

THE INCIDENCE AND CAUSES OF ILLNESS AT SPECIFIC AGES¹

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IN recent years considerable thought has been given to the scrutinizing of two indexes of ill-health, namely, the rate of mortality and the rate of sickness. One of the immediate results of the consideration of the significance of these orthodox tools of the epidemiologist was the observation, pointed out some years ago by Sydenstricker (19), that the pictures resulting from their simultaneous application to a given population were by no means identical. Another result was the recognition of the inadequacy of the rate of mortality as an index of ill-health. This inadequacy has become widely known but has had no appreciable effect on current statistical practice for the obvious reason that sickness data of any useful magnitude have not been collected.

The acquisition of new and more extensive data on sickness makes it possible to compare and contrast in greater detail than heretofore the pictures indicated by the two indexes. The sickness data referred to are the records of illness for a twelve-month period among 8,758 white families in 130 localities of eighteen states that were collected by the Committee on the Costs of Medical Care and tabulated in cooperation with the United States Public Health Service. These data constitute the largest body of records of the incidence of all types of illness in the general population (all ages and both sexes) that has thus far been assembled.²

¹ From the Office of Statistical Investigations, United States Public Health Service.

For assistance in the tabulation and analysis of the data used in this study I am indebted to Dr. I. S. Falk and Miss Margaret Klem, formerly of the staff of the Committee on the Costs of Medical Care. Special thanks are also due to Dr. Mary Gover, who assisted in the analysis, to Miss Lily Vanzee, who was in immediate charge of tabulating the data, to Drs. Amanda L. Stoughton and R. R. Jones for advice and assistance in classifying the causes of sickness and death, and to other members of the statistical staff of the Public Health Service, particularly Dr. W. M. Gafafer and R. H. Britten, for advice and assistance in the preparation of the study.

² Detailed reports on these data with special reference to costs have been published by the Committee on the Costs of Medical Care (15) and further analyses of the incidence of illness have appeared in the *Public Health Reports* (6-11).

A brief summary of available records of mortality and sickness with special reference to data for specific ages may be pertinent at this time.

For many years mortality statistics have been collected by the registration method in nearly all civilized countries of the world. Detailed annual and special reports based on the registered deaths are available for the principal countries and for the various states of the United States. These data afford information on death rates for specific causes, at specific ages, for both males and females and in some countries for specific occupations, together with time trends. In contrast to this mass of more or less complete information on mortality, there are no detailed data on the extent and causes of illness for any large population group in any country.

The tenth decennial census of the United States, taken as of June 1, 1880, included an inquiry on the number of persons "so sick or disabled as to be unable to pursue their ordinary occupations" on the day of the enumeration.³ The tabulations were limited to persons over fifteen years of age and to areas where the data were thought to be complete. The census report devoted to vital statistics (4) includes rates by age and sex, based on a total of twenty million persons over fifteen years of age in nineteen states. No data were published on the causes of illness but the preponderance of chronic ailments is indicated by the rapid rise of sickness prevalence as age increases.

During the years 1915-1917, the Metropolitan Life Insurance Company canvassed families including half a million people (17) to determine the *prevalence of illness on a given day*. The results are published by cause for all ages and by age for all causes, and a few of the reports for individual localities show the numbers of cases of specific diagnoses in broad age groups.

Data on the *prevalence of illness on a given day*, such as those

³ Similar inquiries were included in the Irish censuses of 1851, 1861, and 1871, and in the Australian census of 1881.

in the two sources quoted above, are quite different from data on the *incidence* of new cases that occur *over a period of time*. The prevalence data for a given day are heavily weighted by chronic illnesses, whereas the incidence over a period of time is more largely made up of acute cases of shorter duration.

Among the sources of data on the incidence of illness are the rather incomplete reports of communicable diseases to local and state health departments. These reports (1) afford data on this limited group of diseases for states and cities but tabulations by age or in any classes except as total cases for each diagnosis by years and sometimes by months are rarely published.

Records of illness among members of sick benefit associations (3) are available in specific diagnoses but not by age. In a few special studies of industrial employees (2) and of school children (5, 14, 16, 21), sickness rates are available by age for the limited age ranges covered.

The Hagerstown study (18) shows data classified by age, sex, and cause of illness and is the only one which affords a record of sickness *incidence over a period of time* for persons of different ages throughout life; this solitary record of the incidence of illness in the general population contrasts remarkably with the wealth of mortality data available.

METHOD OF THE STUDY AND CHARACTER OF THE DATA

The periodic canvass method of collecting the data in the present study and the results obtained are similar to those for Hagerstown (18). Suitable areas to be canvassed in a state were selected by conference with the state and local health officers. The actual canvassing was done by health department or other visiting nurses in the various communities. Arrangements were made through the health officer for the nurse to do this work in addition to her regular duties, provided she was willing to undertake it. In inaugurating the study, the nurse did not include

the families to which she had already been called by sickness, but selected a new group without regard to the presence or absence of illness in the household at the time of the initial visit.

Since the work of the nurse was voluntary and was in addition to her regular duties, doubt may arise as to the care used in obtaining the data and as to the regularity of visits. However, the completeness with which the many detailed entries were made on the schedules throughout the twelve-month period indicates that sufficient care was exercised and that visits were regularly made. It is believed that the possible advantages that might have been derived from the employment of full-time paid investigators were counterbalanced to a considerable degree by the fact that the volunteer nurse carried only twenty-five to fifty families with whom she became more or less intimately acquainted. Indeed the nurse cannot be considered a truly volunteer worker since she was approached through the health officer and undertook the canvassing at his suggestion, and consequently the satisfactory performance and completion of her work became to a considerable degree something for which she was responsible to the health officer as well as to the Committee on the Costs of Medical Care.

The study covered by periodic canvasses a total of 8,758 white families including 39,185 individuals. Each family was visited at intervals of two to four months for a period long enough to obtain a sickness record for one year. On the first call a record was made of the numbers of members of the household, together with data about sex, age, marital status, and communicable disease history of each person. On succeeding visits the canvasser recorded all illness that had occurred since the preceding call with such pertinent facts about each case as the date of onset, the duration of disability and of confinement to bed, the nature of such medical service as was obtained, and the termination of the illness. Thus there are available certain facts about the observed population

and the illnesses suffered in the course of twelve months.⁴

The surveyed population was large enough to give a fair degree of reliability to sickness rates, but deaths in the group were too few to indicate the expected mortality from different causes at specific ages. Consequently, in the comparison of illness and death, mortality data from the Registration States were used. That this substitution is justifiable is indicated in later pages where a comparison is made of the death rates in the two groups. (Figures 1 and 3 and Table 1.) The illness data, as previously stated, apply to a twelve-month period for each household but the total time of observation extended over about three years, the record for the first family beginning in February, 1928, and the last one ending in June, 1931; most of the observations, however, were made in 1929 and 1930. For this reason mortality data for the Registration States for the years 1929 and 1930 were used.

DEFINITION OF AN ILLNESS AND THE CLASSIFICATION OF ITS CAUSES

Illness as here used refers to both injury and disease. What was actually included as cases, however, was necessarily influenced not only by the informant's (usually the housewife's) conception of illness but also by her memory. With visits as infrequent as two to four months, it is inevitable that many of the non-disabling illnesses would be terminated and forgotten before the next visit of the enumerator. However, if the record includes most of the real illnesses and excludes only the minor disorders, it may be as useful as a more complete one.

Illnesses that originated prior to the study and caused sickness during the year are included with those having their onset within the period of observation; 93 per cent had their onset within, and 7 per cent prior to, the year. The inclusion of these illnesses of prior onset is necessary to give proper representation to chronic ailments. A large proportion of the cases of such diseases as tuber-

⁴ Further details on the method of collecting the data and the characteristics and geographic distribution of the surveyed population are included in an earlier report (6).

culosis, cancer, diabetes, and cardio-renal affections originated prior to the study. An earlier paper shows for each diagnosis the number of cases with prior onset (6).

Considering an illness in the sense of a continuous period of sickness, one finds only 4.3 per cent designated as due to more than one cause. In general the more important or more serious cause was used as primary, except where a disease like pneumonia is commonly recognized as following measles or influenza; in such cases the antecedent condition was taken as primary.⁵ In the present paper which deals with broad disease groups, the illness rates are based on sole or primary causes only, so that a continuous period of sickness is never counted as two illnesses.

EXTENT OF ILLNESS FROM ALL CAUSES IN DIFFERENT SEVERITY CLASSES

In the present study the crude annual rate was 850 illnesses per 1,000 persons observed. Adjustment to the age distribution of the white population of the Registration States reduces this rate to 823 per 1,000. A rate so adjusted represents the rate that would obtain if the age-specific rates in the surveyed families had prevailed in a population with the age distribution of that in the Registration States. Adjustment for age is necessary before sickness rates in the surveyed population can be compared with death rates in the general population. Rates in an earlier paper (6) which dealt with sickness only were not adjusted for age and hence they are somewhat different from the adjusted rates which are used exclusively in this discussion.

The Hagerstown (18) crude annual illness rate was 1,081 per 1,000 which becomes 1,053 when adjusted for age. Although this rate is considerably above that of 823 per 1,000 for the present study,⁶ both indicate a frequency of illness of roughly one case

⁵ Further details on the method of classifying the causes of illness are included in an earlier report (6).

⁶ The excess in the Hagerstown rate over that of the present study is all in the respiratory diseases (adjusted rate for Hagerstown 649, for eighteen states 329 per 1,000), the non-respiratory rate being greater in this study (adjusted rate for Hagerstown 404, for eighteen states 494 per 1,000). A comparison of results in the two studies is made in an earlier paper (6).

per person per year. The incompleteness of this figure, so far as colds and other trivial attacks are concerned, is indicated by the results of intensive surveys in which the observed individuals made weekly or semi-monthly reports which indicated annual rates as high as three per person for respiratory affections alone (12, 13, 20). No pretense is made of such a degree of completeness in the present record but it probably includes most of the real illnesses and some of the trivial that occur with great frequency.

In addition to the rate of 823 illnesses, nearly four-fifths of which were attended by a doctor, there were 438 services per 1,000 without illness in the usual sense of the word, including vaccinations and immunizations of all kinds, physical examinations, eye refractions, and dental services.

Of the total rate of 823 illnesses, 331 were non-disabling and the remainder, 492 per 1,000, were disabling, that is, they caused the patient to lose one or more days during the year of the study from his usual work, school, play, or other activities. Of the disabling cases, 84 per cent were also confined to bed for one or more days—a rate for bed cases of 414 per 1,000 persons, leaving almost the same number, 409 per 1,000, with no days in bed. About one-fifth of the cases not in bed reported disability for one or more days (78 per 1,000 persons observed).

Of all cases reported, 79 per cent were attended by a doctor and 7 per cent were in a hospital for one or more days during the year of the study, a rate of 62 hospital cases per 1,000 persons observed. Almost as many cases (58 per 1,000 persons observed) had surgery in connection with the primary diagnosis; as some cases had surgery in connection with a contributory diagnosis and others had two or more surgical operations in connection with the same illness, there was a total of 65 surgical operations per 1,000 persons observed. The rates quoted above have all been adjusted to the age distribution of the white population of the Registration States.

Among white persons in the Registration States (1929-1930) there was an annual death rate of 11.1 per 1,000 population; in the surveyed families the death rate (adjusted for age) amounted to 9.6 per 1,000 persons observed.⁷ Infant mortality which is expressed as deaths under 1 year of age per 1,000 live births, was 61 for white infants in the Birth Registration States, 1929-1930; in the surveyed families the figure was 53 per 1,000 live births.⁷ The canvassed group included only families and would not include any representation from such institutions as almshouses, homes for the aged, hospitals for the insane, and orphanages where the death rate is usually high. Somewhat lower death rates in the surveyed group than in the general population might therefore be expected.

CAUSES OF ILLNESS OF DIFFERENT SEVERITIES CLASSIFIED IN BROAD
DIAGNOSIS GROUPS

Figure 1 shows the important causes of sickness of different types and severities discussed in the preceding section and the important causes of death. The cases are classified into the broad groups of the International List of the Causes of Death, the diseases being arrayed in each severity category according to the magnitude of the rates for the groups. The percentages are all based on adjusted rates, each being the percentage that the rate for a given diagnosis group is of the rate for all causes of the same severity category. The percentages that appear on the graph are the equivalent of the percentage of cases as they would occur in a population with the age distribution of that in the Registration States in 1929-1930.

The three bars on the right contrast the causes of sickness and death, the mortality being shown for both the Registration States and the surveyed population. It will be noted that the mortality data for the canvassed families are quite similar to those for the

⁷ All mortality data for the surveyed group are based on the families observed for a full twelve months and those observed for less than that time. All sickness data are based on the full-time families only. For further details see footnote 6 to Table 1.

(including cerebral hemorrhage) are among the four most important causes of death, but are relatively infrequent as causes of sickness. Accidents are third among the causes of sickness and fifth among the causes of death.

The three bars on the left present the causes of (a) medical care without sickness (largely preventive service), (b) sickness that did not keep the patient from his usual activities (non-disabling), and (c) sickness that caused the patient to lose one or more days from his usual work, school, or other activity (disabling). Care of the teeth and eye examinations for glasses are definitely therapeutic, but they have been included with preventive care because illness in the usual sense of the word is not commonly present at the time the service is rendered. More than three-fifths of the cases of care without illness are dental; 17 per cent are physical examinations; 11 per cent, vaccinations and immunizations of the various kinds; and 10 per cent, eye refractions. In both disabling and non-disabling illness, respiratory diseases are the outstanding cause, constituting 32 per cent of the non-disabling and 45 per cent of the disabling cases.⁸ Accidents stand fourth in the disabling class and second in the non-disabling, evidently including a considerable number of minor injuries that did not involve loss of time from usual activities. The communicable diseases occupy second place in the disabling class, but there are also a considerable number that are non-disabling, being sixth in that class. Digestive disorders are third in importance in both classes of illness; skin affections are fourth in the non-disabling but do not appear in the disabling class, since they amount to less than 2 per cent of these cases.

The two center bars show the most frequent causes of illness that were hospitalized and that had surgical treatment. An examination of the diagnoses of hospitalized cases indicates that the

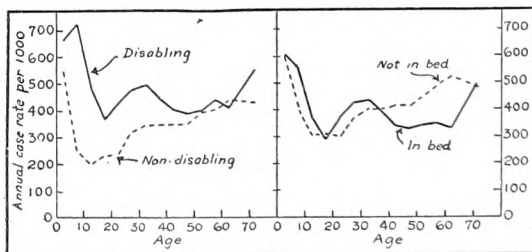
⁸ Respiratory illnesses constitute nearly half of the cases that were in bed for one or more days (6).

hospital is used as a convenience in surgical and maternity cases as much as a concentration point for the most severe illnesses of all kinds. The four most frequent groups of hospital cases are respiratory (largely tonsil and adenoid operations), puerperal and female genital, digestive (nearly half of this group was appendicitis), and accidents. These four classes constitute more than three-fourths of the hospital cases. About 60 per cent of all hospital cases were surgical and about the same percentage of all surgical cases were hospitalized. Surgical cases show about the same picture as hospital cases, respiratory (largely tonsil and adenoid operations), accidents, digestive (largely appendicitis), and puerperal and female genital diseases being the four most frequent diagnoses in surgical as well as in hospital cases. These four causes constitute 75 per cent of the surgical cases.

AGE VARIATION IN ILLNESS OF DIFFERENT SEVERITIES

Figure 2 shows the age curve of illness from all causes classified as disabling and non-disabling (Table 1). Disabling refers to illness that causes loss of one or more days from usual activities, whether or not the individual was gainfully employed. Curves are also shown for cases that were not in bed and for those con-

Fig. 2. Age incidence of illnesses of different severity categories—canvassed white families in eighteen states during twelve consecutive months, 1928-1931.



fining the patient to bed for one or more days; all cases in the latter category are included in the disabling class, constituting 84 per cent of the illnesses in that group.

There is somewhat more variation with age in the non-disabling than in either the disabling or bed cases; the rise with age after 20 years is slightly greater and the rate for children under 5 years is also relatively

higher in the less severe non-disabling class. An examination of the age curves of non-disabling illness in broad diagnosis groups indicates that respiratory and digestive affections are the principal causes that contribute to the more rapid rise as age increases; it is also these groups that are largely responsible for the relatively

Table 1. Age incidence of illness of varying severity and of mortality—illness in canvassed white families in eighteen states during twelve consecutive months, 1928-1931, and mortality among white persons in the Registration States,¹ 1929-1930. (All causes; sole or primary diagnosis only.)

AGE	SURVEYED GROUP						REGIS- TRATION STATES	RELATION BE- TWEEN ILLNESS AND DEATH RATES		White Population (Years of Life) for the Registration States, 1929-1930 (in thou- sands)
	Annual Illness Rates per 1,000 Population				Population (Years of Life) for Illness Data	Annual Death Rates per 1,000 Population ⁶	Annual Death Rates per 1,000 Population	Estimated Case Fatality, Per Cent ³	Estimated Num- ber of Illnesses per Death ⁴	
	All Illness	Non-dis- abling Cases ¹	Disabling Cases	Cases in Bed						
ALL AGES	850	334	516	434	38,544 ⁵	6.90	11.07	—	—	208,492 ⁵
Crude	823	331	492	414	—	9.58	11.07	1.35	74	—
Adjusted ²										
Under 5	1,212	548	664	609	5,513	11.11	17.11	1.41	71	18,935
5-9	978	253	725	563	5,715	1.73	1.92	.20	511	20,904
10-14	679	199	480	372	4,568	.98	1.46	.21	464	20,149
15-19	599	227	372	288	3,050	2.97	2.41	.40	248	19,276
20-24	672	242	430	373	2,119		3.37	.50	199	18,040
25-29	798	317	481	427	2,491	2.71	3.77	.47	212	16,364
30-34	838	343	495	435	3,149		4.30	.51	195	15,527
35-39	792	346	446	392	3,292	4.57	5.28	.67	150	15,708
40-44	753	349	404	339	2,638		6.98	.93	108	13,841
45-49	737	347	390	327	1,928	6.83	9.35	1.27	79	12,166
50-54	790	392	398	342	1,423		13.02	1.65	61	10,420
55-59	840	402	438	348	838	21.07	19.09	2.27	44	8,283
60-64	850	439	411	334	635		28.00	3.29	30	6,723
65 and over	979	430	549	497	998	77.13	75.10	7.67	13	12,008
Number of cases—all ages ⁵	32,756	12,869	19,887	16,726	—	295	2,308,648	—	—	—

¹ Registration States included all except Texas and South Dakota in 1929 and all except Texas in 1930.

² Rates for all ages are adjusted to the age distribution of the white population of the Death Registration States, 1929-1930.

³ Percentage that death rate in Registration States is of case rate in surveyed population.

⁴ Ratio of case rate in the surveyed population to death rate in the Registration States.

⁵ "All ages" includes a few of unknown age.

⁶ The death rate in the surveyed group is based on both the families observed for a full twelve-month period and those observed for less than that time, all part-time persons in both groups being counted in the population for only the actual time under observation. As a death in the family was sometimes the reason for the discontinuance of reports, it was necessary to use both groups of families in computing the death rate. The years of life in the full- and part-time families was 42,749. All sickness data are based on the full-time families only.

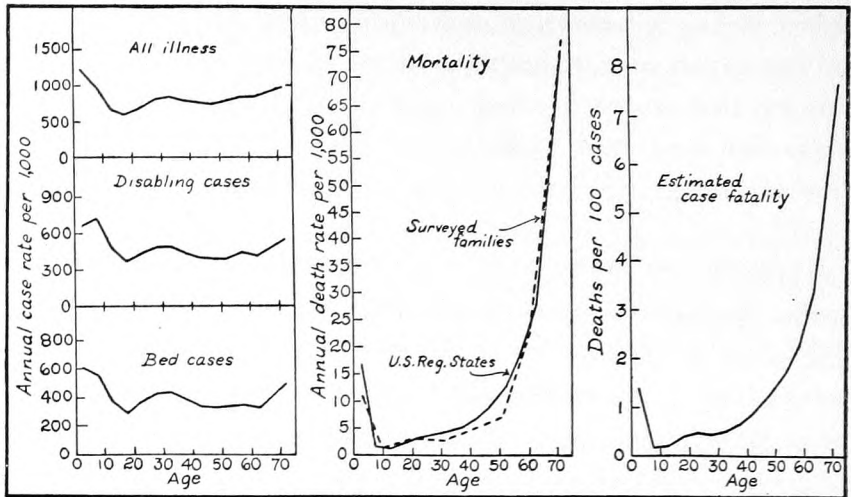


Fig. 3. Variation with age in illness, mortality, and estimated case fatality rates—illness in canvassed white families in eighteen states during twelve consecutive months, 1928-1931; and mortality among white persons in the Registration States, 1929-1930. (Scales are so made that the adjusted rate for all ages represents an interval on the vertical rate scale that corresponds to twenty years on the horizontal age scale.)

high non-disabling illness rate among children under five years.

Figure 3 shows, among other things, age-specific sickness rates in the surveyed population and age-specific mortality rates in the Registration States. The scales in both the sickness and mortality charts are so made that the adjusted rate for all ages plots on the vertical axis at a distance above the base line that is equal to the distance representing 20 years on the horizontal axis. Such an arrangement makes the relative variation with age in the sickness and death curves comparable in the same way as in curves of the ratio of the rate in each age to the rate for all ages. The variation with age is far greater in mortality than in sickness. The mortality curve increases steadily from a minimum at 10-14 years to a maximum at the oldest ages. The sickness curve has its minimum at 15-19, with a small peak at 30-34 years, followed by a decline to 45-49, and a gradual increase to the end of life. But the relative difference between sickness rates for persons over 65 and 15-19 years of age is very small as compared with the relative dif-

ference between mortality rates for the same ages. If the mortality curve were extended forward to the ages 75 and beyond, it would continue to rise rapidly, and if extended back to the age group under one year its rise would be so rapid that it would reach a height about equal to that corresponding to the oldest ages. On the other hand, if the sickness curve were similarly extended in both directions there would be practically no change in the morbidity picture. The age curves of the more serious illnesses that disabled and that confined the patient to bed do not resemble the mortality curve any more closely than does the curve of all illness.

An approximate idea of the case fatality of illness at the different ages may be obtained by relating mortality rates in the Registration States to sickness rates in the surveyed population. Considering all ages, a death rate of 11.1 when related to a total case rate of 823 per 1,000 indicates a fatality of 1.35 per 100 cases. Relating the same death rate to the disabling case rate of 492 and the bed case rate of 414 per 1,000 gives a fatality of 2.25 per 100 disabling cases and of 2.67 per 100 cases that caused confinement to bed. In other words there was a total of 74 cases of illness for each death; there were 44 disabling cases for each death; and there were 37 cases which confined the patient to bed for each death during the year.

Figure 3 shows by age the ratio of the mortality rate to the sickness rate—an estimated case fatality or deaths per 100 cases of illness. Because sickness varies from age to age much less than mortality, the age curve of the estimated case fatality is quite similar to that of mortality. If the sickness rates were the same for all ages, the denominators entering the calculation of the successive case fatalities would be the same, and hence the fatality curve would be identical in shape with the mortality curve.

The reciprocal relation of mortality and sickness in terms of the estimated number of illnesses per death at the different ages is shown in Table 1. From 511 illnesses for each death at 5-9

years, the number declines to only 13 cases per death above 65 years. Likewise, in the youngest group there are fewer cases per death, reflecting the higher fatality of illness at the extremes of life. This is also evident in the series of percentages representing the case fatality by age.

DISTRIBUTION OF INDIVIDUALS ACCORDING TO THE FREQUENCY
OF ILLNESS

An annual illness rate of one case per person does not indicate that every person was sick during the year. Such an assumption would be quite erroneous; among the nearly 40,000 individuals, each of whom was observed for twelve months, almost half (48 per cent) were not sick, about a third (32 per cent) were sick once, about one-eighth (13 per cent) were sick twice, and the other 6 to 7 per cent were sick three or more times during the twelve months of the study. Table 2 shows by age the distribution of persons according to the number of times sick and Figure 4 shows some of the data graphically. The proportions that were not sick, which might be called the "age curve of good health," reached a maximum at 15-19 years, with minima at the two extremes of life. The curve for persons sick three or more

Table 2. Age variation in the proportions of persons sick and not sick during the year under observation—canvassed white families in eighteen states during twelve consecutive months, 1928-1931.

TIMES SICK DURING TWELVE MONTHS	ALL AGES			AGE										
	Num- ber of Per- sons	Crude	Ad- just- ed ¹	Un- der 5	5-9	10-14	15-19	20-24	25-34	35-44	45-54	55-64	65 and Over	
														Percentage of Persons Who Were Sick the Specified Number of Times
Not sick	18,201	47.4	48.2	32.4	41.5	54.1	58.9	55.3	48.3	50.2	51.1	46.8	39.0	
Sick once	12,352	32.1	32.1	34.7	33.6	31.1	28.7	30.2	32.1	31.4	30.8	33.1	39.1	
Sick twice	5,210	13.6	13.2	19.8	16.3	10.7	8.8	9.7	12.6	12.7	12.6	14.2	15.8	
Sick three or more times	2,658	6.9	6.5	13.1	8.6	4.1	3.6	4.8	7.0	5.7	5.5	5.9	6.1	
Number of persons under observa- tion ²		38,421		5,102	5,739	4,584	3,101	2,179	5,683	5,948	3,365	1,494	1,049	

¹ Percentages for all ages are adjusted to the age distribution of the white population of the Death Registration States, 1929-1930.

² All except 1.5 per cent were under observation during the whole twelve months; births during the study are excluded. "All ages" includes a few of unknown age.

times—the “age curve of ill health”—shows the ages when individuals are likely to be ill more frequently than the average; infancy and early childhood and 25 to 35 years of age are the two periods when individuals are most likely to suffer repeated illness during the year. The adult peak is probably due to childbearing and its attendant illnesses.

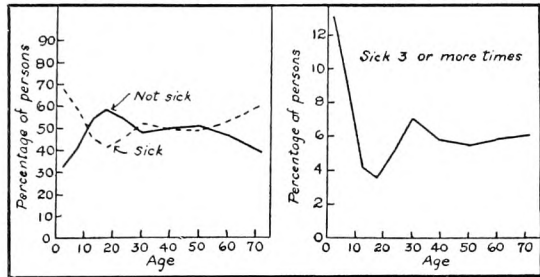
CAUSES OF ILLNESS
AT DIFFERENT AGES

Figure 5 is intended to give a general view

of the important causes of illness at the various ages. The total height of the bar or rectangle for a given age group represents the total sickness rate per 1,000 persons of that age; these rectangles are subdivided into smaller rectangles that represent sickness rates for the various disease classes and thus indicate the diagnostic composition of the sickness load at the various ages. The order of the diseases varies in the different age groups; the arrangement is according to the size of the rate, all diagnoses being shown that have a frequency of 20 or more per 1,000 persons observed. For example, circulatory diseases appear as third in importance in the age group over 65 years, as seventh among persons 35-44, and do not appear under 5 years because the rate is less than 20 per 1,000.

Respiratory diseases are an overwhelming part of the sickness burden at every age; accidents and digestive disorders are also frequent at all ages. The communicable diseases are important, but they become less frequent after 20 years and are replaced in the adult ages by female diseases and puerperal conditions and in the older ages by the cardio-renal, the nervous, and other pre-

Fig. 4. Percentage of persons sick and not sick during a twelve-month period—canvassed white families in eighteen states during twelve consecutive months, 1928-1931. (Scales are so made that the adjusted percentage for all ages represents an interval on the vertical percentage scale that corresponds to forty years on the horizontal age scale.)



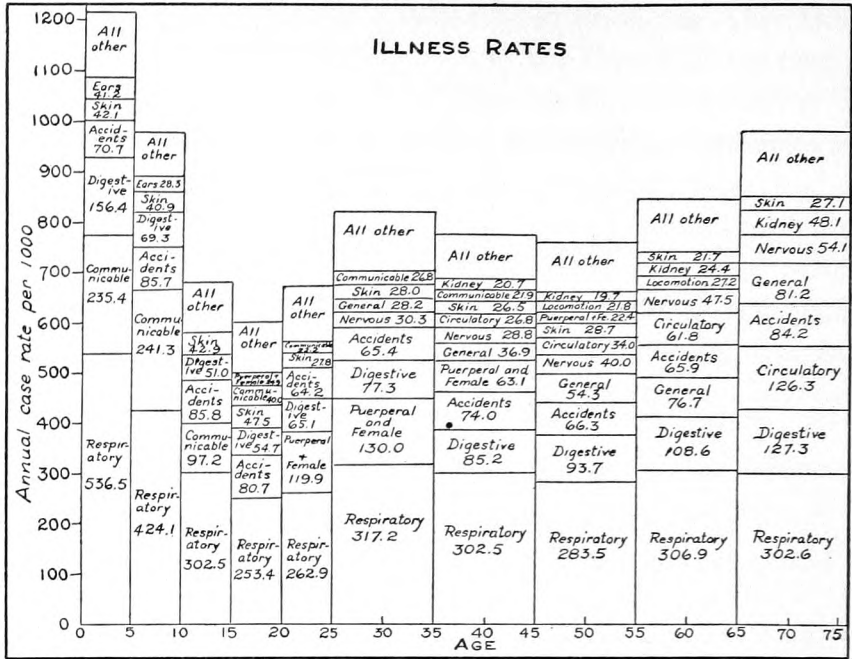


Fig. 5. Illness rates and the broad diagnosis composition of the case load at different ages—cannvassed white families in eighteen states during twelve consecutive months, 1928-1931. (Chart shows all diagnosis groups with rates of 20 or more per 1,000.)

sumably noninfectious general diseases commonly referred to as the degenerative group.

SUMMARY

Records of illness were obtained on 8,758 white families in 130 localities of eighteen states for a period of twelve consecutive months between February, 1928 and June, 1931. Each family was visited at intervals of two to four months to obtain the data.

The surveyed families include representation from all geographic sections of the United States. Every size of community was included, from metropolitan districts to small industrial and agricultural towns and rural unincorporated areas. The observed group was fairly similar to the general population with respect to age and sex composition, percentage native born, and percentage married. With respect to income, the distribution was

reasonably similar to the estimated distribution of the general population of the United States at the time of the survey.

Mortality in the white population of the Registration States for the years 1929-1930 is used to supplement the sickness data. A comparison with the deaths in the canvassed families indicated that the use of the larger mortality experience was justifiable.

The major causes of death are not the most frequent causes of illness. The respiratory diseases are outstanding as causes of illness whether non-disabling or disabling; the degenerative diseases are more important as causes of death (Figure 1).

When illness is divided into non-disabling and disabling, and into cases in bed and not in bed, the variation with age is about as great in one class as another. The more severe cases that were in bed show a considerable peak from 20 to 40 years of age that reflects the illnesses associated with childbearing (Figure 2).

Illness is most frequent under 5 years and least frequent at 15-19 years of age. The frequency is about the same among persons 5-9 and 65 years and over. Deaths are least frequent at 10-14 and most frequent in the oldest ages (Figure 3).

Death rates vary with age far more than illness rates of any severity (Figure 3). Cases of illness per death range from 5.11 at 5-9 years to 1.3 at 65 years and over.

The proportion of the individuals that were sick three or more times during the twelve-month period of observation varies from 13.1 per cent for children under 5 years to 3.6 per cent at 15-19 years (Figure 4).

Respiratory diseases are an overwhelming part of the sickness burden at every age; accidents and digestive disorders are also important throughout life (Figure 5).

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