

Relationships of health to demographic characteristics warrant further examination and study in the United States.

Some Problems for Research in Mortality and Morbidity

By HAROLD F. DORN, Ph.D.

THE COLLECTION, compilation, and publication of vital statistics are among the major activities of every public health agency. Too frequently the collection and preparation for publication of vital statistics require such a large proportion of the time and energy of available personnel that the analysis and interpretation of these data are neglected. Yet without analysis and interpretation, vital statistics remain relatively sterile.

Nearly a century ago the great English vital statistician, William Farr, began his analysis of official mortality records in order to discover and point out significant variations in ill health among various groups of the population. The work he initiated has been continued and expanded by succeeding registrars general. The most extensive information concerning variations in mortality rates by occupation and socioeconomic classes available anywhere is that for England and Wales.

The United States does not have a series of analyses of mortality statistics comparable to those of England and Wales. The first third of

this century was devoted to establishing a complete registration system covering the entire United States. Mortality and natality statistics for the entire country first became available in 1933.

A test of birth registration completeness made at the time of the 1950 census of population revealed that a birth certificate was on file for 98.6 percent of white infants and for 93.5 percent of nonwhite infants born during the first quarter of 1950.

Although a comprehensive study of the completeness of death registration has never been made, the relative amount of under-registration probably is negligible except for some rural areas whose aggregate population is not large. The relative amount of under-registration of infant deaths may be somewhat greater than that for deaths of persons aged 1 year or older. In computing the 1939-41 life tables, the National Office of Vital Statistics assumed that the relative under-registration of infant deaths was approximately equal to that of births. However, this assumption has never been tested by an actual field study.

Dr. Dorn is chief of the Office of Biometry, National Institutes of Health, Public Health Service, Bethesda, Md. This article is based on a paper delivered at the annual meeting of the Population Association of America at Princeton, N. J., May 1955.

Rural and Urban Differences in Mortality

One of the first illustrations of mortality differences in medical literature was the higher death rate among city dwellers in contrast to rural residents. Although this difference gen-

erally is assumed to exist at the present time, no comprehensive study of the problem has been made in recent years.

Mortality statistics classified by the place of residence of the deceased were first published by age, sex, race, and size of community for deaths occurring in 1940. These were available for each State for all causes combined and for a limited number of important causes for both sexes combined for the entire United States. A supplementary volume (1) presented data for the 2-year period, 1939-40, for each city of 100,000 or more population, by leading causes of death, age, and race and for each county and city of 10,000 or more population for all causes. By the time these data were published in 1943, World War II was in progress so that a systematic analysis of the 1940 mortality tabulations was not conducted.

Two important changes affecting the use of mortality statistics were introduced in the 1950 census of population: the change in the definition of the urban population to include the urban fringe of cities of 50,000 or more population and the delineation of standard metropolitan areas and standard economic areas and regions. Prior to and including 1930, urban was defined as places of 10,000 or more inhabitants in the tabulation of vital statistics, a definition that did not correspond to that used in the census of population from 1910 to 1940. In 1940, for the first time, a comparable definition of urban and rural population was used for both the enumeration of population and the tabulation of vital statistics. No practicable way of classifying vital statistics in accordance with the revised definition of urban population used in the 1950 census has yet been devised, so once again it appears that the definition of the urban population may not be the same for the two sets of statistics.

Fortunately, a reasonably satisfactory substitute for the rural-urban classification is available. Since 1950, the National Office of Vital Statistics has tabulated mortality statistics for the metropolitan and nonmetropolitan counties of each State. In general, metropolitan counties are the counties included in the standard metropolitan areas used by the Bureau of the Census. No extensive analysis of these statistics has yet been published.

Geographic Variations in Mortality

Almost a century ago, William Farr proposed that the healthiest districts of England and Wales be used as a yardstick of public health. From time to time since then, the registrar general has used this concept in the presentation and analysis of mortality data. In contrast, very little has been published in the United States concerning geographic variations in mortality rates. The range between the States with the highest and lowest mortality rates probably has been decreasing. Nevertheless, in 1950, after adjusting for differences in the age composition of the population, the highest rate still was 40 percent above the lowest rate.

State death rates by age vary much more than the average rate for all ages. For the white population in 1950, the highest rates for each age group under 55 years were approximately twice as large as the lowest rates. Above this age the range in death rates is smaller but still averages about 50 percent.

The range between the highest and lowest death rates almost certainly would be greater for areas smaller than States. The county is the preferable unit for forming such areas since the basic demographic data are available for counties and since the allocation of deaths to county of residence undoubtedly is more reliable than the allocation to rural or urban areas.

Two groupings of counties suggest themselves: metropolitan and nonmetropolitan counties within each State and the State economic areas or subregions defined by the Bureau of the Census in cooperation with other agencies. The economic subregions, although they cross State boundaries, are probably the most useful grouping of counties for the study of geographic differences in mortality rates. As no tabulation of mortality data by economic subregions has been made, a complete retabulation for one or more years around 1950 would be required.

Mortality by Occupation

The 14th Annual Report of the Registrar General of England and Wales for 1851 contained a tabulation of the deaths of males, aged 20 years or more, classified by the occupation of

the deceased. This was the first of a series of decennial reports that has been continued for 100 years. Shortly after the death registration area was established in the United States, plans were made for a study of occupational mortality around the date of the 1910 census. The 1909 volume of mortality statistics contains tables giving the number of deaths of males classified by age, occupation and cause of death. No data were published for subsequent years and so far as I can determine no analysis was ever made. A special tabulation of the census population by occupation would have been required since the death registration States of 1910 included only 51 percent of the total population of the United States.

The many discussions of the relationship of mortality rates to occupational and socioeconomic groups that have taken place in the United States since 1910 have produced few statistics. The National Tuberculosis Association published a brief analysis of mortality rates for 7 broad social and occupational classes, based upon the deaths of male workers in 10 States during 1930. Except for this study, no analysis of mortality differences among occupational or socioeconomic groups based upon official death statistics has been made in the United States.

One of the major deterrents to a study of occupational mortality has been uncertainty concerning the degree of comparability of the entries of occupation and industry on death certificates with those on the census of population schedules. A corresponding uncertainty also has prevented the analysis of official birth statistics by occupational or socioeconomic groups.

Fortunately, studies are now under way to resolve this difficulty. The Scripps Foundation in cooperation with the Bureau of the Census is planning to compare the entries for occupation and industry on a sample of birth and death certificates with corresponding information from the 1950 census schedules. In the meantime, the National Office of Vital Statistics is preparing an analysis of mortality differentials by occupation and socioeconomic class based on deaths of males from 20 to 65 years of age during 1950. The successful completion of these two projects will provide a basis for planning future studies of the relationship of mor-

tality and fertility to occupational and socioeconomic classes in the United States.

Fetal Mortality

The rapid decline in the infant mortality rate has led some to assume that mortality during the first few months of life is now under control and that it is only a question of time until the death rate at the start of life will be lowered to the irreducible minimum. This is far from being the case. The high infant mortality rates of the past have distracted attention from the even higher fetal mortality rate. In addition, the reporting of fetal deaths has been so incomplete that a reliable estimate of fetal mortality could not be made.

In the United States, New York City probably has the longest record of registration of all fetal deaths regardless of the duration of pregnancy. In 1900 the reported infant mortality rate for New York City was 135 per 1,000 live births, and the reported fetal death rate was 45 per 1,000 live births plus fetal deaths. In 1953 the corresponding rates were 24 and 107 respectively. The increase in the fetal death rate from 45 to 107 per 1,000 probably is largely the result of improved reporting and the revision of regulations to specify more clearly that all fetal deaths, irrespective of the period of gestation, should be reported.

Registration still is seriously incomplete; during the 5 years from 1949 to 1953 the fetal death rate in New York City increased from 84 to 107 or about 27 percent. Studies of selected groups of pregnant women indicate that perhaps as many as one-half of the total fetal deaths are not reported. If generally true, this conclusion leads to an estimate that approximately 20 percent of pregnancies in New York City terminate in a fetal death and 80 percent in a live birth. Of the live births, between 2 and 3 percent die during the first year of life. In total, probably from 20 to 25 percent of pregnancies terminate either in a fetal death or in a live birth that fails to survive the first year of life.

This problem has been recognized by the World Health Organization, which has recommended that the term "stillbirth" be abandoned, and that all fetal deaths, irrespective of dura-

tion of pregnancy, be registered. Many years will be required before this recommendation can become generally effective since existing legal definitions of stillbirths must be changed and physicians must be convinced of the necessity of reporting every fetal death. It would be visionary to expect that the registration of fetal deaths, especially for pregnancies terminating after only 1 or 2 months, will ever be as complete as the reporting of infant deaths. Nevertheless, the experience in New York City is an illustration of what can be accomplished.

In the meantime, a new measure, the perinatal mortality rate, is beginning to be used. This is computed by dividing the sum of the number of infants dying during the first week or month of life and the number of fetal deaths during the last 4 or 5 months of pregnancy by the number of live births plus the number of fetal deaths included in the numerator.

In addition to the problem of developing a reliable measure of fetal mortality is that of obtaining information concerning the causes of fetal death. This is more complicated and difficult than obtaining information concerning the causes of infant deaths since death may be the result of conditions affecting the mother as well as the fetus. Moreover, medical information concerning the cause of death of fetuses has long been very inadequate. Plans are being made to develop better reporting of the causes of fetal death, but rapid progress should not be expected.

Mortality Rates by Sex

Existing data show that males experience a higher mortality rate from the early months of intra-uterine life until the end of the natural life span. Fragmentary data from genealogical records of ruling families indicate that males experienced higher mortality rates than females as long ago as the 15th century. In some countries and among some classes of the population, mortality rates have been higher for females than for males from about 15 to 30 years of age. This has been particularly true where mortality rates have been relatively high compared with those existing at present. As late as 1925 in the United States, the death rate for ages 15 to 34 years was practically as high for females as for

males. Since then the rate for males has exceeded that for females at every age.

The excess mortality among males has increased as the level of the death rates has fallen. In 1900, the age-adjusted death rate for white males was 10 percent higher than that for white females. By 1950 this difference had increased to 48 percent, and there is no indication that it may decrease in the near future.

The difference between the male and female mortality rates is now large enough to warrant an attempt to discover an explanation. To what extent is it the result of greater occupational hazards experienced by men? How much of the difference may be attributed to biological differences? The ratio of mortality rates for the two sexes is in striking contrast to the ratio of morbidity rates. Although morbidity data are rather inadequate, most studies report higher rates for females than for males.

Mortality During Old Age

Not only has the decline in mortality rates for every age among males in the United States failed to keep pace with the decline in mortality rates among females, but the decline in mortality rates for males more than 40 years of age in the United States also has not kept pace with the corresponding decline for males in most of the countries of northwest Europe, Canada, Australia, and New Zealand. To a lesser extent the same comment applies to the relative decline in death rates among females more than 50 years of age. During the first half of the life span, the mortality rates for males and females in the United States are among the lowest in the world. During the latter half of the life span, the rates for females are near the average of those for similar countries while the rates for males are among the highest of those for similar countries.

Several hypotheses have been advanced to explain this reversal of the relative rank of mortality in the United States during the first half in comparison with that during the second half of the life span but none of these have been adequately tested.

Morbidity

No comprehensive data concerning morbidity for the entire population of the United States

are available. The only extensive morbidity study ever conducted in this country was the National Health Survey of 1935-36, which was a survey of the urban population. Since that time a number of general morbidity surveys of individual communities have been carried out as well as a sample survey for one State but no national study has been undertaken. A few studies of morbidity from specific diseases also have been made.

In 1951 the United States National Committee on Vital and Health Statistics created a subcommittee to study the question of a national morbidity survey and to prepare a plan for such a survey keeping in mind the needs of local areas. The subcommittee recommended that a continuing national morbidity survey be conducted on a scale adequate to provide estimates for 50 regions of the Nation at intervals of 2 years and estimates for the Nation as a whole at 3-month intervals. The survey should be designed to collect information on the incidence and prevalence of diseases, impairments, and injuries, on the duration of any resulting disability, and on the amount and kind of medical care received.

This report (2) was published by the Public

Health Service in October 1953 and subsequently distributed to a number of interested individuals for comment. Although there has been rather widespread endorsement of the desirability of collecting national morbidity statistics, no funds have been available for initiating this work. There is much yet to be learned concerning variation in the frequency of fatal illness among different groups of the population. The frequency of nonfatal illness, however, greatly exceeds that of fatal illness. Our present knowledge of nonfatal illness in the United States is no further advanced than the knowledge of fatal illness at the beginning of the century.

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Poliomyelitis Vaccine Injections

The desired levels of immunity in individuals given poliomyelitis vaccine are best derived from the dose schedule in current use, namely, two 1-cc. injections, the second dose 4 to 6 weeks after the initial dose or as soon thereafter as possible, with a booster dose 7 months or more after the second injection.

This was the unanimous opinion of leading virologists and immunologists representing the medical and health professions and the National Foundation for Infantile Paralysis at a meeting called by the Surgeon General on December 7, 1955, to consider how best to use the supply of poliomyelitis vaccine which will be available in the months ahead and to discuss available data on the methods of using the vaccine and spacing of doses. The discussion centered on the possibility of using one injection of 1 cc. in all susceptible individuals before giving the second and the booster injections.

Although it is evident that the injection of 1 cc. of vaccine produces a marked degree of immunity, there is not enough scientific evidence on the duration of immunity after a single dose to lead to any recommendation for a change in the present dosage, the group decided. The Surgeon General accepted the committee's recommendations.