

*An Examination of the  
Concept of Preventive Medicine*

*Odin W. Anderson, Ph.D.,  
Research Director, Health Information Foundation*

*George Rosen, M.D., Ph.D.,  
Professor of Public Health Education,  
School of Public Health and Administrative Medicine,  
Columbia University*

*This report is published with assistance from the  
WILLIAM AYRES AGLAR COOK MEMORIAL FUND  
contributed by his friends to Health Information Foundation for  
such purpose. Mr. Cook (1889-1957) was a leader in the field of  
trade publishing, particularly in the drug and food industries.*

*Research*  *Series 12*

## HEALTH INFORMATION FOUNDATION RESEARCH SERIES

1. *The Behavioral Scientists and Research in the Health Field—a questionnaire survey*, Odin W. Anderson, Ph.D., and Milvoy Seacat, M.A. 1957.
2. *An Examination of the Concept of Medical Indigence*, Odin W. Anderson, Ph.D., and Harold Alksne, M.A. 1957.
3. *The Prescription Pharmacist Today*, Wallace Croatman and Paul B. Sheatsley. 1958.
4. *The Public Looks at Hospitals*, Eliot Freidson and Jacob J. Feldman. 1958.
5. *Public Attitudes Toward Health Insurance*, Eliot Freidson and Jacob J. Feldman. 1958.
6. *The Public Looks at Dental Care*, Eliot Freidson and Jacob J. Feldman. 1958.
7. *The Medical Care Price Index*, Harry I. Greenfield, Ph.D. and Odin W. Anderson, Ph.D. 1959.
8. *Health Research Opportunities in Welfare Records—a preliminary report on illness and economic dependency*, Herbert Notkin, M.D., M.P.H. 1959.
9. *Comprehensive Medical Insurance—a study of costs, use, and attitudes under two plans*, Odin W. Anderson, Ph.D. and Paul B. Sheatsley. 1959.
10. *Financial Resources of the Aging—reported resources available to those aged 65 and over in meeting medical costs up to \$500*, Ethel Shanas, Ph.D. 1959.
11. *Measuring Health Levels in the United States, 1900-1958*, Odin W. Anderson, Ph.D., and Monroe Lerner. 1960.
12. *An Examination of the Concept of Preventive Medicine*, Odin W. Anderson, Ph.D., and George Rosen, M.D., Ph.D. 1960.

MANY OF THE GREAT ADVANCES in controlling communicable diseases in the recent past were victories of preventive medicine. These victories very naturally encouraged the belief that preventive measures would continue to improve health in the future, regardless of the disease target. Further, the same preventive approaches which had been so successfully applied to communicable diseases were expected to solve our newer health problems as well.

These optimistic views are still very evident today. Much contemporary discussion of preventive medicine can only be described as "Utopian." This is well illustrated in the enviable simplicity of the statement on disease prevention voiced by the President's Commission on the Health Needs of the Nation :

*Either we pay to preserve health or we pay to repair it. The choice is the same as with maintenance of a house; either the owner pays to keep a good roof between the elements and the occupants, or he pays for the damages when the roof begins to leak.\**

The same optimism can be seen in the following assessment of our health goals :

*The goal of health now at mid-century calls for not only the cure or alleviation of disease. It calls for even more than the prevention of disease. Rather, it looks beyond, to strive for maximum physical, mental and social efficiency for the individual, for his family, and for the community.*

*To work towards this ideal—though, of course, never*

\**America's Health Status, Needs and Resources*. Washington: Government Printing Office, 1951. Vol. II, p. 254.

*completely attainable — end requires the informed efforts of each individual person to improve his own health, requires provision of health resources by organized society, requires the skills and guidance of physicians and the assistance of various associated professional groups, and indeed of many other individuals, groups, and agencies engaged in health activities in the community.*

*Coordinated health services must be directed toward providing a wide spectrum of comprehensive health care, promoting health, preventing disease, detecting and treating disease at the earliest possible moment to prevent disabling sequelae, limiting disability to the greatest extent possible if disease becomes established, and restoring the individual to his most useful practicable functioning when permanent disability is inevitable.\**

Some of these objectives are undoubtedly attainable. Others may not be—or, at least, may not be in the light of our present knowledge, the nature of our social organization, and the range of life-goals other than optimum health which have a claim on people's time, attention, and resources. The problem is, of course, learning which *are* attainable, when, and how. And despite the optimism engendered by its past successes, prevention has a yet undetermined future role in the achievement of attainable health objectives.

Even among physicians and medical educators there is no consensus as to the theoretical and substantive nature of preventive medicine. The preventive approaches of communicable disease control are still with us, as are other more recent concepts of prevention. Many of the terms of prevention have not been defined, and definition may well reveal fundamental differences in social philosophy among current concepts. This discussion examines prevention as applied to past and present health problems, viewing as well social and economic develop-

\*Katherine G. Clark, ed., "Preventive Medicine in Medical Schools." Report of the Colorado Springs Conference, November 1952. Chicago, Association of American Medical Colleges, 1953. pp. 3-4.

ments to which the control and eradication of disease are closely related.\*

### Disease in time and place

Disease has always occurred in the same basic forms, such as infection, disturbances of development and metabolism, traumatism, and neoplasia. But while these basic types have not changed, the incidence and prevalence of illnesses have varied from time to time and place to place. The occurrence of disease in a given population at a specified time exhibits a characteristic pattern as defined by morbidity, mortality, and causation. Broadly speaking, the pattern of disease is associated with the population's level of social and technical development and is significantly related to the prevailing values of the people. Knowledge of the changes in the occurrence of disease is essential for an understanding of the health problems faced by communities in the course of history and of the concepts of preventive medicine that were developed to meet them.

Civilizations in early centuries reveal continuing concern with general and individual health, as evidenced by rules for individual hygiene, diet, and environmental sanitation. These were not intended to prevent specific diseases, since ancient and medieval physicians did not generally distinguish different diseases but were concerned rather with groups of symptoms exhibited by sick people. These signs of disordered health were explained by theories about the abnormal mixture of the body fluids or the influences of the environment or other ideas based on the concept of health as a balance of elements or forces. Gradually, as a body of knowledge emerged which related organ pathology with signs and symptoms observed at the bedside, there developed a concept of distinct disease entities, such as diphtheria, pneumonia, and typhoid fever.\*\*

Recognition of distinct diseases made possible concepts of prevention in a specific, directly applicable sense and eventually

\*Special recognition is due John R. Goldsmith, M.D. for frequent consultation during the development of this report while he was Research Fellow, Department of Preventive Medicine, Medical School, Harvard University; since then he has become Head, Studies of Health Effects of Air Pollution, California State Department of Public Health, Berkeley, Calif.

\*\*Historical statements and data are based on George Rosen's *A History of Public Health*. New York, MD Publications, 1958.

led to the control or elimination of widespread scourges of microbial origin. It also made possible the counting of morbidity and mortality on a more precise basis, which was undertaken in Europe in the 17th and 18th centuries. It is difficult, however, to establish patterns of disease in earlier centuries. If the very concept of disease has changed, how can we know which modern disease was meant in a document written centuries or millenia ago? Can we establish the incidence and prevalence of disease in these earlier periods and in various parts of the world? Statistical data on health and disease exist only in economically advanced countries even today, and in these countries they have been kept for only the past 100 or 150 years. Yet, despite these limitations and difficulties, it is possible to trace in outline the history of numerous diseases—some from antiquity, others from more recent periods. These data make it possible to distinguish certain disease patterns.

Looking back at the history of Europe over the past 1,000 years, we can see five patterns of disease.\* Of course, these are not exclusive in any period, but they serve as landmarks or outstanding features distinguishing the different centuries in terms of their health problems.

1. *Leprosy and plague.* Although leprosy was present in Europe before the Crusades, it apparently became epidemic around 1100 and then spread widely. After the 14th century it gradually subsided. Nevertheless, it was not until the 16th century that leprosy lost all practical significance in Europe, even though as late as 1900 it was still to be found in Norway.

While leprosy and plague characterize the period between 1000 and 1500, Europe was ravaged by outbreaks of many other diseases as well. Among those that can be identified were smallpox, diphtheria, measles, influenza, ergotism, tuberculosis, scabies, erysipelas, anthrax, trachoma, the sweating sickness, and mass hysteria. However, leprosy and plague dominated thought and action. The methods devised to deal with them provided the pattern of preventive action of the period.

\*Based on lecture notes developed by G. E. Hobbs, M.D., Professor of Preventive Medicine and Psychiatry, Faculty of Medicine, University of Western Ontario, London, Ontario, and Odin W. Anderson when he was on Dr. Hobbs' staff. This material has been qualified and amended by George Rosen.

2. *Louse-borne diseases and syphilis.* Toward the end of the 15th century diseases spread by lice appear to have become increasingly important. From that time until the second half of the 19th century the louse pursued a triumphant course, and typhus fever became the dread companion of wars and famines. As conditions improved or deteriorated there were great fluctuations in the prevalence of typhus and other louse-borne diseases. In the 19th century, as cotton and soap won over dirt and wool, typhus disappeared from Western Europe. However, the disease remained endemic in areas with a lower standard of living (e.g., Eastern Europe, where there were extensive epidemics during and after World War I).

Side by side with the louse-borne diseases was syphilis, which also characterized the period from the 16th to the 18th century. Syphilis, of course, did not disappear at the end of that time, but it acquired a social stigma toward the end of the 18th century and "went underground," which greatly hindered efforts to control it during the 19th century and the present one.

3. *Gastro-intestinal diseases.* During the 19th century the louse-borne diseases were replaced in Europe as major community health problems by diseases spread through the gastro-intestinal tract. Those that were most clearly defined at first and that created the greatest impact were cholera and typhoid fever. The rise of these diseases was closely linked to the urban expansion which followed the industrial revolution. The lack of environmental sanitation permitted gastro-intestinal excretions to spread freely and transmit disease. Toward the end of the century these diseases began to decline as cities benefited from disposing properly of sewage and purifying water and milk.

4. *Tuberculosis and the communicable diseases of childhood.* The impact on the populations of Europe of the 19th century developments in sanitation, microbiology, and nutrition did not become grossly evident until the latter part of the century. All western countries showed a decline in death rates and great increases in population. Frequently overlooked are the great improvements in mortality for the adult and middle age groups during the latter half of the century, before the benefits of the

bacteriological discoveries became evident, apparently as a result of general improvements in living conditions, particularly the stabilization of the food supply.\*

During the late 19th century and continuing into the 20th, a number of diseases of the respiratory tract which had been important causes of death began to decline. Mortality due to tuberculosis dropped even before the discovery of the tubercle bacillus. Concurrently, beginning in most countries about 1880, the communicable diseases of childhood gradually declined as causes of death. During the 20th century this trend was accelerated by immunization and more effective therapies.

5. *Cardiovascular-renal diseases, malignant neoplasms and accidents.* With the decline in morbidity and mortality from gastro-intestinal and respiratory diseases, particularly in children and young adults, many more people survived into the age groups associated with non-communicable diseases, such as cancer, arthritis, and cardiovascular and renal diseases. With our better diagnostic facilities and techniques, these so-called degenerative conditions are undoubtedly identified more often. However, their increasing incidence has been real, and is most likely due to the aging of the population. Deaths due to accidents have probably remained relatively constant, but reductions in deaths from all other causes have exposed accidents as the third cause of death today.

Perhaps increasing concern with such conditions as asthma, peptic ulcers, ulcerative colitis, and others that are less specific symptomatically—the psychosomatic diseases—indicates another period which we are entering, if indeed we are not already in it. Furthermore, increasing isolation of the so-called somatic diseases as causes of death may well make us more aware of psychosomatic disorders as productive of ill health. The implications of such a trend for concepts of prevention are evident. Preventing psychosomatic diseases is indeed a far cry from the specific control of communicable diseases.

The history of diseases and disease prevention can also be studied in terms of specific societies—the age and sex composi-

\*Odia W. Anderson, "Age-Specific Mortality in Selected Western European Countries with Particular Emphasis on the Nineteenth Century," *Bulletin of the History of Medicine* 29:242, May-June 1955.

tion, prevailing methods of earning a living, degree of occupational specialization, and organization, distribution, and quality of the health services of different countries.

What are the minimum available data needed to show in broad outlines the interrelationships of disease and social factors in a country?

The following framework is suggested:

- A. Characteristics of the population
  - a. Age and sex composition
  - b. Birth rate
  - c. Crude mortality rate
  - d. Infant mortality rate
- B. Level of social and technical development
  - a. Proportions of rural-urban residents
  - b. Proportions of various occupational groups
    - (1) Agriculture
    - (2) Public service (government and professions)
    - (3) Commerce
    - (4) Industry
- C. Patterns of disease as measured by mortality
  - a. Major disease problems; chief killing diseases in all age groups
  - b. Diseases that are disappearing
  - c. Diseases that are emerging
- D. Level of medical development
  - a. Nature of medical personnel, facilities, and technology
  - b. Prevailing theories of disease causation
  - c. Methods of disease control and prevention
  - d. Prevailing methods of treatment

**The suggested model: Sweden**

The excellence of Swedish data make possible a good case study of the historical patterns of vital and social indices of that country. Swedish records, maintained continuously since 1750,

are both the earliest and the most complete of any country in the world.†

There are other still more important reasons for selecting Sweden to illustrate the patterns of vital and social indices of a nation. After the Napoleonic Wars, the last wars in which Sweden was involved, the country settled down and gradually evolved from a primarily agricultural country to a well-balanced industrial and agricultural economy. Except for heavy emigration during the latter part of the 19th century there have been, in effect, no violent influences such as wars, rapid industrialization and so on to distort the steady evolution of the social structure. At the same time Sweden has kept abreast of scientific developments in agriculture, industry, and medicine and public health.

Swedish data will be utilized for the following years: 1750, 1850, 1875, 1900, 1930, and 1945. The broad and social indices of Sweden for each of the selected years appear in Table 1.

**Table 1**  
**Vital and Social Indices of Sweden 1750-1945**

	1750	1850	1875	1900	1930	1945
Crude mortality rate*	26	22	19	16	12	11
Infant mortality rate**	206	152	131	97	56	30
Crude birth rate***	37	32	31	27	15	20
Life expectancy at birth	38	38	41	44	62	66
% of population over 50	18	16	18	21	22	25
% of population under 10	23	23	23	22	16	15
% of population in broad occupational groups:						
Public services	10	11	8	7	7	10
Commerce	2	2	6	10	18	20
Industry	8	11	15	28	36	40
Agriculture	80	76	71	55	39	30

\*Number of deaths per 1,000 population, excluding stillbirths.

\*\*Number of deaths of children under one year of age per 1,000 live births.

\*\*\*Number of live births per 1,000 population.

†Swedish data have been obtained from Dorothy S. Thomas, *Social and Economic Aspects of Swedish Population Movements, 1750-1933*. New York, Macmillan, 1941; *Statistisk Årsbok för Sverige, Trettiosjätte Årgangen, 1949*. Stockholm, Statistiska Centralbyrån, 1949; *Demographic Yearbook, 1948*. United Nations, Lake Success, New York, 1949.

The level of Swedish social and technical development remained remarkably stable from 1750 to 1850, as the per cent of the population in the broad occupational groups shows. Over 75 per cent of the population was engaged in agriculture.\*

The vital indices were also stable, except for an appreciable drop in the infant mortality rate (from 206 to 152). In the years between 1750 and 1850 there were violent annual fluctuations in infant mortality (between 141 and 286) but the trend was definitely downward. Infant mortality rates between 1850 and 1875 ranged from 91 to 149. Why did infant mortality rates decrease significantly before there was wide knowledge of elementary sanitation? Perhaps a broad explanation can be broached in terms of living conditions, particularly with regard to the food supply. Before 1750 the food supply in Western Europe was irregular due to crop failures and the absence of outside sources of food. From 1750 to 1850 Western Europe stabilized its food supply and thereby eliminated outright famines. Infant mortality rates and, to a lesser degree, crude mortality rates, reflect the improved conditions.

Modern trends in the vital and social indices began to appear between 1850 and 1875 and rapidly accelerated thereafter. Sweden began to industrialize during this period, particularly after 1875. As Table 1 shows, the per cent of population engaged in agriculture in 1850, 1875, and 1900 dropped from 76 to 71 to 55.

#### A. Characteristics of the population

The age composition of the population in Sweden remained relatively constant from 1750 to 1875, presenting the typical perfect pyramid shape of an agriculturally based economy. (Figure 1.) After 1875 the population pyramid began to contract at the base and expand at the top as a result of the decreasing birth rate and the increase in the average expectation of life. The pyramid for 1945 reflects the increase in births during and after World War II.

The proportion of the population over 50 years of age in-

\*A rewarding article on this period is: E. F. Heckscher, Swedish population trends before the Industrial Revolution," *Economic History Review* 2nd Series 2:266-277, 1950.

creased from 16 per cent in 1850 to 25 per cent in 1945. Correspondingly, the proportion of the population under 10 years of age decreased from 23 to 15 per cent. Life expectancy at birth increased from 38 in 1850 to 66 in 1945, most of the increases occurring since 1900.

Trends in Sweden's absolute growth of the population, infant mortality rate, crude birth rate, and crude mortality rate are shown in Figure 2. As in Sweden, a distinct drop in the infant mortality rate occurred in other Western European countries during the decade from 1890 to 1900, suggesting similar forces producing similar manifestations in several areas. The crude mortality rate began to fall in Western Europe during the period from 1870 to 1890, although Sweden's declining death rate started relatively early, in the first decade of the 19th century. Parallel patterns are found in the birth rates and the changes in the age and occupational composition of the populations. The 19th century was truly an explosive century for Western Europe. The social forces generated during that period—particularly the stabilization of the food supply—had a direct effect on human biology.

The shift in the age at death is dramatically illustrated in Table 2 in the deaths under five and over 65 during different periods.

**Table 2**  
**Average Annual Per cent of All Deaths**  
**By Selected Age Groups and Periods,**  
**Sweden, 1751-1945**

Period	Per cent of all deaths	
	Age	
	Under 5	Over 65
1751-1760	36%	25%
1851-1860	27	33
1891-1900	17	47
1941-1945	5	71

Source of basic data: Sverige. Statistiska Centralbyrån. *Statistisk Årsbok för Sverige*. 1950. *Trettiosjunde Argangen*, 1950. Stockholm, 1950.

## B. Level of social and technical development

The level of social and technical development of a people can be seen broadly from the changing proportions of the population engaged in various groups of occupations. The larger the proportion of the population engaged in industry the higher is the social and technical development of the society. This development is reflected in health controls, standard of living, and so on. Sweden's shifts in occupational groups are shown graphically in Figure 3.

## C. Patterns of disease

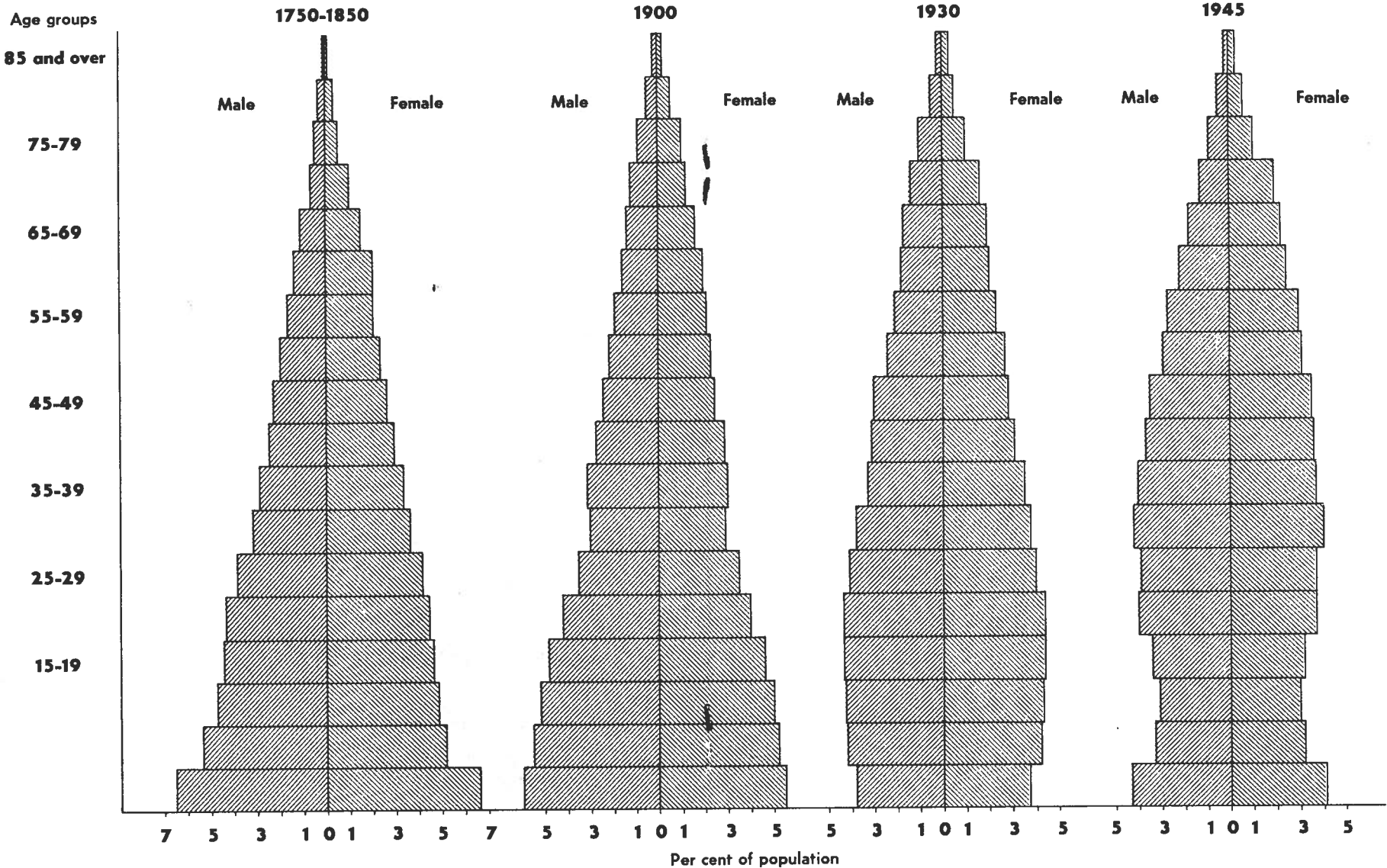
From 1750 to 1875, as well as prior to 1750, Sweden, like other Western countries, was subject to epidemics which periodically took a large toll of life. Smallpox was the only epidemic disease for which a specific method of control was available. Typhus, cholera, typhoid, diphtheria, tuberculosis, diarrhea and enteritis, and others took their toll. Many of these diseases appeared to increase with urbanization and ensuing crowding together of people. It took some time for simple rural health practices to evolve into the more complex health controls needed in cities.

After 1900 the disease patterns as measured by mortality began to change perceptibly. The communicable diseases made way for the emergence of the degenerative diseases such as cancer, heart diseases, and diabetes. At the same time, diseases of virus origin also became prominent. Changed social conditions and health controls had altered the disease pattern and, consequently, the nature of the pressing health problems.

## D. Level of medical development

Before the discovery of parasitic organisms and of the methods by which they were transmitted to produce disease, medical science was not capable of preventing or curing most major diseases. The bacteriological discoveries of the late 19th century and later brought about a fundamental revolution in medicine. The effects of this revolution on the demand for health services can be seen by comparing the number of health facilities, health

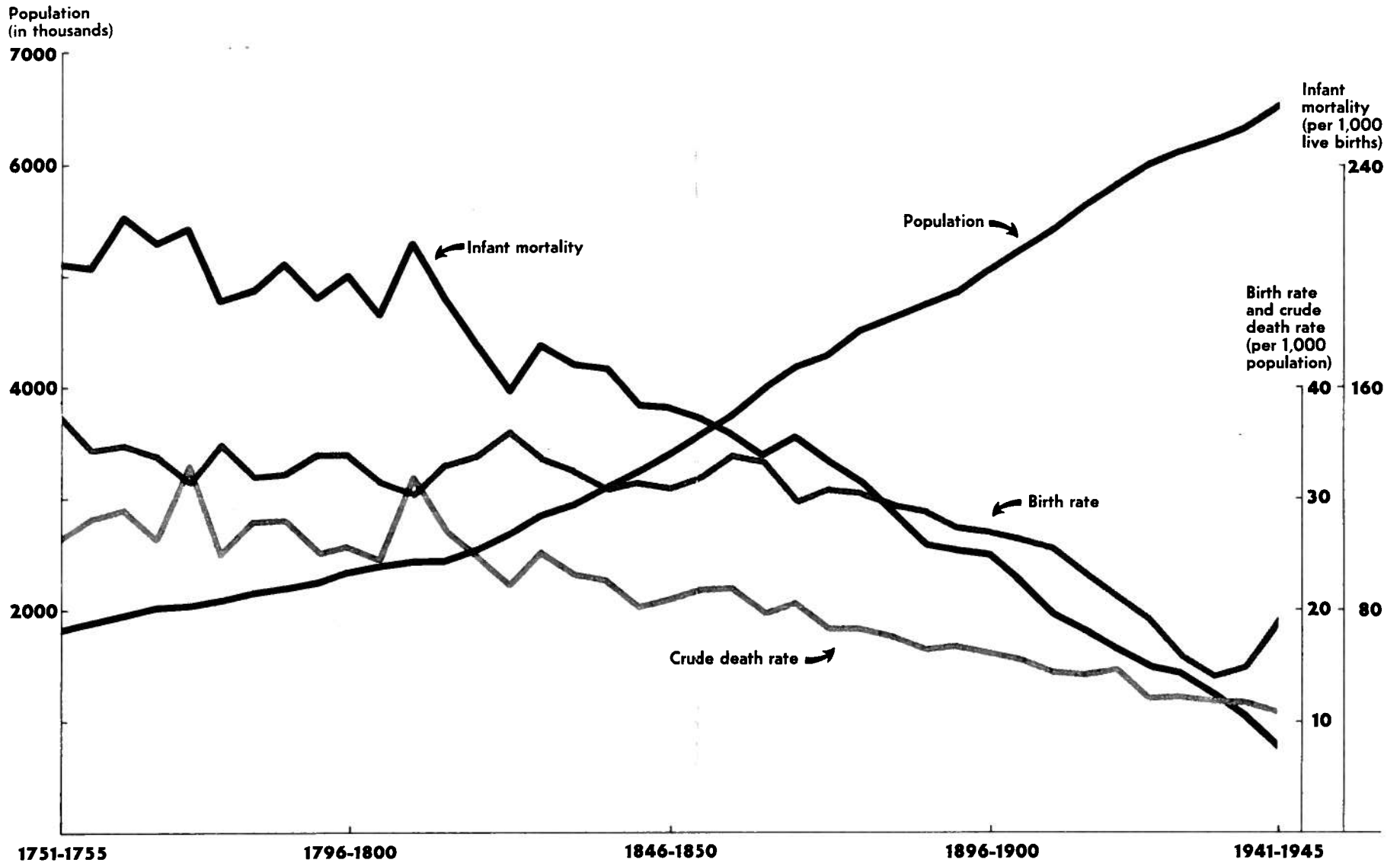
Population Structure  
Sweden, Selected Years, 1750-1945



Source: D. S. Thomas, *Social and Economic Aspects of Swedish Population Movements 1750-1933*, MacMillan, New York, 1941; Sverige, Centralbyrån, *Statistisk Årsbok för Sverige, Trettiosjätte Årgången*, 1949.



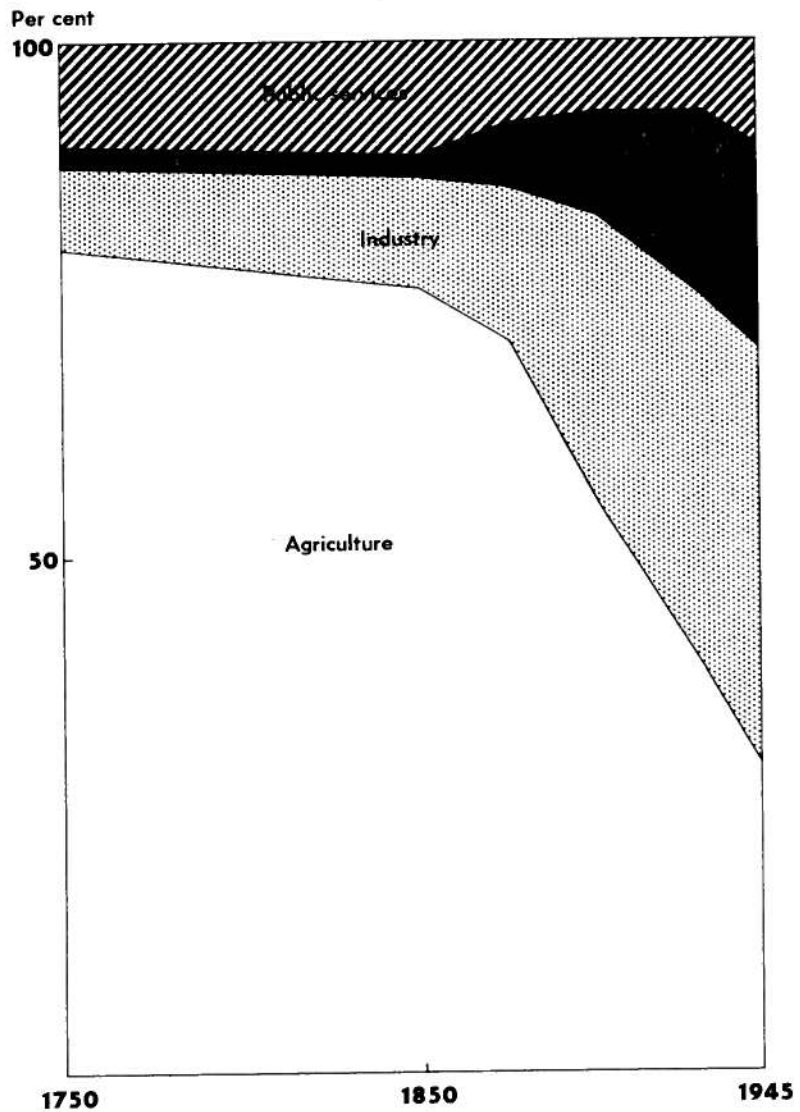
# Vital Statistics for Sweden, 1751-1945\*



\*Five-year averages.

Source: Sverige. Centralbyrån. Statistisk Årsbok för Sverige, Trettiosjätte Årgangen, 1949.

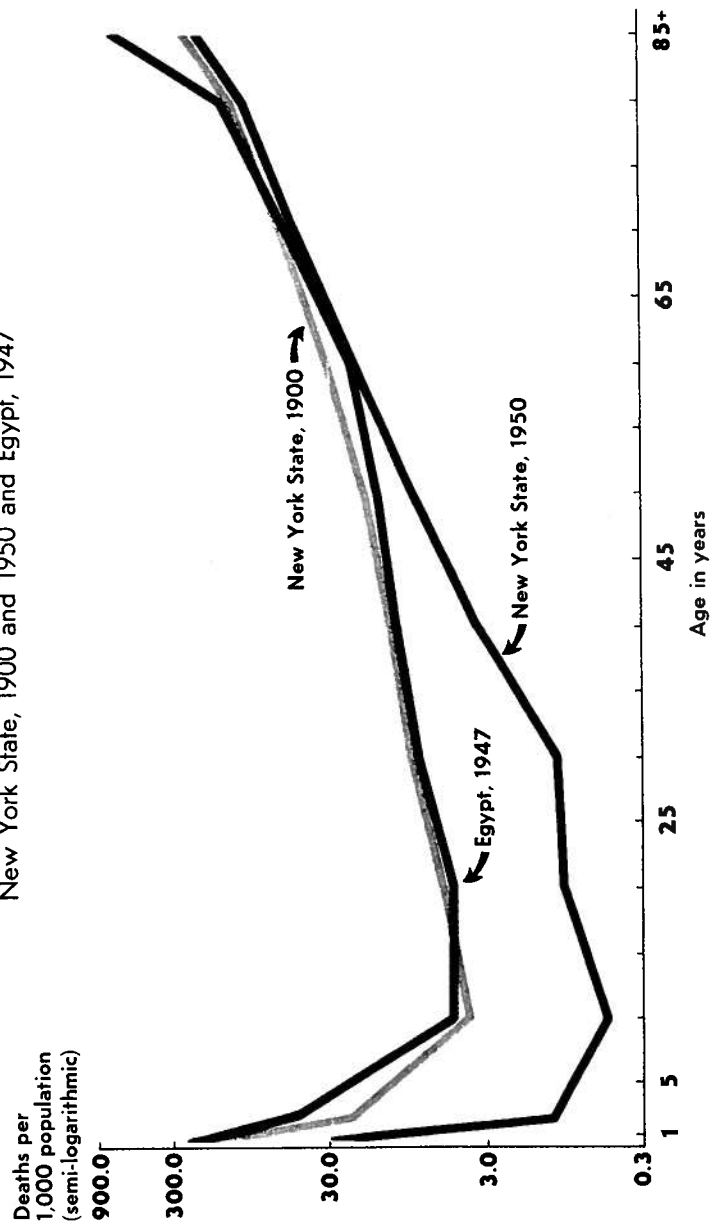
Chart III  
Population by Broad Occupational Group  
Sweden, 1750-1945



Source: Same as Chart I.

Health Information Foundation

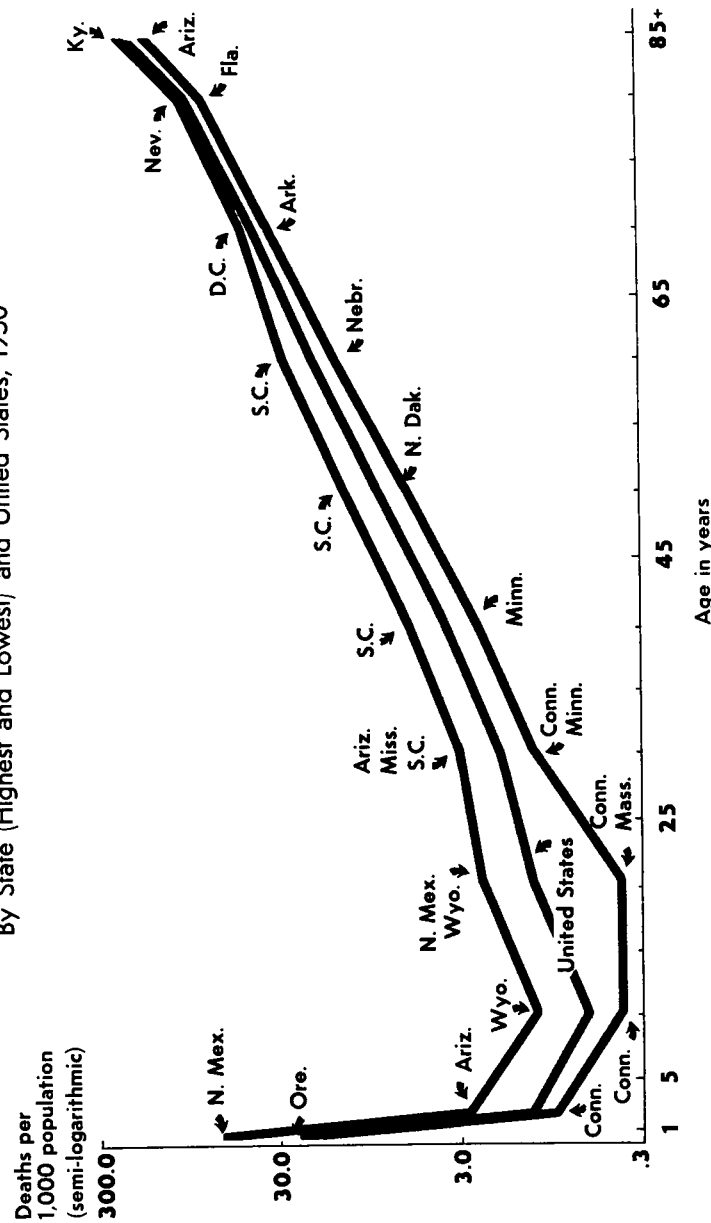
Chart IV  
Mortality by Age  
New York State, 1900 and 1950 and Egypt, 1947



Source: F. E. Linder and R. D. Grove, *Vital Statistics Rates in the United States, 1900-1940*, Table 4; National Office of Vital Statistics, *Vital Statistics of the United States, 1950*, Vol. 1, Table 8.42; and United Nations Demographic Yearbook, 1955, Tables 10 and 27.

Health Information Foundation

Chart V  
Mortality by Age  
By State (Highest and Lowest) and United States, 1950



Source: National Office of Vital Statistics, *Vital Statistics of the United States, 1950*, Vol. 1, Table 8.42, pg. 200.

Health Information Foundation

personnel, and hospital utilization in Sweden in the mid-19th century and the present:\*

	1861-1865	1947
Physicians per 100,000	12	64
Midwives per 100,000	42	30 (1936-40)
General hospital beds per 1,000	.9	5
Admissions per 1,000	6	94
Days per admission	37	15

\*J. Guinchard, ed., *Sweden: Historical and Statistical Handbook. First Part: Land and People*, 2nd ed. English issue. Stockholm, Government Printing Office, 1914. Vol. 1, p. 273, 276, 278; *Statistisk Årsbok*, 1949.

The health progress of Sweden as presented above has more than historical interest. If all the countries of the world were arranged in order of their *present* general mortality and infant mortality rates and by the prevailing causes of death, the resulting picture would virtually repeat the historical development of Sweden in these regards. The same order would also show different levels of social and technical development very much like those through which Sweden has passed during the last 150 years. A recent report of the United Nations bears this out.\* Mortality patterns and the chief causes of death are similar in clusters of countries with similar social and economic characteristics; they vary by groups of countries at different social and economic levels and also by social classes within these countries. Upper class Egyptians, for example, die of the same diseases as middle and upper class Americans, but lower class Egyptians die of diseases that have virtually disappeared even in the lowest American social class. The mortality differences between countries in various stages of industrial development and between social classes are the result of a great many factors, of which conscious health practices and direct medical controls are only a part.\*\*

\**Report on the World Social Situation, including Studies of Urbanization in Underdeveloped Areas*. United Nations Secretariat. Bureau of Social Affairs in cooperation with the International Labour Office, the Food and Agricultural Organization, the United Nations Educational, Scientific and Cultural Organization, and the World Health Organization. New York, United Nations, 1957.

\*\*Odin W. Anderson, "Age-specific mortality differentials historically and currently; observations and implications." *Bulletin of the History of Medicine* 27:521-529, November-December 1953.

A simple illustration of age-specific mortality compares New York State in 1900 with New York State today, and New York State with Egypt today. As it shows, Egypt is at the same level of mortality now as New York State was over 50 years ago. (Figure 4.) In attaining the same level as New York, Egypt will probably repeat the New York experience. This is now going on all over the world in countries which are in the process of industrialization. The age-specific mortality rate curve offers an interesting tool for comparative analysis of countries and periods.

### Current concepts of prevention

Several different concepts of preventive medicine exist side by side today. Some have their roots in the past, while others are just emerging. All of them entail the use of different methods and resources and, in fact, represent different social philosophies. The scope of each concept is outlined briefly here, without any reference to any order of priority or chronology.

*Good health habits.* This concept of preventive medicine is probably as old as civilization. It entails the application of personal health rules, such as sufficient sleep, exercise, proper diet, attention to weight, and regular habits. The idea of disease prevention through healthful living does presuppose relatively prudent human beings, a social system which permits regularity, and an adequate economic standard. For the last two reasons, the deliberate pursuit of a healthful life would have been possible only to the upper classes until recent times. Today, of course, the great proportion of people in industrialized countries face the problem of living healthfully within relative abundance and stability.

*Environmental sanitation.* The idea of controlling human environment through proper disposal of sewage, purification of water, pasteurization of milk, and similar measures led to the reduction and in some instances the elimination of diseases. Environmental sanitation outside of military organizations was an accompaniment of industrialization and the growth of cities. This concept of preventive medicine could be implemented with minimal cooperation from the general public or from individual

practicing physicians. There were no clinical problems unless the sanitary methods failed to work. Environmental sanitation did, however, require a public policy and had to be applied by at least local government. Health departments were created in the latter part of the 19th century. Today environmental sanitation is an important function of both public and private agencies. New problems are emerging, among them air pollution and radiation.

*Communicable disease control.* With the isolation of the bacteria of specific diseases—smallpox, diphtheria, and others—and with the development of vaccines and immune sera, many communicable diseases could be prevented. This led to the concept of communicable disease control as a major part of preventive medicine. The public health laboratory became the center within health departments from which to attack communicable diseases on a mass basis. This attack required a definite public policy backed by legislation. Sometimes the help of law enforcement agencies was needed. People had to cooperate as individuals, and something was done *to* individuals. Physicians also were involved, either in their private practices or in public health clinics and schools. Communicable disease control remains an important part of pediatric and family practice. With environmental sanitation and maternal and child health it also forms the hard core of health department activities. Other public concerns—accident prevention, disease detection, and weight control, for example—are coming within the orbit of health departments.

*Health education and health promotion.* Organized programs of health education of the public are relatively recent, having emerged in the United States immediately before World War I. The concept was that public health education could be a principal means of disease prevention. The methods of health education stemmed from educational psychology, the graphic arts, and the available media of communication. Originally the programs were limited to the dissemination of "facts." The presumption was that if facts were widely disseminated people would act on them for their benefit. Many of the early programs, undertaken by the publicity arms of voluntary health agencies employed the methods of advertising. More recently the whole

array of the social sciences—sociology, social psychology, and cultural anthropology—have been drawn upon. The belief is that communicating facts is not enough; health education must take into account people's values and habits before it can motivate them to use their knowledge to improve health.

*Health services for the individual.* As prevention and therapy reduced the threat of communicable diseases, the so-called chronic diseases increased dramatically in importance, as noted earlier. These diseases are a coming target for organized attack through health education and periodic health inventories. Control of the chronic diseases requires great individual cooperation for symptoms to be recognized and care instituted advantageously. These diseases also pose special problems in providing health services, particularly in developing methods of payment that would help families manage the considerable financial problems these illnesses create. The social sciences as well as the physical and natural sciences are being drawn on to cope with these problems.

The chronic diseases also place great responsibility on the individual for his own health. The recommendations of the Commission on Chronic Illness recognize this:

*“Individual initiative is vital in the prevention of chronic disease. The public—all of us—should incorporate in our daily lives the recognized precepts of preventive medicine and should cooperate fully in practical programs of preventive medicine once they have been worked out by the professions concerned.”\**

The Commission goes on to list these precepts—good nutrition, mental hygiene, adequate housing, moderate living habits, a “useful and productive role in society,” and so on. The recommendations are admittedly Utopian, with no attempt to assess even their approximate attainability. The idea of chronic disease prevention is, however, spelled out in greater depth and detail than ever before, including concepts of primary and secondary prevention and of the value of periodic health examina-

tions. Furthermore, the report discusses the prevalence and incidence, history, etiology, and management of selected chronic diseases, such as arthritis, rheumatism, cancer, multiple sclerosis, and cardiovascular diseases. From this it gives guide lines to determine what resources, personnel, and public cooperation would be entailed if everything known were to be applied.

#### Levels of public knowledge and motivation

Among the current concepts of prevention that have been mentioned, the two newest—those concerned with health education and health services—appear least well understood or defined. Both of these concepts, as they are now viewed, focus their attention on the individual who makes and implements decisions regarding health matters for the family unit. Both ideas require that the individual have a high level of appreciation of health facilities and services that physicians, hospitals, dentists, and other providers of services be accessible, so that the individual who seeks care can obtain it.

What is the individual told to do today to enhance his own chances for a relatively healthy and longer life? The most common answers now being offered are to “have periodic physical examinations” and to “see your doctor early.” Of course, questions of how extensive the examinations should be, how long a time should elapse between examinations, and where examinations should take place (whether in screening programs or the patient's physician's office) are still being debated. Similarly, the advice “see your doctor early” does not make explicit *how* early. The individual has to decide through self-diagnosis when to see a doctor to avoid the full effects of the illness from which he may be suffering. This certainly requires a medically sophisticated population. It also requires a medically sophisticated profession, as well as general revision of current nebulous notions of “hypochondria” and “overuse” and “abuse” of medical services.

The fact is that if the general population acted on the knowledge they appear to have of health conditions and symptoms, our hospital and medical resources and personnel would be literally swamped. This is very evident from a public opinion

\*Commission on Chronic Illness. *Chronic Illness in the United States. Prevention of Chronic Illness.* Vol. 1. Cambridge, Mass., Harvard University Press, 1957. p. 6.

survey of a national sample of adults in the United States conducted in 1955 by the National Opinion Research Center, University of Chicago, in cooperation with Health Information Foundation.\* For example, 80 per cent of this sample of the public said that a person ought to see a doctor for a regular checkup even though he feels well. However, only 29 per cent say that they themselves get such checkups regularly. (Sixty-two per cent of the adults who had children took *them* for regular checkups. Apparently, decisions made for their children followed their beliefs much more closely than did decisions made for themselves.)

A battery of common symptoms of illness was presented to the sample of adults. The symptoms included persistent headaches, shortness of breath, persistent cough, chronic backache, and similar indications of ill health. The public was asked whether they thought a person should see a doctor if he had any of these symptoms. A very large majority (for most of the items, upward of 75 per cent of the public) believed that the symptoms warranted consulting a physician. Then they were asked if *they* had experienced any of these symptoms during the last year. Among those who said "yes," many fewer (for most of the items, under 60 per cent) had actually seen a doctor. Among those who had seen a doctor, 23 per cent thought they should have seen him sooner; 19 per cent of those who had not seen a doctor thought they should have done so.

A substantial proportion of the public believes that a person can consciously take care of his own health and not depend on fate or luck. Forty-two per cent of the adults said that if a person is sick it is largely his own fault, and 41 per cent felt they could take better care of their health than they now do.

These figures are averages for all ages, both sexes, and all income and education levels. As might be expected, answers varied with these variables. People with relatively high incomes were more likely to say that they had a family doctor than people with relatively low incomes; however, there were hardly any differences by educational level. Nevertheless the well-educated

were more likely to have a higher regard for doctors and modern medicine; and they were more likely to believe that good health is something that can be deliberately fostered by proper attention and care.

The survey also interviewed a sample of doctors. These were practitioners mentioned by the sample of adults in the country as being the family doctor or having cared for them during the previous year. The doctors and the adults were in basic agreement on the importance of the symptoms list, indicating that the public knows in general which symptoms need to be watched. Almost 80 per cent of the doctors said that people should have periodic physical examinations even though apparently well, but only 45 per cent said they made a point of recommending them to most of their patients. As for early diagnosis, 21 per cent of the doctors felt that their patients waited too long before seeing a doctor. Fully a third of the doctors complained that patients do not follow their instructions. Still, 95 per cent of the doctors felt that people today were more likely to see a doctor early than was the case ten years ago.

It is a fact that more people see doctors now—and more often—than did 25 years ago. A 1928-31 study showed that during any given year only about 50 per cent of the population would see a doctor even once; currently, about 65-70 per cent see a doctor one or more times during an average 12-month period. Also, the number of physician visits per person has doubled since 1928-31.\*

#### Determining possible levels of achievement

When communicable diseases were the chief causes of death, measuring medical achievement was relatively easy—through determination of the death rate by age, sex, and cause. Many analyses have shown that the overall death rate has fallen from 20 to 9 per 1,000 in the United States and in western countries and is also falling in other countries of the world. As the death rate has been cut in half, the leading causes of death of fifty years ago have been replaced by heart disease, cancer, and accidents, as noted earlier. In fact, if the leading causes of death in an area *are* heart disease and cancer, one can be assured that

\*"The Increased Use of Medical Care," *Progress in Health Services*, Vol. 7, October 1958. Health Information Foundation.

\*Full report in preparation by Paul B. Sheatsley and Jacob J. Feldman of NORC.

the area has kept abreast of modern medicine and its application. Other measures of effectiveness are infant mortality rates by cause and maternal mortality.

Today, with diseases like typhoid fever and diphtheria held in check, the effectiveness of treatment and prevention is much more difficult to measure. We are moving into a period that must deal with chronic and long-term illness, where death rates are a poor measure of the health level. There could be a high rate of illness despite a low death rate, which would certainly not indicate a high level of health. Additionally, the effectiveness of existing treatment and general health regimen on the prevailing chronic diseases is difficult to determine precisely. Consequently we are now in a period of "make do" with traditional methods of health measurement and are groping for concepts and methods of measurement adequate for the era we are entering. Rates of sickness by age and cause have been used to supplement mortality rates, but at best these are still crude measures. Some have suggested measuring *wellness* rather than illness and death. Successful measures of wellness—including mental health—could advance positive concepts of health and maximum well-being.\* A thoughtful publication of the World Health Organization reports an attempt of a study group of that organization to rethink the problem of measuring health and the concept of health itself.\*\*

What are the possible levels of achievement? Theoretical possibilities can be posed by using the death rate as a measure. Presumably a general death rate of 6.7 per 1,000 population in a year is theoretically possible in this country, because it was actually recorded in one state, Utah, in 1955. This has been the lowest rate recorded by any state. Vermont recorded 11 for the same year, almost twice as high. Even if the age composition of the population in the two states had been comparable, there would still have been an appreciable difference in the death rates. Obviously, if current knowledge were applied to the maximum, the present death rate for the country as a whole could still be reduced appreciably.

\*Halbert L. Dunn, "Points of Attack for Raising the Levels of Wellness," *Journal of the National Medical Association*, Vol. 49, No. 4, July 1957.

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

An analysis of the vital statistics of Richland, Washington, provides another measure of possible achievement. This city, with a population of 24,000, was created solely as a center for atomic research. The population of the city lives under closely controlled conditions as to housing, medical care, and working environment.\* Its income and educational levels are high. Richland's general death rate in 1950 was one-half that of the nation, after correcting for age. Its infant mortality was as low as 17 per 1,000 live births, an unusually low rate. It seems reasonable to assume that with current knowledge these rates could hardly go any lower. If the entire country could attain the general environmental and living conditions of Richland, presumably the national death rate would approximate that of Richland. Aside from the question of available health services, achieving these conditions without imposed controls would require a population with a very high level of medical sophistication. Of course, if measures of wellness could be derived, Richland might not vary as much from the national average as it does with present types of measures.

Potentials in mortality rates may be seen more broadly in the mortality rates achieved for different age groups throughout the United States. Figure 5 shows on semi-log paper the lowest and highest death rates recorded among the states in 1950 for each five-year age group. The chart also shows the mortality rate for each age group for the United States as a whole. Each line therefore gives a composite of death rates by five-year age groups. The lower line could be true for the entire United States if the low death rate of one state for each age group obtained in all states. It is interesting to note that even in a composite of rates for high and low states, the lines have the same general shape in comparing New York and Egypt, areas representing different levels of development.

In using morbidity as a measure of health levels and as a guide to possible improvements the Commission on Chronic Illness, mentioned earlier, has very recently published a report by

\*William D. Norwood, Philip A. Fuqua, and Ralph R. Sachs, "Community health planning; study of 'atomic city' (Richland, Washington)," *Journal of the American Medical Association* 154:44-49, January 2, 1954.

Trussell and Elinson\* on the problem of measuring the extent of chronic illness in the population of Hunterdon County, New Jersey. The population of the county in 1950 was almost 43,000 of which over 13,000 were interviewed to determine the presence of chronic illness. This was followed by clinical evaluation of a sub-sample of approximately 865 people conducted by a medical team. A condition was classified as a "medical disability, if in the opinion of the examining physician it currently or potentially interfered with the patient's physical well-being or with his social, economic, or environmental activities, or if it had done so in the year preceding the examination." Only one person in seven was free of currently or potentially disabling disease, as defined. Our concern at the moment is with preventability of the medically disabling conditions. This study, according to the judgment of the clinical evaluation team, found that only 6 per cent of the medically disabling conditions could have been prevented from occurring. On the other hand three out of 10 of the diagnosed conditions could have been prevented from advancing to the stage in which they were found. This gives us a rough idea of the extent to which modern medical care can have an effect if fully applied, i.e., good doctors, adequate facilities, and cooperative patients—in short, optimum conditions.

In any time and place there are both limiting and liberating factors in attaining improved health conditions, however defined and measured. The overall limiting factor is the nature of life itself: the biological stage of development of the individual, the inherent strengths in each stage which can be supported, the weaknesses that can be counteracted, and finally, the absolute limit imposed by death, which comes to all. Thus the life span sets the ultimate limit, and the level of well-being must be raised within this limit. Limiting factors can also be found in the culture and psychology of a society, in how it views its life goals, and in its methods for attaining them. What priorities does it set? Is money a limiting or liberating factor relative to other goods and services desired? All of these may affect the level of scientific advance or the extent to which current knowledge is applied.

Thinking today seems to be directed toward handling well

\*Ray E. Trussell and Jack Elinson, *Chronic Illness in a Rural Area: The Hunterdon Study*. Cambridge, Mass., Harvard University Press, 1959. Commission on Chronic Illness. *Chronic Illness in the United States*. Vol. III.

people in a manner analogous to care for well children and pre-natal and post-natal care. Also analogous are occupational health care and military medicine where ideally, at any rate, there is total environmental control of factors impinging on health. In occupational health and military medicine one authority states that the maintenance of health and prevention of disease have in some instances become practical realities.\* The degree to which comparable deliberate manipulation of the total environment would be desirable for the general population is debatable. The key would seem to be intelligent use of health services by the general public and assurance by public and private agencies of adequate health resources and methods of providing and paying for care.

\*John P. Hubbard, ed., *The Early Detection of Disease*. New York, Blakiston Division, McGraw-Hill Book Co., 1957. p. 9.