

*Measuring Health Levels in the  
United States, 1900-1958*

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# HEALTH INFORMATION FOUNDATION

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## FOREWORD

THERE IS INTENSE PUBLIC EXAMINATION today of the use and cost of medical services. This examination has been extended to physicians' services, hospitals, drugs and all components of care. Questions have been raised as to whether the price of a unit of medical service has increased excessively and whether too much service is being used.

Health Information Foundation, in a report titled *Private Expenditures for Drugs and Other Components of Medical Care\** has presented data bearing on this subject. It shows that the American public is certainly investing increasing sums in medical care—and that the public is using many more services. However, it also makes it evident that the increase in unit costs of service seems comparable to increases in costs of other items in the consumer's budget.

The real test of whether the American public is investing too much in medical care is through evaluation of what the public is receiving in the way of service. Under our economy the value the public places on medical care is well established; certainly increased expenditures, which are criticized by many, are very much a measure of public acceptance and support for health services.

Another important test, however, relates to measurable reductions in mortality and decreases in illness and disability. This report, which describes in some technical detail the development

\*By Odin W. Anderson, Ph.D., New York, December 1959.

of such measurements, also presents statistics to show changes in health levels, particularly during the past 30-year period—three decades in which great progress has been made in medical science, most dramatically in the development of new drugs. The effect, especially of antibiotics and biologicals, on the infectious and parasitic diseases seems clearly demonstrated. Mortality from such diseases during the period has been reduced 75 per cent and contrasts in startling fashion with what amounts to practically no change in the death rate from all other diseases.

As this report explains, however, mortality rates are only one measure of health levels. While it is true that some of the diseases classified as infectious and parasitic have been virtually eliminated by preventive inoculations, in other diseases—such as pneumonia, tuberculosis and the venereal diseases—morbidity or illness has decreased much less dramatically. Total episodes of all types of illness may, in fact, have increased, in spite of dramatic declines in mortality; without question, present health levels can be maintained only as good medical care is available.

The dearth of accurate statistics on morbidity makes it almost impossible to measure the degree of reduction in disability resulting from new medical knowledge. Though results have been dramatic, it is important in considering the economics of medical care to bear in mind that the concomitant of extended life has been the avoidance of death for many with chronic illnesses in all age groups, but particularly for older people. A popular fallacy presumes that wiser use of medical care will lead to less expenditure for the public as a whole. It seems increasingly evident, however, that while tremendous advantages for the public stem directly from new medical knowledge, they cannot be attained without a steadily increasing total national expenditure.

—GEORGE BUGBEE, *President*

Health Information Foundation

**T**HERE HAVE BEEN dramatic improvements in the level of health since 1900 in the United States and throughout the Western world. A problem for research is to determine the causes of these improvements, their extent and distribution in the population, and their consequences for society. An additional and related problem is to find more precise ways of measuring the level of health.

The index of health levels most commonly used throughout medical history has been the mortality rate, but even with various refinements, this measure is no longer as suitable as formerly, particularly when it is employed as the only measure. Today mortality rates are best supplemented by morbidity (illness and disability) rates, and the result is a far more accurate picture of health levels.

Statistics on mortality and its causes, and changes in these measures over time, are available for many nations, and a large body of these data are published annually in the *United Nations Demographic Yearbook*. For the United States, extensive mortality data are available on an annual basis for a Death Registration Area since 1900 and for the entire nation since 1933, with many items tabulated by state and often by smaller administrative unit. Health Information Foundation has made extensive, systematic use of these data to interpret health trends, especially in its monthly publication *Progress in Health Services*.

In contrast to mortality, United States morbidity statistics, except for a few reportable communicable diseases accounting for only a small portion of the total amount of illness, have been

collected only at irregular intervals and usually for populations representing somewhat less than the entire nation. However, illness and disability statistics were compiled from five separate household surveys between 1928 and 1943 and published in several *Public Health Monographs*.<sup>\*</sup> Although not intended to represent a nationwide sample, these data have been used to approximate the experience of the country as a whole for the 1930's. (A National Health Survey was conducted in 1935-36, but because of methodological differences its data are rarely used today for comparative purposes.) Similar data are currently being collected (beginning in 1957) from a national sample of the civilian non-institutional population of the United States by the National Health Survey of the U. S. Public Health Service. Also, Health Information Foundation has initiated a series of comparative analyses of these two sets of data to measure trends in illness over time, thus attempting to illuminate this additional dimension of health progress.

Because death is a clearly defined event and has important legal aspects, mortality registration has been fairly widespread and of long standing in many nations. The resulting statistical data have been very useful as one index of health levels. This is especially true where the numbers of deaths have been related to the size of population, so that mortality rates can be computed, and where the characteristics of deceased persons and the causes of death were known.

Among these characteristics, the more important have been age, sex, place of residence, color or ethnic group, and occupation. Use of specific death rates for age and for sex, for example, have made it possible to construct refined measures, e.g., adjusted death rates and life tables giving average life expectancy. Infant and maternal mortality rates have also been valuable, making it possible to contrast deaths associated with childbirth (for both mothers and infants) with the number of live births.

Mortality rates, however, were far more accurate indexes of health levels at earlier stages in the development of modern

<sup>\*</sup>S. D. Collins et al, *Public Health Monographs*, Nos. 25, 30, 31, 38 and 48, Washington, D. C., various dates. The surveys included were: Committee on the Costs of Medical Care, 1928-31, families observed a full year and families observed for part of a year (separate studies); Syracuse, New York, 1930-31; Cattaraugus County, New York, 1929-32; and Baltimore, Maryland, 1938-43.

sanitation, public health and medical knowledge. At that time communicable diseases constituted the major causes of death and their impact was felt heavily among infants and the younger age groups. Case-fatality rates for most illnesses, especially the communicable, were far higher than today, so that illness and mortality patterns were more closely related. In other words, for some disease categories it was certain that the ill would die.

Today a far smaller proportion of illness results in death. Health is now thought of as more of a multi-dimensional concept,<sup>\*</sup> and mortality rates—however refined, but representing nevertheless only the extreme termination of ill-health—have consequently sharp limitations as indicators of health levels. One of these is that changes in mortality rates and health levels (in multi-dimensional terms) are no longer as closely linked.

For example, it became relatively common during and after World War II to introduce simple public health measures to areas of poor sanitation in foreign countries—measures such as the spraying of insecticides, regulation of garbage disposal, and the establishment of community water resources. Mortality rates dropped sharply, in some areas by as much as 50 per cent. Yet the resulting level of health in these areas was by no means twice as high as before. Many diseases which usually cause severe disability or impairment, but not death, remained endemic and widespread. An example of this in the Near East is trachoma, an illness which causes blindness but is not immediately fatal.

Another discrepancy between changes in mortality and health levels has been found in the Western nations in recent years. Mortality rates in some instances have reached a plateau at very low levels and further decline has come very slowly or not at all. Some question exists as to whether overall mortality rates can drop much lower than they now are without a major breakthrough against heart disease or cancer. Yet there is little doubt that the health of Western populations is improving steadily. Advances are constantly made on many fronts, for

<sup>\*</sup>The World Health Organization defines health as follows: "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity."

example the polio vaccine, improvements in surgical techniques, a whole variety of new drugs and medications, fluoridation of water supplies, advances in radiological health and many others. Such advances, however, rarely have an appreciable impact on mortality rates.

Obviously, mortality rates alone are no longer sufficiently sensitive to indicate more than the grossest differences in health levels. This becomes more and more evident as increasingly larger proportions of all deaths take place at the older ages and are caused by the degenerative diseases, the diseases associated with the aging process. Nevertheless, the collection of mortality data must be continued and extended, especially because of their value for comparative purposes and as fundamental frames of reference, and because they can be further refined with the introduction of new variables such as body build and physical type, family history of mortality and illness, personal history of illness, income, occupation, marital history and many others. And they can be especially valuable if used in conjunction with data on illness and impairments.

Except for the reportable communicable diseases,\* illness and impairment data are far more difficult and expensive to obtain. They pose complicated methodological problems, involving definitions of illness, disability and impairments, factors of memory and recall, and many others. In addition, even once obtained, they must be interpreted with special care because of at least these basic peculiarities:

- (1) Decline of the death rate implies survival of greater numbers with illness and impairment. In this sense a higher reported frequency at least of some illnesses, or extended duration for some chronic disorders, may not mean a less healthy society;
- (2) Illness has a social as well as a physiological component. Among some populations (e.g., the U.S. today) the level of health consciousness is high and individuals

\*The most frequently reported communicable diseases in the United States today in their order of frequency are measles, scarlet fever and streptococcal sore throat, gonorrhoea, syphilis, tuberculosis, whooping cough, infectious and serum hepatitis, bacillary dysentery, typhoid and paratyphoid fever, poliomyelitis, and amebiasis.

recognize and seek treatment more readily than in former years for minor conditions. At the same time, the penalties of illness and disability (loss of income, job, etc.) in such societies may not be as high as they once were, or the individual may be better protected against them. Under these circumstances, too, a higher frequency of reported illness than in former years may not necessarily mean a less healthy society.

Among the many possible ways of collecting these statistics — through household surveys, physicians' records, hospital records, insurance claims, workmen's compensation records and others — all have advantages and drawbacks. For an overall national picture the current method of choice is the household survey technique, especially as employed by the National Health Survey of the U. S. Public Health Service.

This survey today is providing, for the first time in this country, nationwide data on illness, disability, impairments, hospital admissions, use of medical and dental services, and many other items as families and individuals report them. It gives a much clearer picture of many aspects of our national health than has ever been available in the past.

In addition, a recent study group of the World Health Organization suggested a search for new indicators of health in these fields: (a) morbidity, (b) nutrition, (c) mental health, (d) environmental sanitation, (e) health services, and (f) socio-economic conditions.\* However, the group recognized that there were inherent difficulties in obtaining such data in those countries where statistics and research facilities are scarce.

#### Factors associated with changes in health

Levels of health, as expressed in patterns of mortality and morbidity, are roughly associated with the level of arts and sciences in a given society and with the habits and beliefs of its population. However, the correlation is by no means perfect, and specific diseases, especially the infectious and parasitic

\*World Health Organization, "Measurement of Levels of Health," *Technical Report Series*, No. 137, Geneva, 1957.

diseases, seem to behave erratically. They appear and disappear and rise and fall at different times and places. While much of this variation results from man's endeavor to control his environment, it also stems from reasons apparently unrelated to purposive human effort and having to do perhaps with the ecological balance of nature or in response to change in the biological environment.

Thus, leprosy appeared and disappeared in Europe in seeming independence of conscious human efforts to control it. Typhus also appeared and disappeared, although its disappearance was probably related to a specific control measure which brought increased cleanliness and the extermination of body lice. The epidemic diseases prevalent in modern times—smallpox, diphtheria, measles, typhoid, tuberculosis, syphilis and others—were declining as causes of death before modern vaccination and environmental sanitation methods were perfected, possibly in response to slowly improving standards of living, but their decline was greatly accelerated after modern scientific methods were applied.

Research today seeks to determine direct cause-effect relations between changes in health levels and social and medical factors. But it is apparent that prior to the modern era of antibiotics and other life-saving drugs, this could be done only in rare and exceptional instances. Examples of these are the elimination in the late 18th and early 19th centuries of scurvy aboard ships by the use of lemon and lime juice (Vitamin C) and the reduction of smallpox following Jenner's discovery. Later examples are the elimination of pellagra in the southern region of the U. S. because of improved diet, the control of diabetes with insulin, diphtheria with antitoxin, and many others. Generally, however, the establishment of cause-effect relationships in these instances was possible only because of the gross nature of the changes involved.

Today research is attempting to define much more subtle instances of cause-effect relationships. In this area, primarily three methods are used. One of these—most suitable for studying changes of major magnitude—examines changes over time in mortality rates and in causes of death in specific populations (countries, states, cities, etc.) and also compares these indexes

at a point in time in populations at varying stages of social, economic, and technological development. Such research finds, for example, that in Egypt the leading causes of death today are generally similar to those in the U. S. at the turn of the century. But also, upper-class Egyptians whose living conditions more nearly resemble those of the U. S., die of the same diseases as do most Americans, while lower-class Egyptians living under conditions possibly never seen in this country, die of diseases that are exceedingly rare here. These statements point up the relationship between health levels, as manifested in the patterns of disease and death, and the general level of development.

Another method, known as epidemiological research, consists of both extensive and intensive—long-term and short-term—studies of the distribution of specific diseases in a population. This method reveals most readily those changes in health that are perhaps less than global in scope and relates them to measurable modifications in the environment, including the introduction of specific control measures.

A third method uses laboratory and clinical techniques and tests both preventive and therapeutic measures in controlled situations. Each of these methods complements the others, and for a full understanding of the cause of changes in health levels all should be used.

Health Information Foundation, through its monthly bulletin *Progress in Health Services*, has conducted a large volume of research using the first two methods. But it has also surveyed extensively the results of the third—laboratory and clinical techniques—and incorporated these results in the analysis wherever they are relevant. Each bulletin, therefore, represents a synthesis of all three methods, a synthesis necessary for fullest understanding. In the following pages, changes in health levels in the United States are summarized, especially as these changes have been analyzed in *Progress in Health Services*.\*

### Changes in health levels in the United States since 1900

Since 1900 mortality rates for the population as a whole

\*Wherever more recent data were readily available, previously published statistics have been updated in this report.

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and for each age and sex group have declined sharply, although declines have been greatest at the younger ages and for the female sex. Improvement has been especially great for infants and for women during childbirth. At the same time the leading causes of death have changed drastically, from the communicable diseases—influenza and pneumonia, tuberculosis, and the infectious digestive conditions (diarrhea and enteritis, gastritis, etc.)—to the cardiovascular-renal diseases, including heart disease, cancer, and accidents.

The U. S. mortality rate\* dropped from 17.8 per 1,000 population in 1900 to 7.8 in 1958 (see Chart I), or by 56 per cent.\*\* The declines were greatest at the younger ages, and decreased steadily with age. Thus, at ages under 15, mortality rates dropped by 86 per cent (see Chart II), at 15 to 24 by 82 per cent, and for those 65 and over only by 23 per cent.† Mortality for females declined more sharply than for males.†† Thus, between 1900 and 1958 the male mortality rate declined by 48 per cent, but the comparable decline for females was 64 per cent. The per cent decline was greater for females at all ages, but the difference was relatively minor at ages under 15. Even at 65 and over the male rate declined by 13 per cent, while the female rate declined by 31 per cent.

One of the most significant achievements of modern medical science has been the elimination of the hazards associated with pregnancy and childbearing as a major cause of disability or death.‡ Measured against present conditions, maternal deaths were almost unbelievably common early in this century.

Thus, in 1915 in this country, 61 women for each 10,000 live births died from causes related to maternity (see Chart III). The rate rose to 66 by 1917, and in 1918—largely because of the influenza epidemic and the medical and social disorganization

\*Unless otherwise specified, all mortality rates are adjusted for age to the U.S. population of 1940. Rates prior to 1933 refer to the Death Registration States only.

\*\*For a more detailed discussion, see Health Information Foundation, "Declining Crude Mortality in the United States: 1900-1954," *Progress in Health Services*, Vol. V, No. 1, January 1956.

†Health Information Foundation, "Age at Death in the United States," *Progress in Health Services*, Vol. V, No. 2, February 1956.

††Health Information Foundation, "Health and the Sexes," *Progress in Health Services*, Vol. VI, No. 10, December 1957.

‡Health Information Foundation, "Advances in Maternal Health," *Progress in Health Services*, Vol. VII, No. 9, November 1958.

of World War I—it shot up to 92.\* Subsequently the rate levelled off. During the twenties it fluctuated around former levels, averaging 66 for the decade.

After reaching a secondary peak of 69.5 in 1929, the maternal mortality rate began to drop. In 1934 a new record low was reached. A further record low has been established without exception every year since then—an almost unparalleled achievement of medical progress. By 1958 the rate had sunk to 4.0,\*\* a drop of 94 per cent since 1915.

Infants, too, have benefited markedly from improved health conditions in this country. Thus, although the first year is still the most hazardous single year in the human life span until advanced old age is reached, impressive reductions in infant mortality have been made over the last half-century.†

In 1915 as many as one in every ten live-born babies was unable to survive the first year of life (the infancy period); by 1958 the comparable proportion had dropped to one in forty.†† About 113,000 infant deaths were registered in this country last year, or 26.9 per 1,000 live births. If the mortality conditions of 1915 had continued to prevail in 1958, an additional 300,000 of the over 4,200,000 infants born alive last year would not have reached a first birthday.

The decrease in infant mortality since 1915 has been steady and consistent, with only minor fluctuations. Not all periods of infancy have benefited equally by reduction in mortality, however, nor are all equally safe today.

For the first week of life (the early neonatal period) the mortality rate dropped by less than 50 per cent from 1915 to 1957—from 30 per 1,000 live births to 16.7. The causes of death during the first week of life have proved relatively resistant to control and, in fact, are still unknown in a large number of deaths. For the remainder of the infancy period, improvement

\*Birth Registration states only, 1915-32.

\*\*For comparability all mortality rates are classified according to the Fifth Revision of the International List of Diseases and Causes of Death.

†Health Information Foundation, "The Diminishing Hazards of Infancy," *Progress in Health Services*, Vol. VI, No. 3, March 1957.

††Birth Registration states only, 1915-32.

has been much more rapid; the current mortality rate is less than 10 per 1,000 births, or only a seventh as high as that in 1915.

Infant deaths have become more and more concentrated in the especially hazardous first week of life, and even in the first day. In 1915, less than a third of all infant deaths occurred in the first week of life, but currently nearly two-thirds takes place within that period. The curve of mortality today declines sharply and consistently after an initial high, reaching a minimum for the entire period by the end of infancy. Thus, in 1957 seven times as many deaths occurred during the first week as during the remainder of the first month, over 25 times as many as during the sixth month and 70 times as many as the twelfth month.

#### Changes in leading causes of death

The three leading causes of death in 1900 were communicable diseases—pneumonia-influenza, tuberculosis and gastritis\*; they accounted for nearly one-third of all the deaths in that year.\*\* By 1958, however, medical progress had reduced their share of total mortality to about 5 per cent.

Pneumonia-influenza was the major killer in 1900, causing 210 deaths per 100,000 population, and it fluctuated between first and second place among the leading causes of death through 1930. During this time, however, its death rate dropped sharply, and by 1930 was only about one-half the 1900 figure. By 1958, as a result of its continuing rapid decline, pneumonia-influenza had dropped to sixth place, and its death rate was 31 per 100,000 (see Chart IV). This represented an 85 per cent decline since the turn of the century.

Tuberculosis—the second leading cause of death in 1900—experienced an even greater decline. During the decades beginning with 1910 and 1920 it dropped from second to third place; by 1930 it was in seventh place, and today it is no longer among the 10 leading causes of death. From 1900 to 1958 the death rate from this disease declined 97 per cent.

\*Includes gastritis, duodenitis, enteritis and colitis.

\*\*Health Information Foundation, "Control of the Communicable Diseases," *Progress in Health Services*, Vol. VI, No. 4, April 1957, and "Changes in Leading Causes of Death," *Progress in Health Services*, Vol. V, No. 3, March 1956.

Mortality from gastritis, the third major killer in 1900, also declined 97 per cent since the turn of the century. The same pattern of decline has been followed by diphtheria and bronchitis, the other two communicable diseases among the 10 leading causes of death in 1900. Both had dropped from among the 10 leading causes by 1910, and between 1900 and 1958 the death rate from bronchitis dropped 95 per cent, and from diphtheria 99.8 per cent. Mortality from another major infectious disease, syphilis and its sequelae, rose from 12 per 100,000 in 1900 to 19 per 100,000 in 1917, but then declined to 3.0 by 1958.\*

As the communicable diseases declined in importance, the degenerative diseases rose to displace them as leading causes of death. Thus, diseases of the heart rose from fourth place in 1900\*\* to first in 1958, and today at 270 deaths per 100,000 population (see Chart V), over one-third of all deaths in the United States result from them. Although heart diseases are generally associated with the older ages, they also accounted for nearly 12 per cent of all deaths among persons 25 to 34 last year.

Malignant neoplasms (cancer) also rose in rank, from seventh place in 1900† to second in 1958. At the turn of the century, less than 5 per cent of all deaths resulted from cancer, whereas in 1958 this disease claimed 16 per cent of the total. Cancer, like heart disease, is usually associated with the older ages; yet it kills many more children aged 5 to 14 than does polio.

The other degenerative diseases are also rising in importance as causes of death, although they account for a much smaller proportion of the total than either heart disease or cancer. The death rate for vascular lesions of the central nervous system (a category which includes cerebral hemorrhage) has remained relatively constant even though it is now the third leading cause of death and causes a higher per cent of all deaths than formerly. The death rate from diabetes‡ increased from 13 per 100,000 in

\*Health Information Foundation, "Control of Venereal Disease," *Progress in Health Services*, Vol. VIII, No. 4, November 1959. All rates in this paragraph are crude death rates.

\*\*Health Information Foundation, "Trends in Heart Disease," *Progress in Health Services*, Vol. VI, No. 5, May 1957

†Health Information Foundation, "Trends in Cancer Control," *Progress in Health Services*, Vol. VIII, No. 2, February 1959.

‡Health Information Foundation, "Trends in Diabetes Control," *Progress in Health Services*, Vol. VII, No. 2, February 1958.



1900 to 22 in 1958, and it is now the eighth leading cause of death. Nephritis, on the other hand, declined. For accidents, death rates declined over 40 per cent from 99.5 per 100,000 in the peak of 1906, to 55.1 in 1958.\* However, accidents now rank as the fourth leading cause of death in this country.

It is evident, then, that the decline in mortality rates and the changing spectrum of causes of death have been occurring continuously at least since 1900. These changes were in general a response to medical progress and improved social conditions as well.

Thus, in its previously cited study of the decline of the communicable diseases, Health Information Foundation reported that: "Various anti-pneumonia sera were introduced in the late 1920's; as a result, the mortality decline from pneumonia and influenza speeded up during the 1930's. The decline accelerated even more when the sulfonamides were introduced at the end of the decade and when penicillin came into wide use after World War II. In recent years, the use of broad-spectrum antibiotics has caused further drops in the combined pneumonia-influenza death rate.

"The mortality decline from tuberculosis parallels that of pneumonia and influenza in many respects. A major factor in the sharp decline has been the rise in the level of living, especially as this affects nutrition and housing. On the medical side, advances have stemmed from the newly discovered drugs and surgical techniques, bed rest and other standard methods of treatment, hospitalization of increased numbers of tuberculosis patients and earlier detection of cases through mass X-ray surveys."

With reference to improvements in maternal health, the Foundation reported that: "Although maternal mortality rates remained high during the 1920's, the basis for later improvement was established. Hospital standards of sanitation were improved; medical research was revealing the dynamics of normal pregnancy and of its complications; great advances were made in nutrition, obstetrical surgery, anesthesia, and related areas; post-

\*Health Information Foundation, "Accidents in the United States," *Progress in Health Services*, Vol. VI, No. 8, October 1957.

graduate instruction in obstetrics was greatly increased; and the certification of medical specialists was begun. Later the improvement accelerated with the introduction of the sulfas, penicillin, and the broad-spectrum antibiotics. As the public became better informed about childbirth, prenatal care became more and more common and the proportion of births attended by physicians (especially in hospitals) increased."

Similar statements may be made for many of the major disease categories and infant mortality where large reductions in the death rate took place before 1930. Thus, even in the early years of this century, health progress was considerable. However, an acceleration in the decline of the death rate took place after 1930, coinciding with the introduction of the sulfa drugs, penicillin after World War II, and later the broad-spectrum antibiotics.

#### Changes since 1930

Even though health levels, as measured by mortality rates, improved constantly from 1900 to 1930, the 1930's began a period of rapid acceleration in the decline of mortality. The new decline was striking; it exceeded the hopes even of confirmed optimists. Most strongly affected were those diseases that had already evidenced major tendencies toward decline, especially the communicable diseases. Childbirth, too, both for mother and infant, increased in safety at an accelerated rate. For the first time in history an effective method of control was developed for the venereal diseases.

Improvements reached a maximum in the late 1930's and the 1940's. During this period the sulfa drugs were introduced; penicillin was developed and after World War II was finally put to wide use by the civilian population. Many other medical discoveries and inventions took place within the two decades. Social conditions (level of living, etc.) also improved, although slowly at first. In spite of World War II, which was a major social and economic upheaval, the general improvement in social conditions continued. As part of this improvement, the entire population began to use more medical services than before, and the use of these services was more evenly distributed in the population.

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Medical discovery, in fact, had accelerated during World War II and later the broad-spectrum antibiotics, cortisone, and many other effective therapies found their way into public use.

From 1930-34 to 1955-58, a period of just under 25 years, the U. S. death rate (adjusted for age) fell from 12.0 per 1,000 population to 7.8, or by 35 per cent. The greatest extent of decline from the preceding five-year average of annual rates came in 1945-49, a drop of 11.8 per cent (see Chart VI and Table I). But

(text continues on page 29)

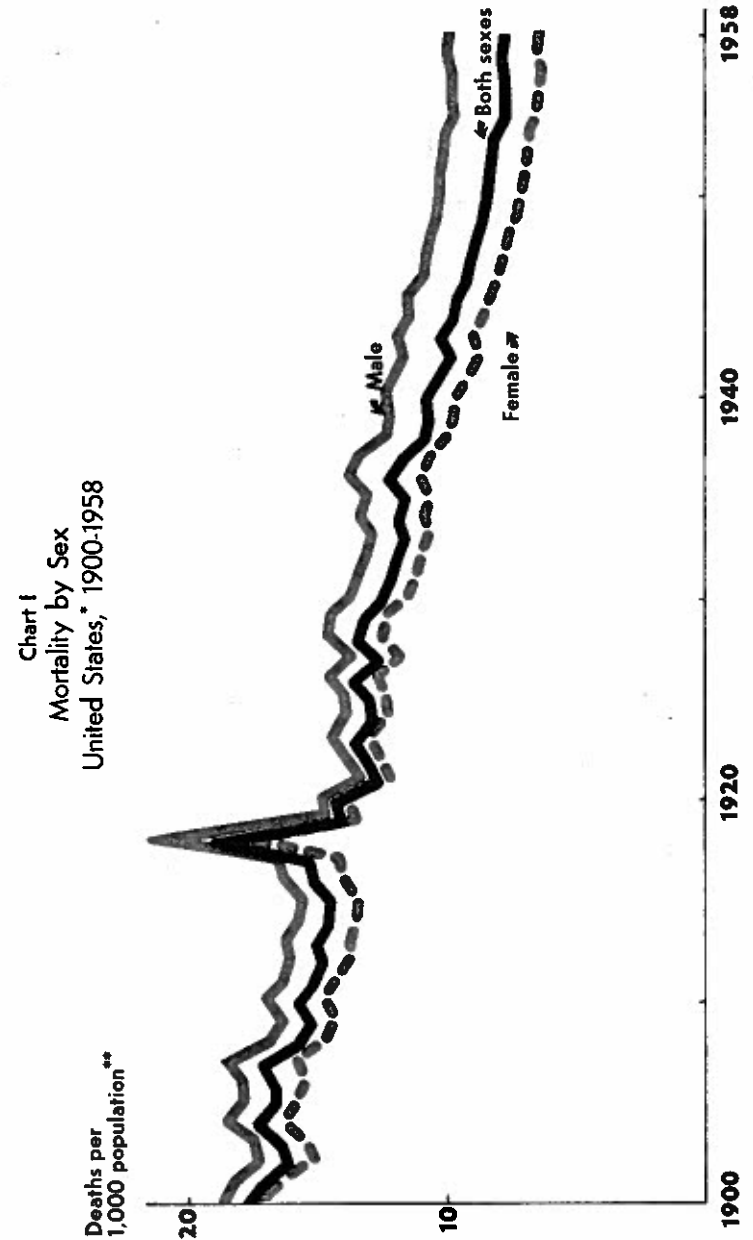
**Table I**  
**Mortality by Age**  
**Per cent Decline from Preceding Period in**  
**Five-year Averages of Annual Rates**  
**United States, 1930-34 to 1955-58**

Age in years	Per Cent Decline from Preceding Period					1930-34 to 1955-58*
	1935-39	1940-44	1945-49	1950-54	1955-58*	
All ages, unadjusted	0.0	3.5	5.4	5.0	1.0	14.2
All ages, adjusted**	4.6	11.1	11.8	9.1	4.3	35.0
Under 1	8.1	17.6	20.6	17.6	7.5	54.1
1-4	21.0	34.9	34.3	22.2	16.4	78.0
5-14	16.2	27.3	22.1	24.9	16.4	70.2
15-24	16.0	19.6	21.4	21.8	9.5	62.4
25-34	13.6	23.6	23.5	22.2	11.7	65.3
35-44	7.8	17.9	16.6	16.9	10.4	53.0
45-54	3.1	10.9	10.2	9.9	8.9	36.4
55-64	2.3	7.2	6.8	7.2	5.2	25.6
65-74	2.8	5.5	9.4	3.5	-1.0	18.9
75-84	-2.2	8.1	9.5	4.1	3.3	21.1
85 and over	0.1	1.7	5.2	10.4	-2.8	14.2

\*Average of four-year period.

\*\*Adjusted for age to the population of the United States in 1940.

Source of basic data: Various reports by the U. S. National Office of Vital Statistics.

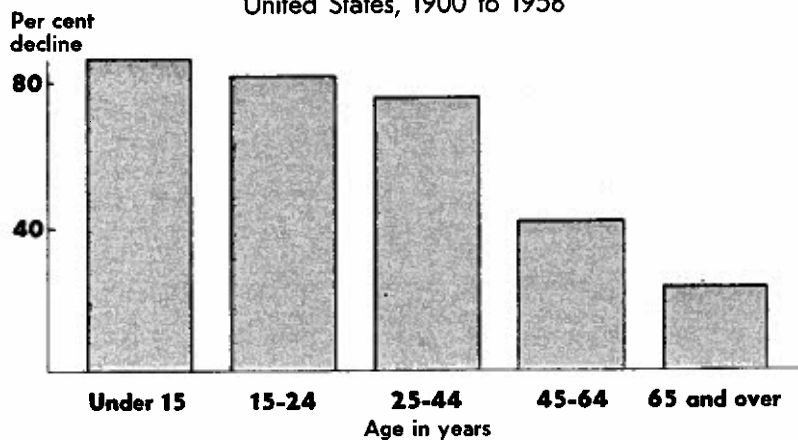


\*Death Registration States only, 1900-32. In 1900 these consisted of 10 states and the District of Columbia. 1958 data are provisional.

\*\*Adjusted to 1940 standard.

Source: Various reports by the National Office of Vital Statistics.

Chart II  
Mortality Decline by Age  
United States, 1900 to 1958\*

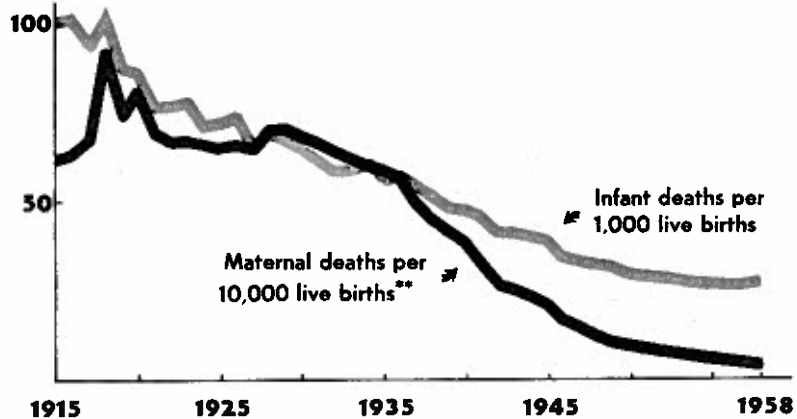


\*Death Registration States only, 1900. 1958 data are provisional.

Source: Same as Chart I.

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Chart III  
Infant and Maternal Mortality  
United States,\* 1915-1958



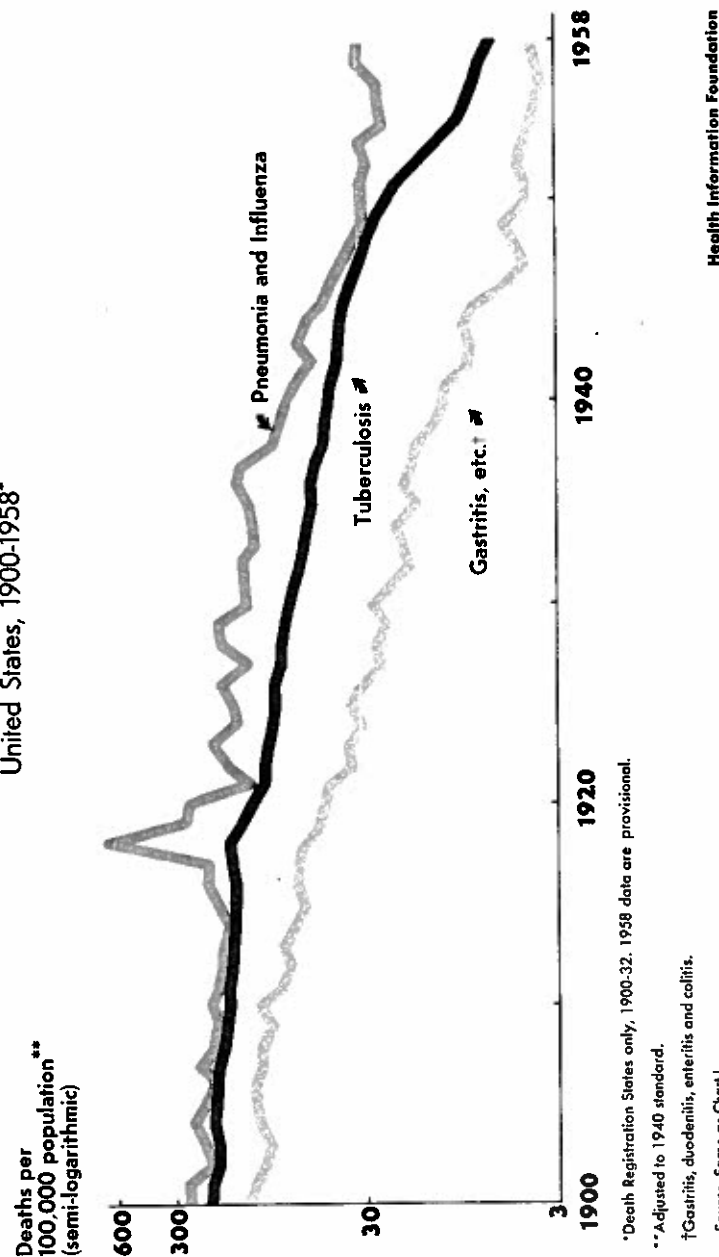
\*Birth Registration States only, 1915-32. In 1915 these consisted of 10 states and the District of Columbia. 1958 data are provisional.

\*\*Rates since 1949 are adjusted to the Fifth Revision of the International List of Diseases and Causes of Death.

Source: Same as Chart I.

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Chart IV  
Mortality from the Major Communicable Diseases  
United States, 1900-1958\*



\*Death Registration States only, 1900-32. 1958 data are provisional.

\*\*Adjusted to 1940 standard.

†Gastritis, duodenitis, enteritis and colitis.

Source: Same as Chart I.

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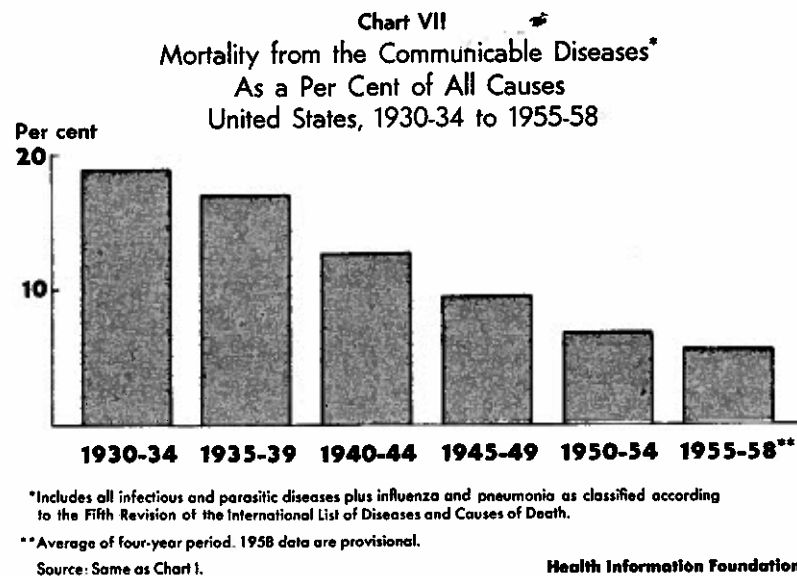
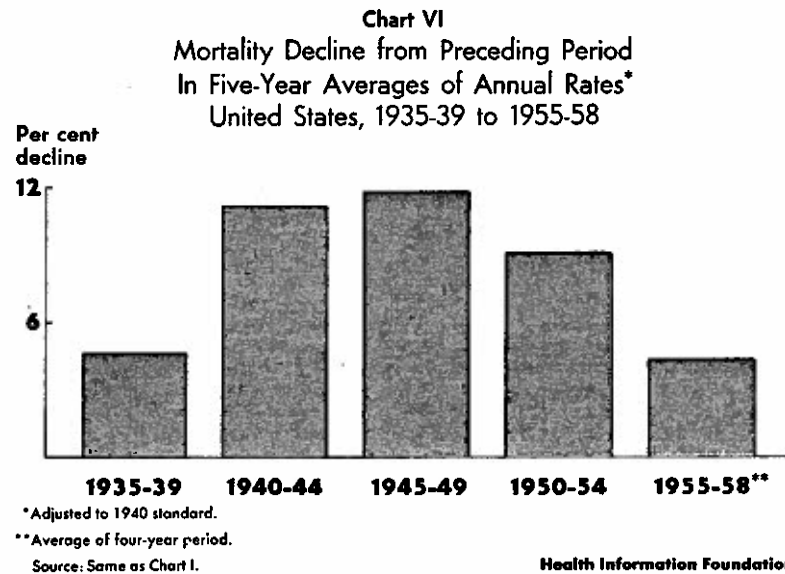
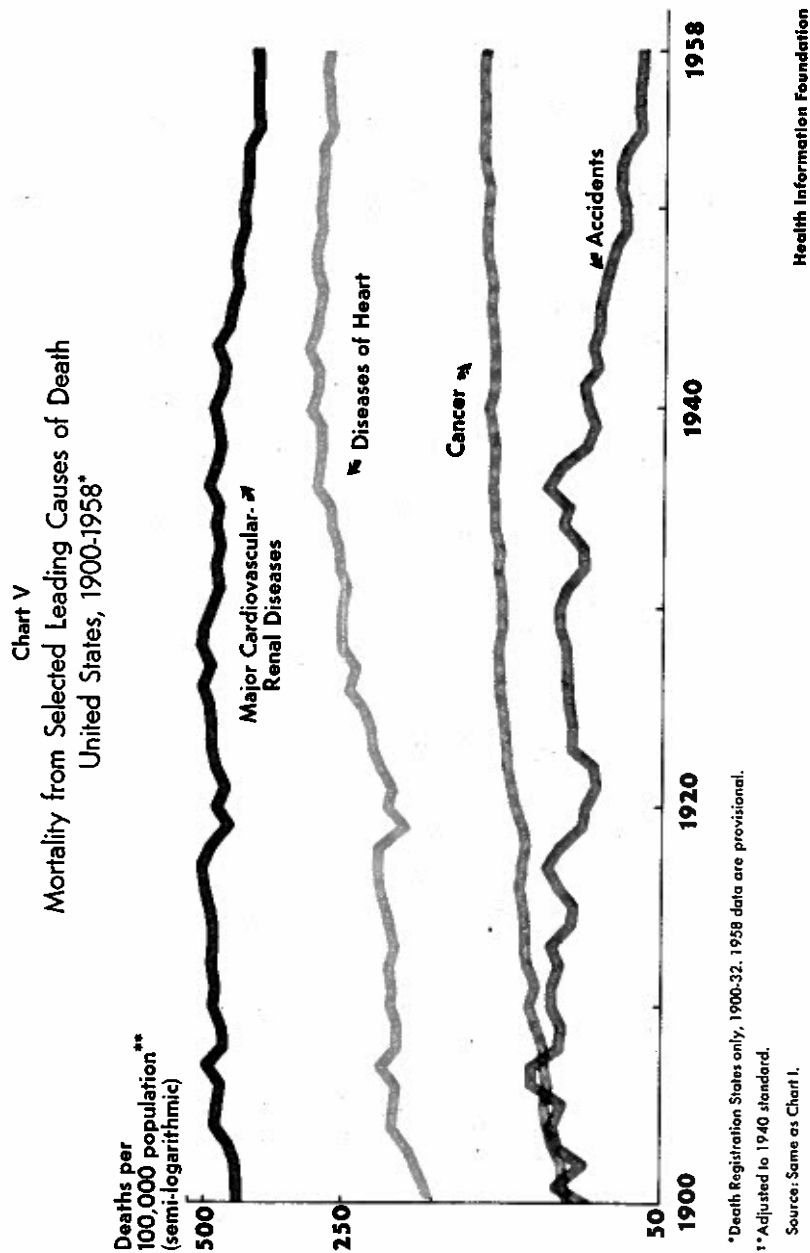
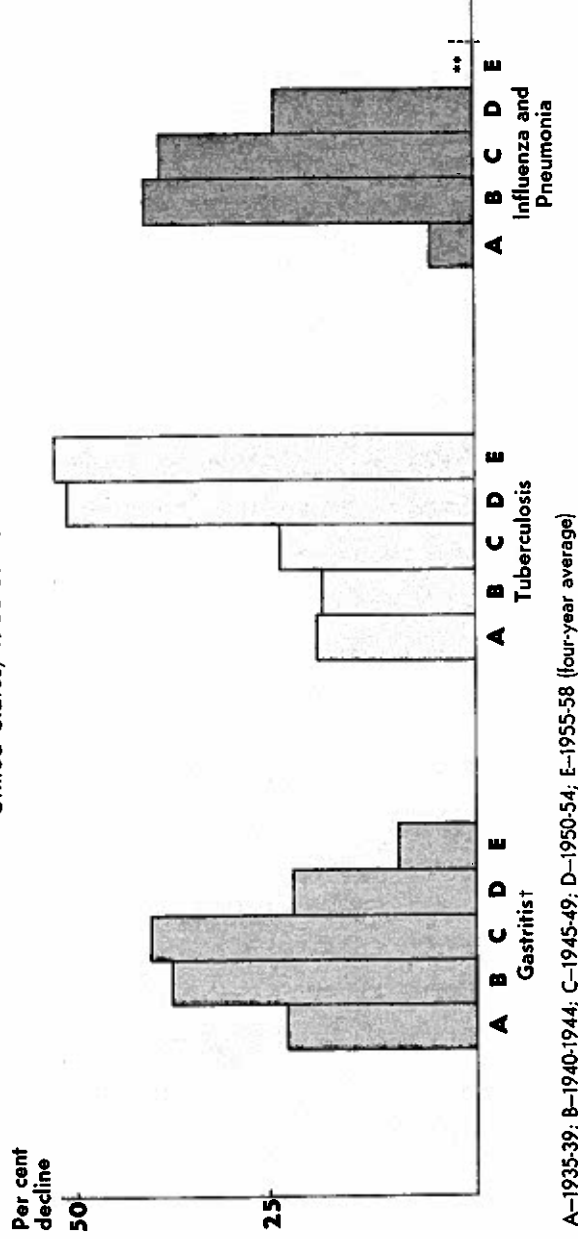


Chart VIII  
Mortality from Selected Communicable Diseases  
Decline from Preceding Period  
In Five-Year Averages of Annual Rates\*  
United States, 1935-39 to 1955-58



\*Adjusted to 1940 standard.

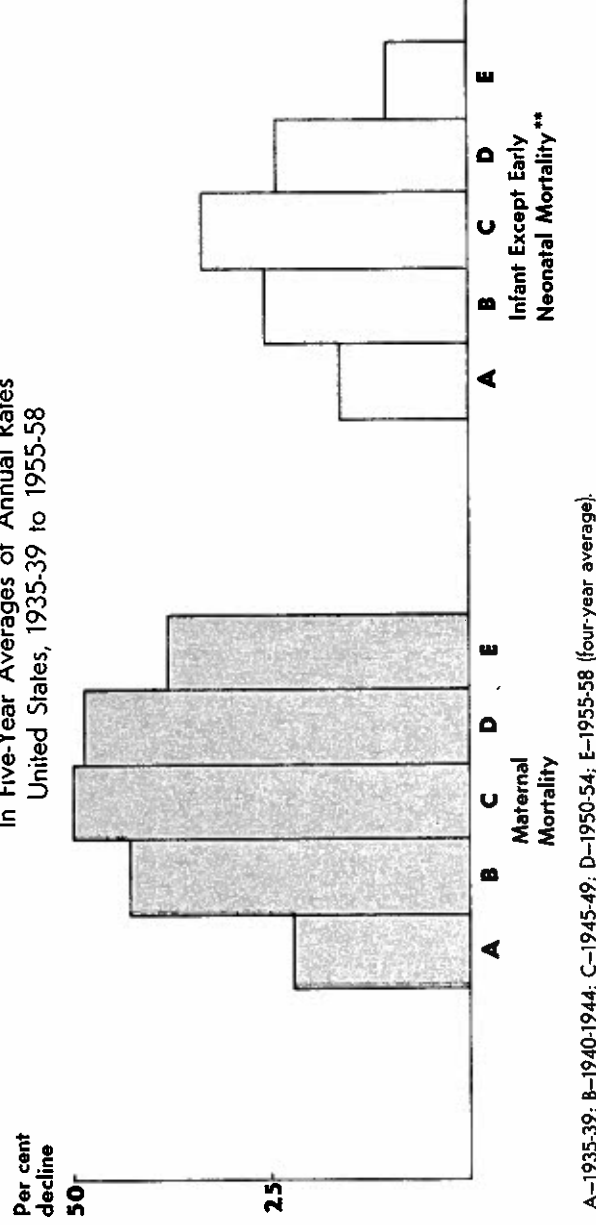
\*\*An increase of less than one per cent.

†Includes gastritis, enteritis, duodenitis and colitis.

Source: Same as Chart I.

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Chart IX  
Maternal and Infant Except Early Neonatal Mortality  
Decline from Preceding Period  
In Five-Year Averages of Annual Rates\*  
United States, 1935-39 to 1955-58



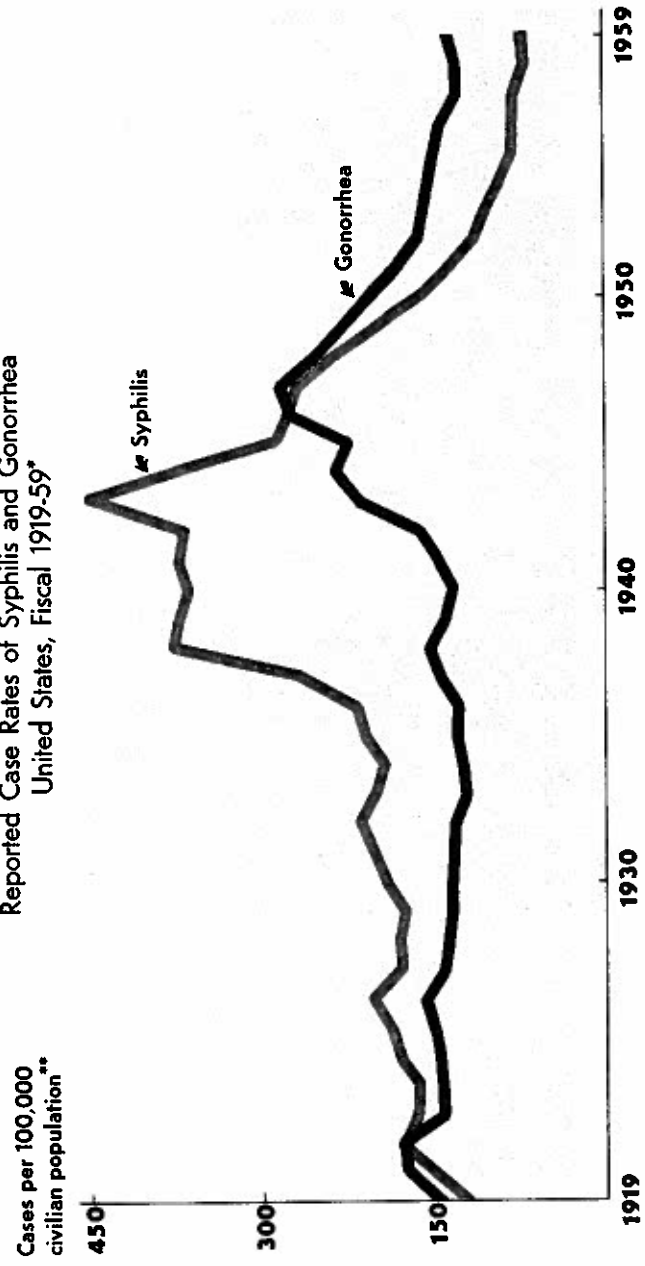
\*Adjusted to 1940 standard.

\*\*From one week to one year of age.

Source: Same as Chart I.

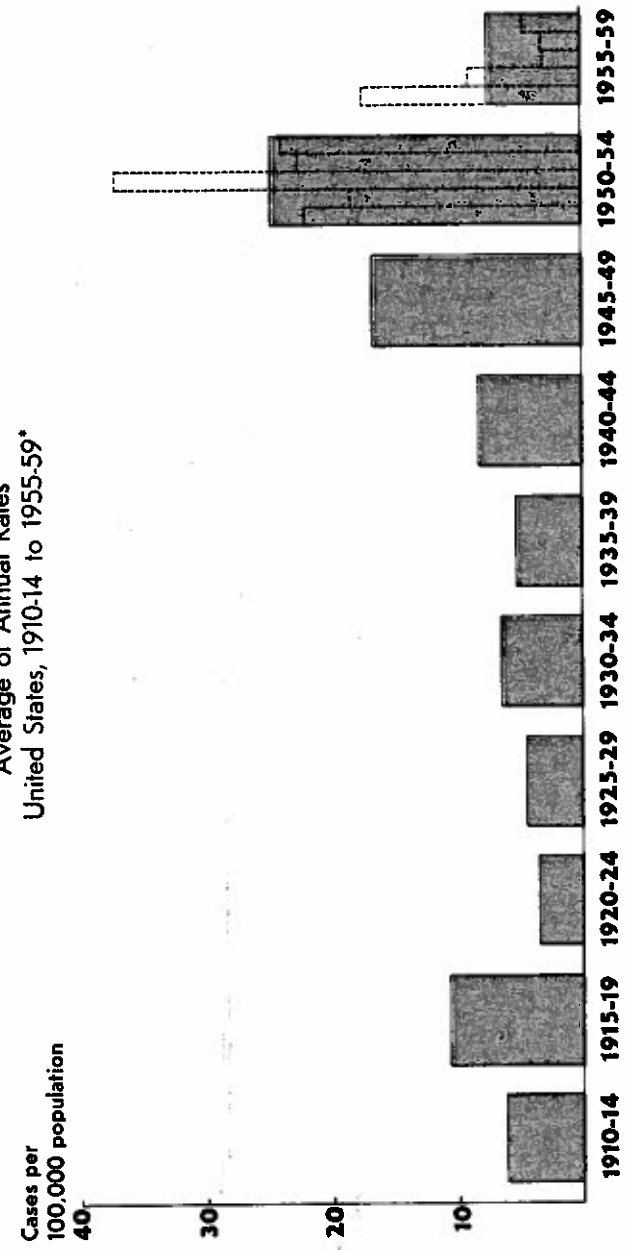
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Chart X  
Reported Case Rates of Syphilis and Gonorrhea  
United States, Fiscal 1919-59\*



\*Reporting States only, 1919-38. Data relate to fiscal year July 1 to June 30 of year named.  
 \*\*Excludes military cases after 1940; for syphilis only, excludes cases reported among Mexican agricultural workers diagnosed in the United States, 1957-59.  
 Source: Various reports by the Venereal Disease Branch, Communicable Disease Center, U.S. Public Health Service.  
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Chart XI  
Reported Cases of Poliomyelitis  
Average of Annual Rates  
United States, 1910-14 to 1955-59\*



\*Reporting States only, 1910-32. 1959 data are provisional.  
 Source: Various reports by the U.S. Public Health Service.  
 Health Information Foundation

Chart XII  
Expectation of Life at Birth  
Selected Countries, 1901, 1930, and 1958

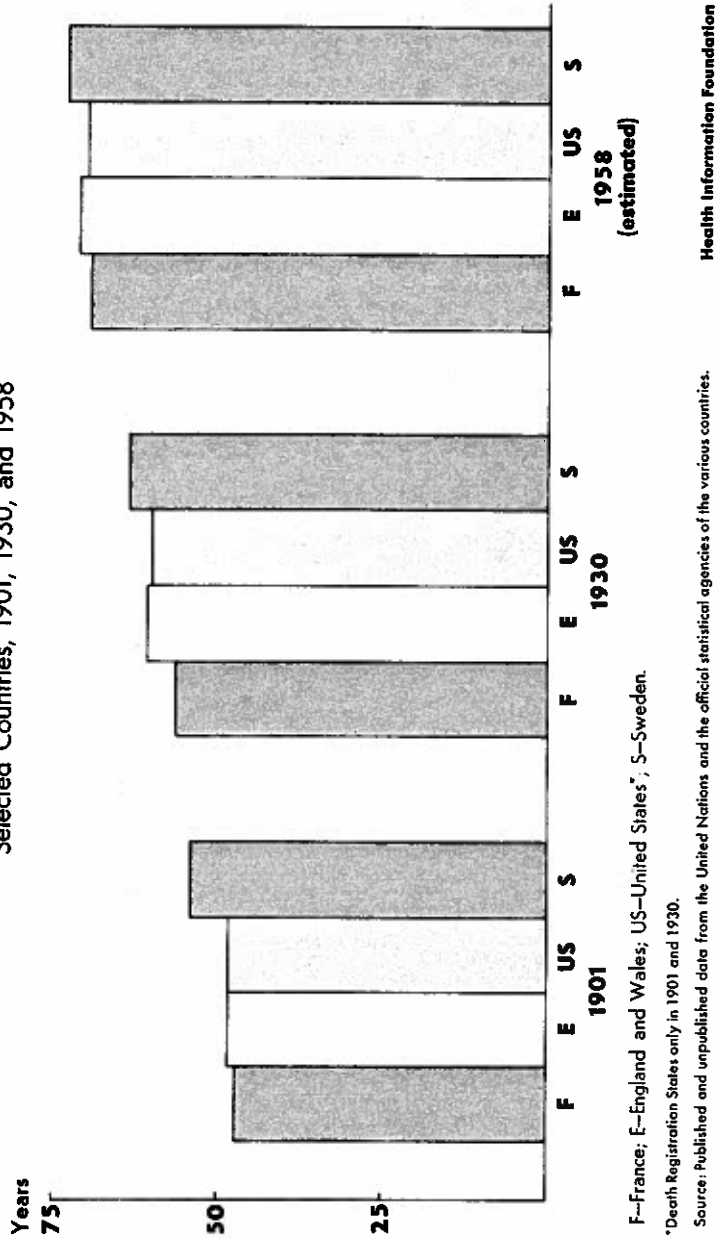


Chart XIII  
Marital Dissolutions by Death,  
United States,\* Selected Years

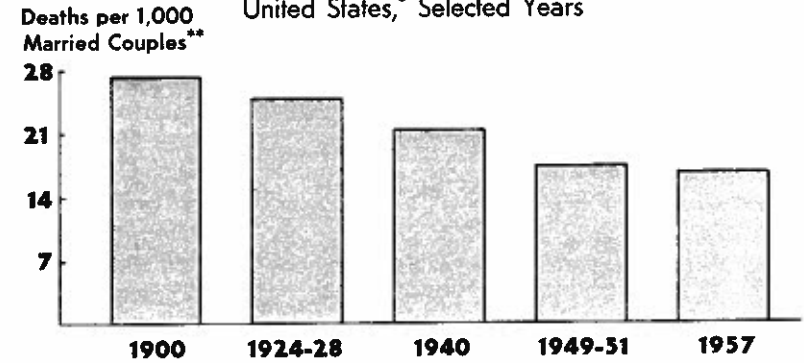


Chart XIV  
Physician Visits  
United States, Selected Years

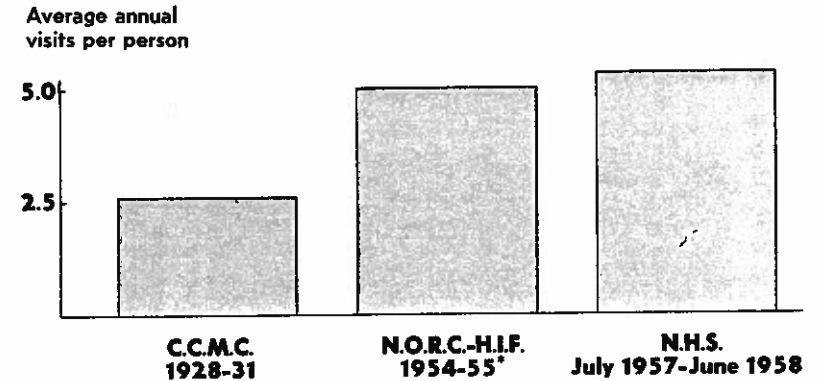
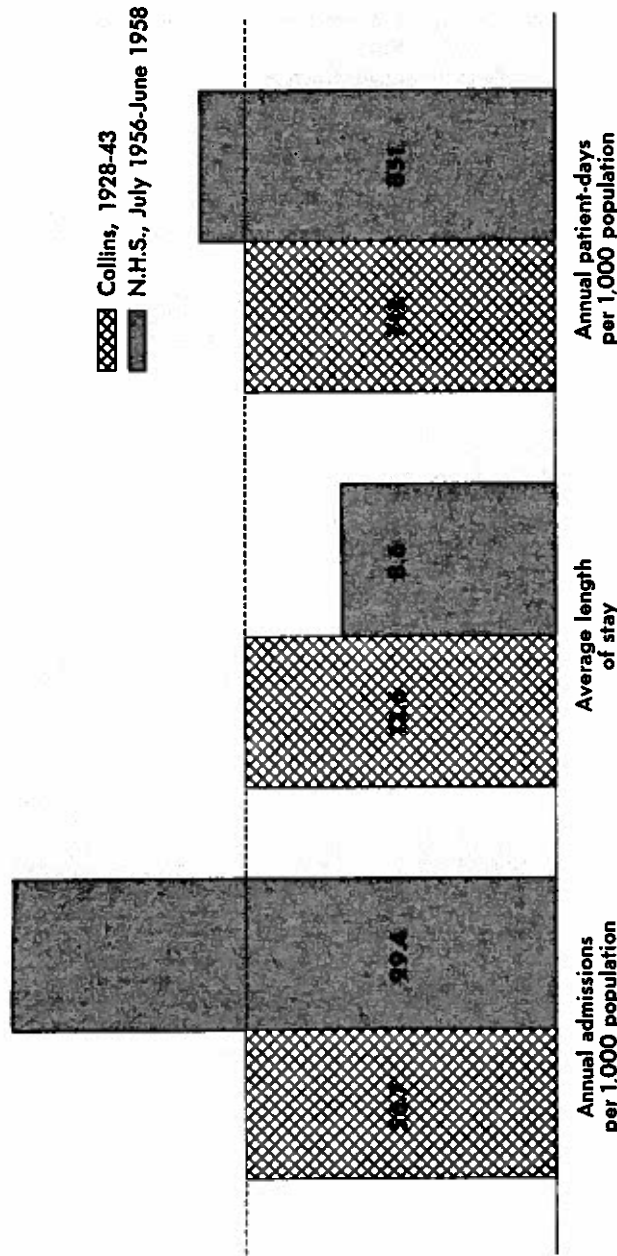


Chart XV  
Selected Measures of Hospitalization  
United States, 1928-43 and July 1956-June 1958



Sources: S. D. Collins et al., "Sickness Experience in Selected Areas of the United States," Public Health Monograph No. 25, Washington, D.C., 1955; and U.S. National Health Survey, "Hospitalization: Patients Discharged from Short-Stay Hospitals, United States, July 1957, June 1958," Series B-7, Washington, D.C., 1958.

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it was nearly as large for 1940-44, 11.1 per cent, and 1950-54, 9.1 per cent. For the most recent period (of four years), 1955-58, the decline slowed to 4.3 per cent, or at about the same level as the decline from 1930-34 to 1935-39.

A similar pattern prevails for each age-group of the population. The decline in death rates from the preceding period were uniformly highest through the period from 1935-39 to 1950-54. Again, for 1955-58 the extent of the decline slowed at nearly all ages, dropping back to the level of 1935-39. For two age-groups, 65-74 and 85 and over, there was actually an increase in death rates during the most recent period.

Nearly all of the decline in overall mortality represents the downfall of the communicable diseases.\* In fact, the communicable disease death rate declined 75 per cent between 1930-34 and 1955-58.\*\* Here, too, the major decline took place during the 15-year period after 1935-59 (see Table II), and between 1945-49 and 1950-54 the drop was 34 per cent. In contrast, the aggregate of mortality rates from all other causes dropped not at all between 1930-34 and 1955-58. As a result the communicable diseases which had accounted for 18.9 per cent of all deaths in 1930-34 dropped to only 5.5 per cent in 1955-58 (see Chart VII and Table III).

Among the communicable diseases, the major disorders which had been the leading causes of death in 1900 also declined far more between 1930-34 and 1955-58 than did the total of all deaths. Thus tuberculosis at 66.1 deaths per 100,000 in 1930-34, was down to 7.7 in 1955-58, a decline of 88 per cent (see Table IV). For tuberculosis the rate of decline actually increased with the passage of time. Between 1930-34 and 1935-39 the mortality rate fell 20 per cent, but from 1950-54 to 1955-58 it dropped 52 per cent (see Chart VIII).

Gastritis, averaging 18.7 deaths per 100,000 in 1930-34, dropped to 3.7 in 1955-58, or by 80 per cent. Its maximum rate

\*For purposes of this discussion, the communicable diseases are considered to include all infectious and parasitic diseases and influenza and pneumonia.

\*\*In this paragraph only, the discussion concerns death rates unadjusted for age.



Table II

**Mortality from the Communicable Diseases\* and All Other Causes  
Per cent Decline from Preceding Period in  
Five-year Averages of Annual Rates  
United States, 1930-34 to 1955-58**

Years	Per Cent Decline from Preceding Period	
	Communicable diseases	All other causes
1930-34	—	—
1935-39	10.5	-2.4
1940-44	27.0	-1.4
1945-49	30.2	1.8
1950-54	33.8	2.2
1955-58**	17.8	-0.2
1930-34 to 1955-58**	75.2	0†

\*"Communicable diseases" includes all infectious and parasitic diseases plus influenza and pneumonia; since 1949 adjusted to the Fifth Revision of the International List of Diseases and Causes of Death.

\*\*Average of four-year period.

†Increase of less than 0.05 per cent.

Source: Same as Table I.

Table III

**Mortality from the Communicable Diseases\*  
As a Per cent of All Causes  
United States, 1930-34 to 1955-58**

Years	% of all causes
1930-34	18.9
1935-39	16.9
1940-44	12.8
1945-49	9.4
1950-54	6.6
1955-58**	5.5

\*"Communicable diseases" includes all infectious and parasitic diseases plus influenza and pneumonia; since 1949 adjusted to the Fifth Revision of the International List of Diseases and Causes of Death.

\*\*Average of four-year period.

Source: Same as Table I.

Table IV

**Mortality from Gastritis,\* Tuberculosis, and Influenza and Pneumonia  
Five-year Averages of Annual Rates\*\*  
and Per cent Declines from Preceding Period  
United States, 1930-34 to 1955-58**

Years	Mortality Rates			Per Cent Decline From Preceding Period		
	Gastritis	TB.	Influenza and Pneumonia	Gastritis	TB.	Influenza and Pneumonia
1930-34	18.7	66.1	108.0	—	—	—
1935-39	14.3	53.1	102.2	23.5	19.7	5.4
1940-44	8.9	43.0	60.3	37.8	19.0	41.0
1945-49	5.3	32.6	36.7	40.4	24.2	39.1
1950-54	4.1	16.1	27.6	22.6	50.6	24.8
1955-58†	3.7	7.7	27.8	9.8	52.2	-0.7
1930-34 to 1955-58†				80.2	88.4	74.3

\*This category includes gastritis, enteritis, duodenitis, and colitis.

\*\*All rates are expressed per 100,000 population and are adjusted for age to the 1940 population of the United States. Rates since 1949 are adjusted to the Fifth Revision of the International List of Diseases and Causes of Death.

†Average of four-year period.

Source: Same as Table I.

of decline was 40 per cent from 1940-44 to 1945-49. Since then the rate of decline has slowed, although decline still continues.

Influenza and pneumonia, now leaders among these three disease categories, dropped from 108.0 in 1930-34 to 27.8 in 1955-58. For this category the maximum decline, 41 per cent, occurred from 1935-39 to 1940-44. In recent years its average rate has actually increased slightly, probably as a result of the Asian influenza epidemic of 1957-58.

Both the maternal and infant (except early neonatal, or infants after their first week of life) mortality rates, although already at an all-time low, have experienced an accelerated decline since 1930-34. Between those years and 1955-58, the maternal mortality rate dropped from 63.6 per 10,000 live births to 4.5, a decline of 93 per cent (see Chart IX and Table V). Mortality of infants after their first week of life dropped from 33.9 per 1,000 live births to 9.7, or a decline of 71 per cent. In each case the

decline was at a maximum rate over the preceding period in 1945-49, 50 per cent for maternal mortality and 33 per cent for infant except early neonatal.

**Shifting patterns of illness**

While progress against the major communicable diseases as leading causes of death has been clearly evident, tremendous progress also has been made in reducing the amount of illness from some of these same communicable diseases and others that relatively seldom result in death. An additional change which has taken place is that the case-fatality rates from some of these diseases are today far lower than they once were.

Some of the most severe diseases have virtually disappeared today. For example, in the Collins surveys during the 1930's, 31 acute disabling cases of smallpox were recorded per 100,000 population. If this rate were in effect today, over 50,000 cases would

**Table V**

**Maternal and Infant Except Early Neonatal\* Mortality Rates\*\*  
Five-year Averages of Annual Rates and  
Per cent Declines from Preceding Period  
United States 1930-34 to 1955-58**

Years	Mortality Rates		Per Cent Decline From Preceding Period	
	Maternal	Infant except early neonatal	Maternal	Infant except early neonatal
1930-34	63.6	33.9	—	—
1935-39	49.6	28.5	22.0	15.9
1940-44	28.5	21.3	42.5	25.3
1945-49	14.3	14.2	49.8	33.3
1950-54	7.4	10.8	48.3	23.9
1955-58†	4.6	9.7	37.8	10.2
1930-34 to 1955-58†			92.8	71.4

\*"Infant except early neonatal" refers to the period of life extending from one week to one year.

\*\*Maternal deaths per 10,000 live births and infant except early neonatal deaths per 1,000 live births. Maternal deaths since 1949 are adjusted to the Fifth Revision of the International List of Diseases and Causes of Death.

†Average of four-year period.

Source: Same as Table I.

occur annually. Actually, during the five-year period of 1954-58 only a total of 12 cases of this disease were reported in the entire U. S., and even these cases did not fulfill the generally accepted criteria for a diagnosis of smallpox.\*

Similarly, for whooping cough (pertussis), once far more prevalent and serious than today, the rate in the Collins surveys, 893 per 100,000, would now result in 1,500,000 cases annually, but during 1958 only 32,150 cases were reported in the U. S. Other infectious-parasitic diseases for which similar statements hold true, and where comparative data are available, include at least these: typhoid fever, diphtheria, measles, scarlet fever, malaria, and undulant fever.

But also, many very serious disease entities today are far more amenable to treatment than formerly, and as a result, their case-fatality rates are far lower. Fatality rates in the U. S. from scarlet fever and streptococcal sore throat declined from 10 deaths per 1,000 reported cases in 1935 to one in 1957. For whooping cough the comparable decline was from 26 to 6.\*\*

The dangers of venereal diseases, too, one of the world's major health problems for centuries, are now being greatly diminished, as a result of effective methods of treatment and the establishment of vigorous control and educational programs. The annual numbers of reported cases of syphilis and gonorrhea have been reduced sharply since the use of penicillin therapy. Thus, reported cases of syphilis dropped from 447 per 100,000 in fiscal 1943 to 69 in 1959.† The comparable figures for reported cases of gonorrhea were 284 per 100,000 in 1947 and 137 in 1959 (see Chart X).

Poliomyelitis in its epidemic form has been a late-comer on the morbidity scene in this country. In many ways it was a by-product of this century's higher living standards and progress in public health and sanitation. Until recently this disease was a widespread and constantly increasing danger, and little could be done to control it. But medical progress, culminating in the Salk

\*U. S. National Office of Vital Statistics, *Morbidity and Mortality Annual Report*, Annual Supplement for 1958, Vol. 7, No. 54, Oct. 30, 1959.

\*\*Computed from various reports by the U. S. Public Health Service.

†Health Information Foundation, "Control of Venereal Disease," *Progress in Health Services*, Vol. VIII, No. 9, November 1959.

vaccine, reduced this disease to its lowest levels in many years.\* The rise in number of cases which took place in 1958 and 1959 (see Chart XI) has been generally attributed to the failure of many individuals to avail themselves of the benefits of the vaccine.

Even against the communicable diseases, where some of the greatest progress has been made, major efforts are still oriented toward control. Prevention of these diseases is still far from an accomplished fact. The recent Asian influenza epidemic and the rise in the incidence of respiratory conditions and other illnesses document this statement. To put it another way, even though many diseases have changed in character, they are more readily cured than formerly because of medical progress, new medications, etc., and the amount of disability they cause is therefore less. However, although some of the more severe illnesses have disappeared completely, others remain. Comparison of the National Health Survey data for 1957-58 with the Collins surveys suggests the possibility of an actual increase in the volume of acute disabling illness.\*\*

### The effects on society of improved health

Improvements in the level of health have resulted in many drastic changes in our society. Most of these are without doubt on the plus side, yet many also have created new and complex problems, difficult to solve. Nevertheless the major goal, improved health for the entire population, remains the same.

One striking change has been the substantial increase in life expectancy and survivorship. From 47 years in 1900 (see Chart XII), our average expectancy of life at birth increased to 69.5 years in 1958.† The increases in this country have paralleled those of other advanced (in the public health sense) nations.†† Further sizable increases in life expectancy today depend on breakthroughs against the complex cardiovascular-renal diseases, cancer, and accidents.

\*Health Information Foundation, "The Changing Status of Polio," *Progress in Health Services*, Vol. VIII, No. 3, March 1959.

\*\*Health Information Foundation, "Acute Illness in Two Surveys," *Progress in Health Services*, Vol. VIII, No. 10, December 1959.

†Health Information Foundation, "Increasing Life Expectancy at Birth," *Progress in Health Services*, Vol. V, No. 4, April 1956, and "Adding to Length of Life," *Progress in Health Services*, Vol. V, No. 5, May 1956.

††Health Information Foundation, "Health Levels in Four Advanced Nations," *Progress in Health Services*, Vol. VIII, No. 7, September 1959.

As a corollary to increased life expectancy, the proportion of aged persons in our population has risen.\* In turn, the problem of maintaining these individuals and of providing them with the requisite and necessary medical care looms as far more important than ever before.\*\*

The American family has benefited greatly from improvements in health.† The decline in mortality, especially at the younger and middle ages, has increased average lifetime for the family unit as well as for each member. Thus, the dissolution of marriage by the death of one partner, especially at a young age, is less common than it once was. In 1900, 27.4 marriages in every 1,000 ended each year in the death of one spouse. By 1957 the rate had dropped to 16.6 per 1,000 (see Chart XIII), or by about 40 per cent. Currently about 750,000 marriages are broken by the death of a husband or a wife each year. At 1900 rates an additional 400,000 would be dissolving annually.

Furthermore, marital dissolutions by death now occur at much older ages on the average, and after many more years of married life. The average individual today has a much greater chance of surviving to see his children past their dependency period. Widowhood has been largely postponed to a period of life when responsibility for minor children is not as great. And even more striking, orphanhood is fast diminishing as a social problem even though these children, as all others, have a greatly improved chance of reaching adulthood.

By the same token, the person who begins his formal education (usually at ages 5 or 6 in this country) has a much better chance of surviving through the school years. Length of working life, too, has increased, so that the person entering the labor force has a far better chance than formerly to reach retirement age, and once retired, to enjoy many more years of leisure. The work-life expectancy for men increased from 32 years in 1900 to 42 in 1955.

\*Health Information Foundation, "Our Aging Population," *Progress in Health Services*, Vol. V, No. 6, June 1956.

\*\*Health Information Foundation, "Voluntary Health Insurance Among the Aged," *Progress in Health Services*, Vol. VIII, No. 1, January 1959, and "Use of Health Services Among the Aged," *Progress in Health Services*, Vol. VIII, No. 4, April 1959.

†Health Information Foundation, "Health and the Changing Family," *Progress in Health Services*, Vol. VII, No. 7, September 1958.

Another consequence of increased survivorship, at least in part, is that many individuals who would formerly have died from severe illnesses, may today be living, although in somewhat less than perfect health. The load of illness, both acute disabling and chronic, may be somewhat larger than formerly. Partly in response to this, the use of physicians' services has increased.\* Whereas 25 years ago the average individual may have made about 2.5 doctor visits annually (see Chart XIV), today the average is more likely to be about 5. Most of these visits are made to the family physician, still a key figure in medical practice.\*\*

Similarly, hospital admissions and average annual days of use per person have also increased.† Admission rates to general hospitals in the United States increased from 56.7 per 1,000 population in 1928-48 (Collins' surveys) to 99.4 in 1956-58 (National Health Survey), or by 75 per cent. Hospital utilization increased from 712 to 851 annual patient-days per 1,000 population (see Chart XV), or by 20 per cent. Much of the increase resulted from the growth in hospitalization for deliveries and related conditions, but even without that category the rise in admissions and utilization was impressive. Nearly all categories of diagnostic conditions shared in the increase, but again for nearly all diagnoses, the average duration of stay per admission declined. For all diagnoses combined, the average duration of stay dropped from 12.6 days per admission to 8.6, or by about one-third.

These changes in health levels and the resulting changes in hospital use have transformed the general hospital in this country.†† Today each bed in general hospitals is used for the treatment of a larger number of patients annually. This is made possible by the decreased average length of stay per patient, but also by larger average occupancy ratios. Nevertheless, over the years our investment in hospitals in this country has grown consider-

\*Health Information Foundation, "The Increased Use of Medical Care," *Progress in Health Services*, Vol. VII, No. 8, October 1958.

\*\*Health Information Foundation, "A View of Our Family Physicians," *Progress in Health Services*, Vol. VII, No. 6, June 1958.

†Health Information Foundation, "The Changing Pattern of Hospital Use," *Progress in Health Services*, Vol. VII, No. 5, May 1958, and "Trends in Use of General Hospitals," *Progress in Health Services*, Vol. VIII, No. 8, October 1959.

††Health Information Foundation, "The General Hospital in Transition," *Progress in Health Services*, Vol. VI, No. 7, September 1957.

ably.\* As a result, the number of beds in hospitals has increased by a substantial quantity,\*\* and their distribution throughout the country has been altered radically.†

Since despite the improved levels of health in the United States there is likely to be an increased load of illness and disability, Americans use more health services than formerly and consequently spend more money on their health than they ever did.†† Thus in 1929 Americans disbursed almost \$3 billion as aggregate personal consumption expenditures for medical care, but by 1957 the total had reached \$15 billion.

### Summary and overview

Health levels in the United States have improved substantially during the twentieth century. Because of these improvements, mortality no longer looms as large in the health picture and the mortality rate is not sensitive enough as an index of the nation's health to be used alone. Illness and disability rates, and other measures as well, are needed to supplement it. However, illness and disability rates, because of their inherent peculiarities, must be used with extreme caution.

Between 1900 and the present, mortality rates dropped sharply in this country. The decline occurred at all ages and for both sexes, but it was greatest among younger people and for the female sex. Childbirth became far less hazardous for mothers, and infant mortality declined sharply as well.

The communicable diseases — gastritis, tuberculosis, and influenza and pneumonia — decreased sharply as causes of death and lost their places in the front ranks of major killers. They were replaced by heart disease, cancer, vascular lesions of the central nervous system, and accidents.

Although they were considerable in the first quarter of this century, the declines in mortality actually accelerated in the latter

\*Health Information Foundation, "Our Growing Investment in Hospitals," *Progress in Health Services*, Vol. VII, No. 3, March 1958.

\*\*Health Information Foundation, "The Growth of American Hospital Facilities," *Progress in Health Services*, Vol. V, No. 8, October 1956.

†Health Information Foundation, "The Distribution of American Hospital Facilities," *Progress in Health Services*, Vol. V, No. 10, December 1956.

††Health Information Foundation, "What Americans Spend for Personal Health Services," *Progress in Health Services*, Vol. V, No. 7, September 1956, and "Consumer Spending for Medical Care," *Progress in Health Services*, Vol. VII, No. 10, December 1958.

part of the second quarter. The improvement in infant and maternal mortality, and the decline of the communicable diseases, was even more rapid than before. The acceleration in improvement coincided generally with an acceleration in the pace of new medical advances, introduction of the sulfa drugs and the antibiotics and improvements in the standard of living. However, within the most recent period, the mortality rates generally have reached a plateau, and it may be that further declines will be slow, even though health progress steadily continues.

Changes in illness patterns also have been far-reaching. Many cases of acute disabling illness are recorded today, but the duration of disability or days in bed associated with each case has decreased. The character of illness has been transformed—some of the severe infectious illnesses of former days (e.g., smallpox) have virtually disappeared. Others have become far less severe (e.g., scarlet fever and streptococcal sore throat) and case-fatality rates have dropped sharply. Some (e.g., whooping cough), although not completely vanished, are far less prevalent than formerly. Other major diseases (e.g., syphilis) have been reduced to record lows. But progress has not yet reached the point where these diseases have been prevented; rather, our efforts are directed at better control.

Declines in mortality have had profound consequences for society. Life expectancy has increased and survival at all stages of life is much greater than formerly. The family is strengthened, since widowhood has been relegated to the older ages, and orphanhood has become a vanishing social problem. The chances of surviving through to the end of the working life period are better, as are the chances of surviving to see one's children reach adulthood.

Increased survivorship, especially at the older ages and at less than perfect health, have resulted in increased demands for medical care. Also contributing to increased demands is a possible rise in the volume of illness. The use of physicians' services, hospital admissions and days of use, and expenditures for medical care—all have increased. If present trends continue, the outlook for further progress and better health is certain.

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## ~~ABOUT HEALTH INFORMATION FOUNDATION~~

The Foundation was organized in 1950 by a group of leaders in the drug, pharmaceutical, chemical and allied industries who believe that the health field can continue its great progress only if citizens assume responsibility for its freedom.

These progressive representatives of the more than 200 companies supporting the Foundation decided they could serve the public interest by:

—documenting through research the accomplishments of the present system of medical care;

—defining areas in the health field in need of improvement and investigating possible solutions to current problems;

—bringing, through all media of communication, research findings, needed facts and new knowledge related to health problems to organizations active in the health field and to the public.

Today the Foundation is studying many of the most vital problems related to health in the United States, among them the ways by which voluntary health insurance can be expanded and improved, the special problems of Americans over 65, and the opinions and attitudes of the general public toward health services.

The Foundation's president is George Bugbee; Odin W. Anderson, Ph.D., is research director. The Foundation offices are at 420 Lexington Avenue, New York 17, N. Y. Reports in the Research Series and other Foundation publications are available on request.