6,308	100.0	38.3	30.8	30.9	3,250	100.0	78.9	18.9	2.2		
15 to 64.....	4,675	4,217	100.0	76.7	17.7	5.6	1,586	100.0	59.2	25.3	15.5	3,089	100.0	85.5	13.9	0.6		
65 to 74.....																		

APPENDIX TABLE D—Continued
ACCIDENTAL AND UNSPECIFIED VIOLENCE
Percentage Distribution of Deaths by Origin of Hazard for Principal Means of Injury
By Sex and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Department, 1926 to 1935

MEANS OF INJURY Age Period	TOTAL PERSONS						MALES						FEMALES					
	ORIGIN OF HAZARD SPECIFIED			ORIGIN OF HAZARD SPECIFIED			ORIGIN OF HAZARD SPECIFIED			ORIGIN OF HAZARD SPECIFIED			ORIGIN OF HAZARD SPECIFIED			ORIGIN OF HAZARD SPECIFIED		
	Total Number of Deaths	Number of Deaths	PERCENTAGE DISTRIBUTION	Number of Deaths	PERCENTAGE DISTRIBUTION	PERCENTAGE DISTRIBUTION	Total Number of Deaths	Number of Deaths	PERCENTAGE DISTRIBUTION	PERCENTAGE DISTRIBUTION	PERCENTAGE DISTRIBUTION	Total Number of Deaths	Number of Deaths	PERCENTAGE DISTRIBUTION	PERCENTAGE DISTRIBUTION	Total Number of Deaths	Number of Deaths	PERCENTAGE DISTRIBUTION
			Total	Home	Public	Occu- pa- tional			Total	Home	Public	Occu- pa- tional			Total	Home	Public	Occu- pa- tional
Accidental Trauma- tism in Mines and Quarries	1,789	1,786	100.0	.....	9.0	91.0	1,774	1,772	100.0	.....	8.4	91.6	15	14	100.0	.....	92.9	7.1
1 to 74 years.....	7	7	100.0	.....	100.0	.....	5	5	100.0	.....	100.0	.....	2	2	100.0	.....	100.0	.....
1 to 4.....	68	66	100.0	.....	98.5	1.5	66	64	100.0	.....	98.4	1.6	2	2	100.0	.....	100.0	.....
5 to 14.....	1,675	1,674	100.0	.....	5.2	94.8	1,666	1,666	100.0	.....	4.8	95.2	9	8	100.0	.....	87.5	12.5
15 to 64.....	39	39	100.0	.....	5.1	94.9	37	37	100.0	.....	.....	100.0	2	2	100.0	.....	100.0	.....
65 to 74.....																		
Accidental Trauma- tism by Machines	1,951	1,864	100.0	4.3	9.0	86.7	1,836	1,765	100.0	2.9	7.6	89.5	115	99	100.0	28.3	33.3	38.4
1 to 74 years.....	43	36	100.0	61.1	38.9	.....	26	22	100.0	63.6	36.4	.....	17	14	100.0	57.1	42.9	.....
1 to 4.....	121	98	100.0	17.3	68.4	14.3	102	83	100.0	14.5	71.0	14.5	19	15	100.0	33.3	53.4	13.3
5 to 14.....	1,691	1,640	100.0	2.3	4.8	92.9	1,617	1,574	100.0	1.6	3.9	94.5	74	66	100.0	18.2	27.3	54.5
15 to 64.....	96	90	100.0	3.3	7.8	88.9	91	86	100.0	.....	7.0	93.0	5	4	100.0	75.0	25.0	.....
65 to 74.....																		
Railroad Accidents	5,647	5,639	100.0	.....	75.2	24.8	4,672	4,664	100.0	.....	70.2	29.8	975	975	100.0	.....	99.5	0.5
1 to 74 years.....	132	132	100.0	.....	100.0	.....	82	82	100.0	.....	100.0	.....	50	50	100.0	.....	100.0	.....
1 to 4.....	541	540	100.0	.....	99.8	0.2	400	399	100.0	.....	99.7	0.3	141	141	100.0	.....	100.0	.....
5 to 14.....	4,619	4,613	100.0	.....	71.2	28.8	3,907	3,901	100.0	.....	66.1	33.9	712	712	100.0	.....	99.3	0.7
15 to 64.....	355	354	100.0	.....	81.4	18.6	283	282	100.0	.....	76.6	23.4	72	72	100.0	.....	100.0	.....
65 to 74.....																		

APPENDIX TABLE D--Continued
ACCIDENTAL AND UNSPECIFIED VIOLENCE
Percentage Distribution of Deaths by Origin of Hazard for Principal Means of Injury
By Sex and Age. Ages 1 to 74 Years
Metropolitan Life Insurance Company, Industrial Department, 1926 to 1935

MEANS OF INJURY AGE PERIOD	TOTAL PERSONS						MALES						FEMALES					
	ORIGIN OF HAZARD SPECIFIED						ORIGIN OF HAZARD SPECIFIED						ORIGIN OF HAZARD SPECIFIED					
	Total Number of Deaths	Number of Deaths	PERCENTAGE DISTRIBUTION			Total Number of Deaths	Number of Deaths	PERCENTAGE DISTRIBUTION			Total Number of Deaths	Number of Deaths	Total Number of Deaths	Number of Deaths	PERCENTAGE DISTRIBUTION			Total Number of Deaths
			Total	Home	Public			Total	Home	Public					Total	Home	Public	
Streetcar Accidents	1,790	1,780	100.0	0.1	99.5	9.4	1,272	1,271	100.0	0.1	86.7	13.2	518	100.0	100.0	.....	.....	.....
1 to 4 years.....	93	93	100.0	.....	100.0	.....	50	50	100.0	.....	100.0	.....	45	100.0	100.0	.....	.....	.....
5 to 14.....	138	138	100.0	.....	100.0	.....	101	101	100.0	.....	100.0	.....	37	100.0	100.0	.....	.....	.....
15 to 64.....	1,317	1,316	100.0	0.1	88.1	11.8	979	978	100.0	0.1	83.9	16.0	338	100.0	100.0	.....	.....	.....
65 to 74.....	242	242	100.0	.....	95.0	5.0	142	142	100.0	.....	91.5	8.5	100	100.0	100.0	.....	.....	.....
Automobile Accidents	34,264	34,256	100.0	*	94.9	5.1	23,796	23,788	100.0	*	92.7	7.3	10,468	100.0	.....	*	99.9	0.1
1 to 4 years.....	2,452	2,452	100.0	.....	100.0	.....	1,535	1,535	100.0	.....	100.0	.....	917	100.0	100.0	.....	.....	.....
5 to 14.....	6,859	6,859	100.0	.....	99.7	0.3	4,921	4,921	100.0	.....	99.6	0.4	1,938	100.0	100.0	.....	.....	.....
15 to 64.....	21,853	21,853	100.0	*	92.5	7.5	15,519	15,511	100.0	*	89.5	10.5	6,442	100.0	100.0	*	99.5	0.5
65 to 74.....	2,992	2,992	100.0	.....	96.9	3.1	1,821	1,821	100.0	.....	95.1	4.9	1,171	100.0	100.0	.....	99.8	0.2
Accidental Trauma-																		
tism by Other																		
Vehicles																		
1 to 4 years.....	1,676	1,670	100.0	0.4	70.4	29.2	1,444	1,440	100.0	0.4	66.1	33.5	232	100.0	100.0	0.4	97.4	2.2
5 to 14.....	319	318	100.0	2.0	98.0	.....	63	62	100.0	3.2	96.8	.....	59	100.0	100.0	.....	100.0	.....
15 to 64.....	1,155	1,150	100.0	0.3	98.4	1.3	261	261	100.0	0.4	97.1	2.5	170	100.0	100.0	.....	100.0	.....
65 to 74.....	104	104	100.0	.....	61.6	38.1	1,035	1,032	100.0	0.3	37.7	52.9	19	100.0	100.0	0.9	99.1	0.9
					56.7	43.3	85	85	100.0	.....	47.1	52.9	19	100.0	100.0	.....	100.0	.....

*Less than 0.05 percent.

APPENDIX TABLE D—*Concluded*
 ACCIDENTAL AND UNSPECIFIED VIOLENCE
 Percentage Distribution of Deaths by Origin of Hazard for Principal Means of Injury
 By Sex and Age. Ages 1 to 74 Years
 Metropolitan Life Insurance Company, Industrial Department, 1926 to 1935

MEANS OF INJURY AGE PERIOD	TOTAL PERSONS							MALES							FEMALES										
	Total Number of Deaths	ORIGIN OF HAZARD SPECIFIED				Total Number of Deaths	Total Number of Deaths	ORIGIN OF HAZARD SPECIFIED				Total Number of Deaths	Total Number of Deaths	ORIGIN OF HAZARD SPECIFIED				Total Number of Deaths	Total Number of Deaths						
		Number of Deaths	PERCENTAGE DISTRIBUTION					Number of Deaths	Total	Home	Public			Occu- pa- tional	Number of Deaths	PERCENTAGE DISTRIBUTION				Number of Deaths	Total	Home	Public	Occu- pa- tional	
			Total	Home	Public											Occu- pa- tional	Total								Home	Public	Occu- pa- tional
Excessive Heat	1,261	574	100.0	24.7	47.6	27.7	876	404	100.0	14.6	46.8	38.6	385	170	100.0	48.8	49.4	1.8							
1 to 74 years....	35	15	100.0	53.3	46.7	.....	14	5	100.0	60.0	40.0	.....	21	10	100.0	50.0	50.0	.....							
1 to 4.....	32	11	100.0	18.2	81.8	.....	26	9	100.0	22.2	77.8	.....	6	2	100.0	.....	100.0	.....							
5 to 14.....	988	446	100.0	21.8	46.6	31.6	734	341	100.0	12.9	46.3	40.8	254	105	100.0	50.5	47.6	1.9							
15 to 64.....	206	102	100.0	34.3	48.0	17.7	102	49	100.0	20.4	44.9	34.7	104	53	100.0	47.2	50.9	1.9							
65 to 74.....																									
Electricity (lightning excepted)	961	867	100.0	9.1	18.0	72.9	911	827	100.0	6.4	17.7	75.9	50	40	100.0	65.0	25.0	10.0							
1 to 74 years....	11	10	100.0	90.0	10.0	.....	8	7	100.0	85.7	14.3	.....	3	3	100.0	100.0	.....	.....							
1 to 4.....	112	82	100.0	12.2	87.8	.....	97	72	100.0	11.1	88.9	.....	15	10	100.0	20.0	80.0	.....							
5 to 14.....	827	765	100.0	7.5	10.3	82.2	799	742	100.0	5.1	10.4	84.5	28	23	100.0	82.6	8.7	8.7							
15 to 64.....	11	10	100.0	30.0	40.0	30.0	7	6	100.0	16.7	66.6	16.7	4	4	100.0	50.0	.....	50.0							
65 to 74.....																									

INDEX



INDEX

(Page numbers in italics refer to tables in Appendix II)

	PAGE		PAGE
— A —		American Red Cross, automobile accident prevention.....	455
Abscess, acute; deaths and crude death rate.....	537	Amputations, and other diseases of the organs of locomotion; deaths and crude death rate...	537
Accidental and unspecified vio- lence.....	431-520	Anemia, chlorosis; deaths and crude death rate.....	533
age incidence.....	433	Anemia, pernicious.....	379-381
color incidence.....	434	annual death rates.....	575
death rates, annual.....	582	deaths and crude death rate.	533
deaths and crude death rate.	538	Angina pectoris....	267-276, 278-281
home accidents.....	438, 591	age incidence.....	273, 280
importance as cause of death	431	color incidence.....	275, 281
insured and general popula- tion compared.....	432	death rates, annual.....	568
means of injury.....	438, 440	deaths and crude death rate.	534
occupational accidents....	438, 591	importance as a cause of death	245
origin of hazard....	438, 440, 591	sex incidence.....	274, 280
public accidents.....	438, 591	syphilis a causative factor...	282
rank as cause of death....	404, 433	trend of mortality.....	269, 278
sex incidence.....	434	interpretation.....	281
trend of mortality.....	436	Animals, injuries by; deaths and crude death rate.....	539
U. S. Registration States of 1920.....	432	Ankylostomiasis, deaths and crude death rate.....	536
<i>see also</i> Automobile accidents;		Anthrax, deaths and crude death rate.....	532
Burns, accidental; Confla- gration, accidental death from; Drowning, accidental; Electricity, accidental death from; Fall, traumatism by; Firearms, traumatism by; Heat, excessive; Machines, traumatism by; Mines and quarries, traumatism in; Poisoning by food; Poison- ing, chronic; Poisoning, other acute accidental; Poisonous gas, absorption of; Railroad accidents; Streetcar acci- dents; Vehicles, other, trau- matism by.		Apoplexy, <i>see</i> Cerebral hemor- rhage.	
Adrenals, diseases of (Addison's disease); deaths and crude death rate.....	533	Appendicitis.....	388-391
After-lifetime, mean, <i>see</i> Expec- tation of life.		death rates, annual.....	577
Alcoholism, acute or chronic; deaths and crude death rate..	533	deaths and crude death rate.	536
All causes of death combined, <i>see</i> Mortality from all causes of death combined.		Arteries, diseases of.....	312-316
Allen, F. M., undernutrition treatment of diabetes.....	332	death rates, annual.....	569
		deaths and crude death rate.	534
		importance as cause of death.....	245, 312
		trend of mortality.....	315
		Arteriosclerosis, age incidence...	313
		cerebral hemorrhage and....	307
		classification of deaths.....	313
		color incidence.....	313
		death rates, annual.....	569
		deaths and crude death rate.	534
		sex incidence.....	313
		trend of mortality.....	315

- | | PAGE | | PAGE |
|--|---------|---|----------|
| Asiatic cholera, deaths and crude death rate..... | 531 | Burns, accidental..... | 480-485 |
| Asthma, deaths and crude death rate..... | 535 | age, color, and sex incidence..... | 480 |
| Automobile accidents..... | 443-456 | death rates, annual..... | 584 |
| age incidence..... | 445 | deaths and crude death rate..... | 538 |
| classification..... | 444 | origin of hazard..... | 484, 592 |
| color incidence..... | 446 | specific agencies of..... | 484 |
| death rates, annual..... | 589 | trend of mortality..... | 481 |
| deaths and crude death rate..... | 539 | | |
| insured and general population compared..... | 451 | — C — | |
| origin of hazard..... | 595 | Cabot, R. C., cancer diagnosis.. | 166 |
| prevention..... | 455 | Cancer..... | 163-225 |
| rank among other accidental deaths..... | 445 | Cancer—all forms..... | 165-185 |
| sex incidence..... | 445 | age incidence..... | 168 |
| trend of mortality..... | 448 | classification of deaths.... | 165, 183 |
| factors involved..... | 449 | color incidence..... | 172 |
| types of..... | 451 | death rates, annual..... | 553 |
| U. S. and foreign countries compared..... | 443 | deaths and crude death rate..... | 532 |
| Average length of life, <i>see</i> Expectation of life. | | diagnosis, accuracy of.... | 165, 183 |
| | | importance as cause of death..... | 166 |
| — B — | | influenza epidemic of 1918-1919, effect of..... | 173 |
| Benign tumors, deaths and crude death rate..... | 533 | organs or parts affected..... | 167 |
| Beriberi, deaths and crude death rate..... | 533 | rank as cause of death..... | 166 |
| Bigelow, G. H., cancer diagnosis | 183 | sex incidence..... | 168 |
| Biliary calculi..... | 399-400 | sites..... | 167 |
| death rates, annual..... | 579 | accessibility of..... | 181 |
| deaths and crude death rate..... | 536 | statistics, accuracy of..... | 165 |
| Bladder, diseases of; deaths and crude death rate..... | 536 | trend of mortality..... | 172 |
| Bones, diseases of (tuberculosis excepted); deaths and crude death rate..... | 537 | by accessibility of organs affected..... | 181 |
| Breast, nonpuerperal diseases of (cancer excepted); deaths and crude death rate..... | 537 | by age..... | 175 |
| Bright's disease, <i>see</i> Nephritis, chronic. | | by color and sex..... | 174 |
| Bronchitis, acute, and bronchitis unspecified under 5 years of age; deaths and crude death rate.. | 535 | by organs affected..... | 179 |
| Bronchitis, chronic, and bronchitis unspecified 5 years and over; deaths and crude death rate..... | 535 | insured and general population compared..... | 178 |
| Bronchopneumonia, <i>see</i> Pneumonia, broncho- | | interpretation..... | 184 |
| | | U. S. Registration States of 1920..... | 178 |
| | | Cancer of the anus, <i>see</i> Cancer of the rectum and anus. | |
| | | Cancer of the bladder..... | 223 |
| | | death rates, annual..... | 561 |
| | | Cancer of the breast..... | 206-209 |
| | | age incidence..... | 206 |
| | | color incidence..... | 207 |
| | | death rates, annual..... | 558 |
| | | deaths and crude death rate..... | 532 |
| | | trend of mortality..... | 207 |
| | | interpretation..... | 208 |
| | | Cancer of the buccal cavity..... | 210-213 |
| | | age incidence..... | 211 |
| | | color incidence..... | 212 |
| | | control..... | 212 |
| | | death rates, annual..... | 554 |
| | | deaths and crude death rate..... | 532 |
| | | sex incidence..... | 211 |
| | | trend of mortality..... | 212 |

- | | PAGE | | PAGE |
|--|---------|---|----------|
| Cancer of the Fallopian tube, <i>see</i> | | Cancer of the skin..... | 214-218 |
| Cancer of the ovary and Fal- | | age incidence..... | 215 |
| lopian tube. | | color incidence..... | 216 |
| Cancer of the female genital | | death rates, annual..... | 559 |
| organs..... | 200-205 | deaths and crude death rate. | 532 |
| age and color incidence..... | 201 | sex incidence..... | 215 |
| death rates, annual..... | 557 | trend of mortality..... | 216 |
| deaths and crude death rate. | 532 | Cancer of the stomach..... | 191 |
| trend of mortality..... | 202 | death rates, annual..... | 555 |
| interpretation..... | 203 | Cancer of the stomach, liver. | 186-193 |
| Cancer of the gall bladder, <i>see</i> | | age incidence..... | 188 |
| Cancer of the liver and gall | | color incidence..... | 189 |
| bladder. | | death rates, annual..... | 554 |
| Cancer of the intestines; age, | | deaths and crude death rate. | 532 |
| color, and sex incidence..... | 198 | importance as cause of death | 186 |
| death rates, annual..... | 556 | sex incidence..... | 188 |
| <i>see also</i> Cancer of the peri- | | trend of mortality..... | 189 |
| toneum, intestines, and | | Cancer of the uterus..... | 204 |
| rectum. | | death rates, annual..... | 558 |
| Cancer of the liver and gall | | Carbon monoxide poisoning, <i>see</i> | |
| bladder; age, color, and sex in- | | Poisonous gas, absorption of. | |
| cidence..... | 192 | Carbuncle, <i>see</i> Furuncle and car- | |
| death rates, annual..... | 555 | buncle. | |
| <i>see also</i> Cancer of the stomach, | | Cardiovascular-renal diseases. | 227-316 |
| liver. | | age incidence..... | 235 |
| Cancer of the lung and pleura; | | classification of deaths | |
| age and sex incidence..... | 223 | 229, 231, 232 | |
| death rates, annual..... | 560 | color incidence..... | 239, 243 |
| Cancer of other or unspecified | | contributory to other causes | |
| organs..... | 219-225 | of death..... | 231 |
| age incidence..... | 220 | death rates, annual..... | 562 |
| color incidence..... | 221 | heredity as a factor..... | 244 |
| death rates, annual..... | 559 | importance as cause of death | |
| deaths and crude death rate. | 532 | 229, 233 | |
| sex incidence..... | 221 | infection as a causative factor | |
| trend of mortality..... | 221 | 230, 244 | |
| Cancer of the ovary and Fallo- | | probability of dying from... | 229 |
| pian tube..... | 204 | rank of each cardiovascular- | |
| death rates, annual..... | 558 | renal disease..... | 245 |
| Cancer of the pancreas..... | 224 | sex incidence..... | 238 |
| death rates, annual..... | 560 | trend of mortality..... | 239 |
| Cancer of the peritoneum, intes- | | colored persons..... | 241, 242 |
| tines, and rectum..... | 194-199 | white persons..... | 240, 242 |
| age, color, and sex incidence. | 195 | <i>see also</i> Angina pectoris; | |
| death rates, annual..... | 556 | Arteries, diseases of; Cere- | |
| deaths and crude death rate. | 532 | bral hemorrhage; Coronary | |
| importance as cause of death | 194 | arteries, diseases of; Heart, | |
| trend of mortality..... | 196 | organic diseases of; Nephri- | |
| Cancer of pleura, <i>see</i> Cancer of | | tis, chronic. | |
| the lung and pleura. | | Causes of death, classification.. | 525 |
| Cancer of the prostate..... | 224 | <i>see also</i> under individual | |
| death rates, annual..... | 561 | causes. | |
| Cancer of the rectum and anus. | 199 | Cerebral hemorrhage..... | 300-311 |
| death rates, annual..... | 557 | age, color, and sex incidence. | 302 |
| | | death rates, annual..... | 563 |
| | | deaths and crude death rate. | 534 |
| | | importance as cause of death | |
| | | 245, 300 | |

- | | PAGE | | PAGE |
|---|------------|---|----------|
| Cerebral hemorrhage— <i>Continued</i> | | Conflagration, accidental death | |
| influenza epidemic of 1918– | | from..... | 486–489 |
| 1919, effect of..... | 136 | age, color, and sex incidence. | 486 |
| trend of mortality..... | 304 | death rates, annual..... | 584 |
| by age..... | 307 | deaths and crude death rate. | 538 |
| colored persons..... | 306 | origin of hazard..... | 488, 592 |
| interpretation..... | 308 | prevention..... | 488 |
| white persons..... | 305 | trend of mortality..... | 488 |
| U. S. Registration States of | | Congenital malformations, deaths | |
| 1920..... | 304 | and crude death rate..... | 538 |
| Chancre, soft, and gonococcus in- | | Congestion and hemorrhagic in- | |
| fection; deaths and crude death | | farct of the lung, deaths and | |
| rate..... | 532 | crude death rate..... | 535 |
| Chickenpox, deaths and crude | | Conner, L. A., prognosis in coro- | |
| death rate..... | 532 | nary thrombosis..... | 283 |
| Childbearing, <i>see</i> Puerperal state, | | Convulsions, infantile; deaths and | |
| diseases of. | | crude death rate..... | 534 |
| Childhood, communicable dis- | | Convulsions, nonpuerperal; | |
| eases of, <i>see</i> Communicable dis- | | deaths and crude death rate... | 534 |
| eases of childhood. | | Coronary arteries, diseases of | |
| Children, <i>see</i> Age incidence, under | | 267, 276–278, 281 | |
| individual causes of death. | | age incidence..... | 273 |
| Chlorosis, <i>see</i> Anemia, chlorosis. | | color incidence..... | 275 |
| Cholera nostras, deaths and crude | | deaths and crude death rate. | 534 |
| death rate..... | 531 | sex incidence..... | 274 |
| Chorea, deaths and crude death | | syphilis a causative factor... | 282 |
| rate..... | 534 | trend of mortality..... | 269 |
| Chyluria, deaths and crude death | | future..... | 284 |
| rate..... | 536 | interpretation..... | 281 |
| Cirrhosis of the liver..... | 397–398 | Coronary arteries, diseases of, | |
| death rates, annual..... | 579 | and angina pectoris..... | 267–284 |
| deaths and crude death rate. | 536 | deaths and crude death rate. | 534 |
| Classification of causes of death | | Craig, J. D., economic status and | |
| 524, 525 | | pneumonia mortality..... | 138 |
| supplementary information | | Cutting or piercing instruments, | |
| from physicians..... | 526 | accidental traumatism by; | |
| <i>see also</i> under individual | | deaths and crude death rate.. | 539 |
| causes. | | | |
| Cold, excessive; deaths and crude | | | |
| death rate..... | 539 | | |
| Collins, Selwyn D., age incidence | | | |
| of specific causes of illness... | 248 | | |
| Communicable diseases of child- | | | |
| hood..... | 43–78 | | |
| death rates, annual..... | 545 | Deaths from all causes, <i>see</i> Mor- | |
| importance as cause of death | 47 | tality from all causes of death | |
| prevention..... | 52 | combined. | |
| sequelae..... | 46 | Deaths from specific causes, | |
| treatment..... | 50 | classification..... | 524 |
| trend..... | 45, 47, 51 | <i>see also</i> under individual | |
| U. S. Registration States of | | causes. | |
| 1920..... | 46 | Degenerative diseases, <i>see</i> Car- | |
| years of life lost from..... | 46 | diovascular-renal diseases. | |
| <i>see also</i> Diphtheria; Measles; | | Denny, Francis P., classification | |
| Scarlet fever; Whooping | | of deaths from heart disease.. | 271 |
| cough. | | DePorte, J. V., heart disease in | |
| | | New York State..... | 248 |

— D —

	PAGE		PAGE
Diabetes mellitus.....	317-342	Dublin, Louis I., economic status and pneumonia mortality.....	138
age distribution of the popula- tion as a factor.....	333	influence of weight on certain causes of death.....	310
age incidence.....	319	<i>Length of Life—A Study of the Life Table.</i>	35
color incidence.....	322	Dublin, Mary, study of maternal mortality.....	352
coma.....	338	Dysentery, deaths and crude death rate.....	531
death rates, annual.....	571		
deaths and crude death rate.....	533	— E —	
diagnosis.....	335	Ear, diseases of; deaths and crude death rate.....	534
factors in the increase of....	332	Electricity (lightning excepted), accidental death from.....	500-503
heredity a factor.....	341	age incidence.....	500
insulin treatment... 324, 337,	338	death rates, annual.....	590
insured and general popula- tion compared.....	330	deaths and crude death rate.....	539
living standards as a factor..	334	origin of hazard.....	502, 596
longevity of diabetics.....	338	prevention.....	503
overweight as a factor.....	335	trend of mortality.....	501
population changes as a factor	332	Embolism and thrombosis, deaths and crude death rate.....	535
prevention.....	341	Empysema, pulmonary; deaths and crude death rate.....	535
racial susceptibility.....	333	Encephalitis, deaths and crude death rate.....	534
rank as cause of death.....	319	Encephalitis, lethargic, see Le- thargic encephalitis.	
sex incidence.....	321	Endocarditis and myocarditis, acute; deaths and crude death rate.....	534
trend of mortality.....	323	Endocarditis, chronic, and valvular heart disease.....	260
by age and sex... 326, 328,	329	death rates, annual.....	567
by color and sex.....	325	Enteritis, see Diarrhea and en- teritis.	
future.....	340	Epilepsy, deaths and crude death rate.....	534
U. S. Registration States of 1920.....	323, 331	Erysipelas, deaths and crude death rate.....	531
urban and rural differences..	332	Esophagus, diseases of; deaths and crude death rate.....	535
urbanization a factor in in- crease.....	333	Excessive heat, see Heat, exces- sive.	
Diarrhea and enteritis.....	386-387	Exophthalmic goiter, see Goiter, exophthalmic.	
death rates, annual.....	577		
deaths and crude death rate.....	536		
Diphtheria.....	54-60		
age incidence.....	55		
antitoxin.....	58		
color incidence.....	56		
death rates, annual.....	547		
deaths and crude death rate.....	531		
immunization.....	59		
New York City, 1880 to 1934	57		
prevention.....	4, 60		
Schick test.....	59		
sex incidence.....	55		
trend of mortality.....	56		
U. S. Registration States of 1920.....	56		
see also Communicable dis- eases of childhood.			
Drowning, accidental.....	475-479		
age, color, and sex incidence.....	475		
death rates, annual.....	585		
deaths and crude death rate.....	538		
origin of hazard.....	479, 593		
prevention.....	479		
trend of mortality.....	477		

- | | PAGE | | PAGE |
|---|------------------------------|--|----------|
| Expectation of life..... | 33-42 | — G — | |
| at birth..... | 35 | Gallstone disease, <i>see</i> Biliary calculi. | |
| by age, color, and sex..... | 37 | Gangrene, deaths and crude death rate..... | 537 |
| insured and general population compared..... | 41 | Gangrene of the lung, deaths and crude death rate..... | 535 |
| life table for 1935..... | 34 | Gas, poisonous, accidental absorption of, <i>see</i> Poisonous gas. | |
| relation to death rate in stationary population..... | 33 | General paralysis of the insane, <i>see</i> Syphilis. | |
| trend..... | 3, 39 | Genital organs, female, non-venereal diseases of; deaths and crude death rate..... | 537 |
| United States..... | 42 | Genital organs, male, nonvenereal diseases of; deaths and crude death rate..... | 536 |
| Exposure, Metropolitan Life Insurance Company, Industrial Department..... | 15 | Glanders, deaths and crude death rate..... | 532 |
| age limits..... | 523 | Goiter, exophthalmic..... | 377-378 |
| estimating number of policyholders exposed to risk.... | 523 | death rates, annual..... | 575 |
| External causes of death.... | 401-520 | deaths and crude death rate. | 533 |
| by class of violence..... | 404 | Gonococcus infection <i>see</i> Chancre, soft, and gonococcus infection. | |
| classification of deaths..... | 403 | Gout, <i>see</i> Rheumatism, chronic, osteoarthritis, gout. | |
| importance as cause of death | 404 | | |
| <i>see also</i> Accidental and unspecified violence; Homicide; Suicide. | | | |
| Eye and annexa, diseases of; deaths and crude death rate.. | 534 | — H — | |
| — F — | | Halsey, Robert H., changing diagnosis in heart disease..... | 263 |
| Fall, traumatism by..... | 468-474 | Heart, organic diseases of... | 248-266 |
| age incidence..... | 468 | age incidence..... | 252 |
| color incidence..... | 471 | color incidence..... | 254 |
| death rates, annual..... | 586 | death rates, annual..... | 564, 565 |
| deaths and crude death rate. | 539 | deaths and crude death rate. | 534 |
| origin of hazard..... | 472, 593 | importance as a cause of death | 245, 248 |
| sex incidence..... | 469 | infection as a causative factor | 264 |
| trend of mortality..... | 471 | influenza epidemic of 1918-1919, effect of..... | 136 |
| types of fatal falls..... | 473 | morbidity..... | 248 |
| Firearms, traumatism by... | 490-493 | probability of dying from... | 248 |
| age and color incidence.... | 490 | sex incidence..... | 253 |
| death rates, annual..... | 586 | syphilis as a causative factor. | 264 |
| deaths and crude death rate | 538 | trend of mortality..... | 254 |
| geographic distribution..... | 492 | by age..... | 256 |
| origin of hazard..... | 491, 593 | by type of heart disease... | 261 |
| prevention..... | 492 | colored persons..... | 256 |
| trend of mortality..... | 490 | future..... | 265 |
| Fishberg, Arthur M., study of hypertension and nephritis | 287, 289, 291, 307, 308, 310 | white persons..... | 255 |
| Folin, Otto, blood-sugar test... | 336 | types of heart disease..... | 260 |
| Food, poisoning by, <i>see</i> Poisoning by food. | | U. S. Registration States of 1920..... | 249 |
| Furuncle and carbuncle, deaths and crude death rate..... | 537 | <i>see also</i> Endocarditis; Myocardial disease. | |

	PAGE		PAGE
Heat, excessive, mortality from		Influenza— <i>Continued</i>	
517–520		occupational influences.....	138
age, color, and sex incidence.	517	sex incidence.....	159
death rates, annual.....	590	trend of mortality.....	160
deaths and crude death rate.	539	<i>see also</i> Influenza and pneu-	
geographic distribution.....	517	monia; Influenza epidemic	
origin of hazard.....	520, 596	of 1918–1919.	
Hemorrhage without specified		Influenza and pneumonia...115–161	
cause and other diseases of the		age incidence.....	121
circulatory system; deaths and		classification of deaths.....	117
crude death rate.....	535	color incidence.....	124
Hemorrhagic infarct of the lung,		contributory to other causes	
<i>see</i> Congestion and hemorrhagic		of death.....	120
infarct of the lung.		death rates, annual.....	551
Hernia.....	392–393	deaths and crude death rate.	531
death rates, annual.....	578	rank as cause of death.....	119
deaths and crude death rate.	536	sex incidence.....	123
Herrick, James B., the coronary		trend of mortality.....	124
origin of angina pectoris...267, 268		<i>see also</i> Influenza; Influenza	
Hodgkin's disease, deaths and		epidemic of 1918–1919;	
crude death rate.....	533	Pneumonia—all forms;	
Holt, E., prognosis in coronary		Pneumonia, broncho-; Pneu-	
thrombosis.....	283	monia, lobar and unspecified.	
Home accidents, <i>see</i> Accidental		Influenza epidemic of 1918–1919	
and unspecified violence.		125–138	
Homicide.....	420–430	age, color, and sex incidence	
age incidence.....	421	of deaths.....	129
color incidence.....	422	deaths, number of.....	127
death rates, annual.....	581	effect on mortality from:	
deaths and crude death rate.	539	all causes combined.....21, 134	
definition.....	420	cancer.....	173
geographic distribution.....	424	cerebral hemorrhage.....	136
methods used.....	428, 539	chronic nephritis.....	136
prevention.....	429	organic heart disease.....	136
rank as cause of death.....	404	puerperal causes.....	134
sex incidence.....	422	tuberculosis.....89, 136	
trend of mortality.....	424	Insulin treatment of diabetes	
insured and general popula-		324, 337, 338	
tion compared.....	424	Intestinal obstruction.....	394–396
United States and foreign		death rates, annual.....	578
countries compared.....	420	deaths and crude death rate.	536
urban and rural differences..	428		
		— J —	
— I —		Joints, diseases of; deaths and	
Industrial policyholders, <i>see</i>		crude death rate.....	537
Metropolitan Life Insurance		Joslin, Elliott P., diabetes con-	
Company.		trol program.....	342
Influenza.....	157–161	diabetic children in the pre-	
age incidence.....	158	insulin era.....	338
classification of deaths.....	117	diagnosis of diabetes from Life	
color incidence.....	160	insurance examinations....	337
death rates, annual.....	551	overweight and diabetes....	335
deaths and crude death rate.	531	— L —	
historic outbreaks.....	126	Larynx, diseases of; deaths and	
importance as cause of death		crude death rate.....	535
120, 157		Lead poisoning, chronic; deaths	
		and crude death rate.....	533

- | | PAGE | | PAGE |
|--|---------|---|---------|
| Leading causes of death, rank. 27, 29 | | Maternal mortality, <i>see</i> Puerperal state, diseases of. | |
| Length of life, average, <i>see</i> Expectation of life. | | Mean after-lifetime, <i>see</i> Expectation of life. | |
| Leprosy, deaths and crude death rate..... | 531 | Measles..... | 61-66 |
| Lethargic encephalitis, deaths and crude death rate..... | 531 | age incidence..... | 61 |
| Leukemia, deaths and crude death rate..... | 533 | color incidence..... | 62 |
| Life table, description..... | 35, 524 | death rates, annual..... | 545 |
| Metropolitan Life Insurance Company, Industrial Department, total persons, 1935..... | 34 | deaths and crude death rate..... | 531 |
| Lightning, deaths and crude death rate..... | 539 | prevention of deaths..... | 65 |
| Liver, acute yellow atrophy of; deaths and crude death rate.. | 536 | sex incidence..... | 62 |
| Liver, cirrhosis of; annual death rates..... | 579 | trend of mortality..... | 63 |
| deaths and crude death rate.. | 536 | U. S. Registration States of 1920..... | 64 |
| Liver, hydatid tumor of; deaths and crude death rate..... | 536 | <i>see also</i> Communicable diseases of childhood. | |
| Lobar pneumonia, <i>see</i> Pneumonia, lobar and unspecified. | | Measles, German; deaths and crude death rate..... | 532 |
| Locomotor ataxia, <i>see</i> Syphilis. | | Medicine, advances in..... | 5 |
| Lombard, H. L., cancer diagnosis | 183 | Meningitis, deaths and crude death rate..... | 534 |
| Longevity, <i>see</i> Expectation of life. | | Meningitis, tubercular, <i>see</i> Tuberculosis of the meninges and the central nervous system. | |
| Lotka, Alfred J., <i>Length of Life—A Study of the Life Table</i> | 35 | Meningococcus meningitis, deaths and crude death rate..... | 532 |
| Lymphatic system, diseases of; deaths and crude death rate.. | 535 | Mental alienation (except general paralysis of the insane), deaths and crude death rate..... | 534 |
| — M — | | | |
| Machines, traumatism by... 497-499 | | Methods of compilation and analysis of data used in this report | 521-528 |
| age and color incidence..... | 497 | Metropolitan Life Insurance Company, industrial hygiene work..... | 7 |
| death rates, annual..... | 587 | Industrial policyholders..... | 7-12 |
| deaths and crude death rate.. | 539 | age distribution..... | 8, 523 |
| origin of hazard..... | 504 | classifying and tabulating data for deaths..... | 524 |
| prevention..... | 499 | color distribution..... | 10 |
| trend of mortality..... | 498 | deaths, total..... | 15 |
| Malaria, deaths and crude death rate..... | 531 | geographic distribution.... | 8 |
| Malta fever, <i>see</i> Relapsing fever and Malta fever. | | number of..... | 15, 523 |
| Marks, H. H., the influence of weight on mortality..... | 310 | occupational distribution.. | 8 |
| Mastoid process, diseases of; deaths and crude death rate.. | 534 | sex distribution..... | 8 |
| | | social-economic status.... | 7 |
| | | standardization of death rates..... | 11 |
| | | years of life exposed to risk | 15 |
| | | Influenza-Pneumonia Commission..... | 7, 149 |
| | | nursing service..... | 6 |
| | | pneumonia campaign..... | 151 |
| | | public health work..... | 6, 7 |
| | | Miliary fever, deaths and crude death rate..... | 531 |

- | | PAGE | | PAGE |
|---|--------------|---|----------|
| Mines and quarries, traumatism | | Nephritis, chronic..... | 285-299 |
| in..... | 494-496 | age incidence..... | 287 |
| age and color incidence..... | 495 | associated conditions..... | 286 |
| death rates, annual..... | 587 | classification of deaths... 285, | 298 |
| deaths and crude death rate. | 539 | color incidence..... | 291 |
| origin of hazard..... | 594 | diagnosis, accuracy of..... | 297 |
| trend of mortality..... | 495 | death rates, annual..... | 570 |
| Mortality from all causes of death | | deaths and crude death rate. | 536 |
| combined..... | 15-30 | importance as cause of | |
| age incidence..... | 17, 541 | death..... | 245, 286 |
| classification of deaths..... | 524 | infection a causative factor.. | 287 |
| color incidence..... | 19, 541 | influenza epidemic of 1918- | |
| death rates, annual, by age, | | 1919, effect of..... | 136 |
| color, and sex..... | 541 | insured and general popula- | |
| influenza epidemic of 1918- | | tion compared..... | 292 |
| 1919, effect of..... | 21, 134, 136 | sex incidence..... | 290 |
| insured and general popula- | | trend of mortality..... | 292 |
| tion compared..... | 24 | future..... | 299 |
| sex incidence..... | 18, 541 | interpretation..... | 295 |
| trend of mortality..... | 21 | U. S. Registration States of | |
| by age, color, and sex..... | 22 | 1920..... | 293 |
| U. S. Registration States of | | Neuralgia and neuritis, deaths | |
| 1920..... | 26 | and crude death rate..... | 534 |
| Mortality from specific causes of | | Neuritis, <i>see</i> Neuralgia and neu- | |
| death, <i>see</i> individual causes of | | ritis. | |
| death. | | Nursing service, Metropolitan | |
| Mouth and annexa, diseases of; | | Life Insurance Company..... | 6 |
| deaths and crude death rate.. | 535 | | |
| Mumps, deaths and crude death | | | |
| rate..... | 531 | — O — | |
| Mycoses, deaths and crude death | | Occupation, influence on pneu- | |
| rate..... | 532 | monia mortality..... | 138, 140 |
| Myocardial disease, acute, <i>see</i> | | influence on respiratory tuber- | |
| Endocarditis and myocarditis, | | culosis..... | 103 |
| acute. | | Occupational accidents, <i>see</i> Acci- | |
| Myocardial disease, chronic.... | 260 | dental and unspecified violence. | |
| death rates, annual..... | 566 | Organic diseases of the heart, <i>see</i> | |
| | | Heart, organic diseases of. | |
| | | Osteoarthritis, <i>see</i> Rheumatism, | |
| | | chronic. | |
| — N — | | Ovary, cysts and other benign | |
| Nasal fossae and annexa, diseases | | tumors of; deaths and crude | |
| of; deaths and crude death rate | 535 | death rate..... | 537 |
| National Fire Protection Asso- | | | |
| ciation..... | 489 | — P — | |
| National Safety Council, preven- | | Pancreas, diseases of, and other | |
| tion of automobile accidents.. | 455 | diseases of the digestive system; | |
| National Tuberculosis Associa- | | deaths and crude death rate.. | 536 |
| tion..... | 92 | Paralysis without specified cause, | |
| Negroes, <i>see</i> color incidence under | | <i>see</i> Cerebral hemorrhage. | |
| specific causes of death. | | Parathyroid glands, diseases of; | |
| Nephritis, acute; deaths and | | deaths and crude death rate.. | 533 |
| crude death rate..... | 536 | Paratyphoid fever, <i>see</i> Typhoid | |
| | | and paratyphoid fever. | |

	PAGE		PAGE
Pellagra, deaths and crude death rate.....	533	Poisoning by food.....	509-511
Pericarditis, deaths and crude death rate.....	534	death rates, annual.....	583
Peritonitis without specified cause, deaths and crude death rate.....	536	deaths and crude death rate.	538
Pernicious anemia, <i>see</i> Anemia, pernicious.		origin of hazard.....	591
Pharynx and tonsils, diseases of; deaths and crude death rate..	535	Poisoning, chronic, by mineral or organic substances; deaths and crude death rate.....	533
Pituitary gland, diseases of; deaths and crude death rate..	533	Poisoning, other acute accidental	512-516
Plague, deaths and crude death rate.....	531	age, color, and sex incidence.	512
Pleurisy, deaths and crude death rate.....	535	death rates, annual.....	583
Pneumonia—all forms.....	117	deaths and crude death rate.	538
classification of deaths.....	117	origin of hazard.....	591
contributory to other causes of death.....	120	specific means.....	514
death rates, annual.....	551	trend of mortality.....	513
geographic distribution.....	142	Poisonous gas, absorption of.	504-508
occupational influences..	138, 140	age, color, and sex incidence.	505
<i>see also</i> Influenza and pneumonia; Pneumonia, broncho-; Pneumonia, lobar and unspecified.		death rates, annual.....	585
Pneumonia, broncho-.....	152-156	deaths and crude death rate.	538
age incidence.....	152	origin of hazard.....	592
classification of deaths.....	118	prevention.....	508
color incidence.....	155	trend of mortality.....	507
contributory to other causes of death.....	120	Policyholders, <i>see</i> Metropolitan Life Insurance Company.	
death rates, annual.....	552	Poliomyelitis, acute.....	369-370
deaths and crude death rate.	531	death rates, annual.....	573
importance as a cause of death.....	120, 152	deaths and crude death rate.	531
sex incidence.....	154	Pregnancy, accidents of; deaths and crude death rate.....	537
trend of mortality.....	155	<i>see also</i> Puerperal state, diseases of.	
<i>see also</i> Influenza and pneumonia.		Prostate, diseases of; deaths and crude death rate.....	536
Pneumonia, lobar and unspecified.....	145-151	Public accidents, <i>see</i> Accidental and unspecified violence.	
age incidence.....	146	Puerperal albuminuria and convulsions.....	357-358
causative organisms.....	145	death rates, annual.....	572
classification of deaths.....	118	deaths and crude death rate.	537
color incidence.....	148	Puerperal convulsions, <i>see</i> Puerperal albuminuria and convulsions.	
death rates, annual.....	552	Puerperal hemorrhage, deaths and crude death rate.....	537
deaths and crude death rate.	531	Puerperal phlegmasia alba dolens, embolus, sudden death; deaths and crude death rate.....	537
importance as cause of death	120, 145	Puerperal septicemia.....	354-356
sex incidence.....	146	age and color incidence.....	354
treatment.....	149	death rates, annual.....	572
trend of mortality.....	148	deaths and crude death rate.	537
<i>see also</i> Influenza and pneumonia.		prevention of deaths.....	356
		rank as cause of death.....	354
		trend of mortality.....	355

	PAGE		PAGE
Puerperal state, diseases of.....	343-361	Rheumatism, chronic, osteoarthritis, gout; deaths and crude death rate.....	533
abortion, effect of.....	352	Rickets, deaths and crude death rate.....	533
age incidence.....	345	Rogers, E. S., efficacy of pneumonia serum.....	150
color incidence.....	347		
death rates, annual.....	572	— S —	
deaths and crude death rate.....	537	Salpingitis and other diseases of the female genital organs, deaths and crude death rate..	537
illegitimacy as a factor.....	348	Scarlet fever.....	67-72
influenza epidemic of 1918-1919, effect of.....	134	age incidence.....	69
insured and general population compared.....	350	color incidence.....	70
order of birth a factor.....	351	death rates, annual.....	546
rank as cause of death.....	345	deaths and crude death rate.....	531
specific causes of death.....	352	Dick test.....	67
trend of mortality.....	349	prevention.....	71
U. S. Original Birth Registration Area.....	349	sex incidence.....	69
<i>see also</i> Puerperal albuminuria and convulsions; Puerperal septicemia; Puerperal state, other diseases of.		trend of mortality.....	70
Puerperal state, other diseases of.....	359-361	U. S. Registration States of 1920.....	70
age and color incidence.....	359	<i>see also</i> Communicable diseases of childhood.	
death rates, annual.....	572	Scurvy, deaths and crude death rate.....	533
deaths and crude death rate.....	537	Senility, deaths and crude death rate.....	538
trend of mortality.....	360	Septicemia, <i>see</i> Purulent infection, septicemia.	
Purulent infection, septicemia; deaths and crude death rate..	532	Septicemia, puerperal, <i>see</i> Puerperal septicemia.	
— Q —		Smallpox, deaths and crude death rate.....	531
Quarries, traumatism in, <i>see</i> Mines and quarries, traumatism in.		Softening of the brain, deaths and crude death rate.....	534
— R —		Spirochetal hemorrhagic jaundice, deaths and crude death rate..	531
Rabies, deaths and crude death rate.....	532	Spleen, diseases of; deaths and crude death rate.....	533
Railroad accidents.....	457-460	Starvation, deaths and crude death rate.....	539
age incidence.....	457	Standardization of death rates..	526
color incidence.....	458	Statistical technique used in the preparation of this study..	523-528
death rates, annual.....	588	standardization of death rates	526
deaths and crude death rate.....	539	trends, computation of.....	527
deaths in United States.....	457		
origin of hazard.....	460, 594		
rank as cause of death.....	457		
sex incidence.....	457		
trend of mortality.....	459		
Rank of leading causes of death. 27,	29		
Rankin, F. W., location of rectal cancers.....	183		
Relapsing fever and Malta fever, deaths and crude death rate..	531		
Rheumatic fever, acute.....	375-376		
death rates, annual.....	574		
deaths and crude death rate.....	533		

- | | PAGE | | PAGE |
|--|----------|---|---------|
| Streetcar accidents..... | 461-464 | Tuberculosis—all forms..... | 81-96 |
| age, color, and sex incidence. | 461 | age incidence..... | 82 |
| death rates, annual..... | 589 | childbearing, influence of.... | 83 |
| deaths and crude death rate. | 539 | color incidence..... | 85 |
| origin of hazard..... | 595 | death rates, annual..... | 548 |
| trend of mortality..... | 463 | deaths and crude death rate. | 532 |
| Suffocation, accidental mechanical; deaths and crude death rate..... | 538 | influenza epidemic of 1918-1919, effect of..... | 89, 136 |
| Suicide..... | 407-419 | insured and general population compared..... | 89 |
| age, color, and sex incidence. | 407 | occupational influences..... | 85 |
| death rates, annual..... | 580 | organs or parts affected..... | 98 |
| deaths and crude death rate. | 538 | prevention..... | 92 |
| economic conditions a factor. | 415 | rank as cause of death..... | 81 |
| factors involved..... | 407, 419 | sex incidence..... | 83 |
| insured and general population compared..... | 412 | treatment..... | 93 |
| methods used..... | 413, 538 | trend of mortality..... | 4, 86 |
| probability of dying from.... | 407 | future..... | 94 |
| rank as cause of death..... | 404 | U. S. Registration States of 1920..... | 91 |
| trend of mortality..... | 410 | Tuberculosis of the central nervous system, <i>see</i> Tuberculosis of the meninges and the central nervous system. | |
| United States and foreign countries compared..... | 413 | Tuberculosis, chronic disseminated, <i>see</i> Tuberculosis of other organs and chronic disseminated tuberculosis. | |
| U. S. Registration States of 1920..... | 412 | Tuberculosis of the intestines and peritoneum..... | 109-112 |
| Swartout, H. O., accuracy of cancer diagnosis..... | 166 | age incidence..... | 109 |
| Sydenstricker, Edgar, economic status and influenza mortality. | 138 | color incidence..... | 111 |
| Syphilis..... | 371-374 | death rates, annual..... | 550 |
| age, color, and sex incidence | 371, 372 | deaths and crude death rate. | 532 |
| causative factor in heart disease..... | 264, 282 | sex incidence..... | 110 |
| death rates, annual..... | 574 | trend of mortality..... | 111 |
| deaths and crude death rate. | 532 | Tuberculosis of the meninges and the central nervous system. 105-108 | |
| importance as cause of death | 371 | age incidence..... | 105 |
| trend of mortality..... | 372 | color incidence..... | 106 |
| | | death rates, annual..... | 549 |
| — T — | | deaths and crude death rate. | 532 |
| Tetanus, deaths and crude death rate..... | 532 | sex incidence..... | 105 |
| Thrombosis, <i>see</i> Embolism and thrombosis. | | trend of mortality..... | 107 |
| Thymus gland, diseases of; deaths and crude death rate..... | 533 | Tuberculosis of the nervous system, <i>see</i> Tuberculosis of the meninges and the central nervous system. | |
| Thyroid gland, diseases of; deaths and crude death rate..... | 533 | Tuberculosis of other organs and chronic disseminated tuberculosis..... | 113-114 |
| Tonsils, <i>see</i> Pharynx and tonsils, diseases of. | | death rates, annual..... | 550 |
| Trends, computation of..... | 527 | deaths and crude death rate. | 532 |
| Tuberculosis..... | 79-114 | Tuberculosis of the peritoneum, <i>see</i> Tuberculosis of the intestines and peritoneum. | |
| Tuberculosis, acute disseminated, <i>see</i> Tuberculosis of the respiratory system. | | | |

	PAGE		PAGE
Tuberculosis of the respiratory system.....	97-104	— V —	
age incidence.....	99	Vehicles, other, traumatism by	465-467
color incidence.....	100	age, color, and sex incidence.	465
death rates, annual.....	549	death rates, annual.....	590
deaths and crude death rate.	532	deaths and crude death rate.	539
dust as a contributory factor.	103	origin of hazard.....	595
occupational influences.....	103	Veins, diseases of; deaths and	
sanatorium treatment.....	102	crude death rate.....	535
sex incidence.....	100	Violent deaths, <i>see</i> External	
silica dust as a contributory		causes of death.	
factor.....	103		
treatment.....	101	— W —	
trend of mortality.....	100	War, wounds of; deaths and	
Tumors, benign, or not returned		crude death rate.....	539
as malignant.....	533	rank as cause of death.....	404
Typhoid and paratyphoid fever		White, Paul D., changing meth-	
365-368		ods of diagnosing heart disease	263, 297
age, color, and sex incidence.	365	Whitney, Jessamine S., occupa-	
control.....	368	tion and pneumonia mortality.	138
death rates, annual.....	573	Whooping cough.....	73-78
deaths and crude death rate.	531	age, color, and sex incidence.	73
trend of mortality.....	365	death rates, annual.....	546
urban and rural differences..	366	deaths and crude death rate.	531
Typhus fever, deaths and crude		prevention.....	77
death rate.....	531	trend of mortality.....	75
— U —		U. S. Registration States of	
Ulcer of the duodenum.....	384	1920.....	76
death rates, annual.....	576	<i>see also</i> Communicable dis-	
deaths and crude death rate.	535	eases of childhood.	
Ulcer of the stomach.....	382	Williams, R., location of rectal	
death rates, annual.....	576	cancers.....	183
deaths and crude death rate.	535	Willius, F. A., expectation of life	
Urethra, diseases of, urinary ab-		in coronary thrombosis.....	283
scess, etc.; deaths and crude		Working conditions, influence on	
death rate.....	536	pneumonia mortality.....	138
Urinary passages, calculi of;		— Y —	
deaths and crude death rate..	536	Years of life exposed to risk,	
Uterine hemorrhage, nonpuer-		Metropolitan Life Insurance	
peral; deaths and crude death		Company, Industrial Depart-	
rate.....	537	ment, 1911 to 1935.....	15
Uterus, benign tumors of; deaths		Yellow fever, deaths and crude	
and crude death rate.....	537	death rate.....	531

