A Discussion of the Concepts of Incidence and Prevalence as Related to Epidemiologic Studies of Mental Disorders

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We need to know much more about the epidemiology of mental disorders. The research needed will prove expensive and difficult since it will depend on long observation and will involve several disciplines, but it is the way we must take to advance our knowledge of the incidence, duration and prevalence of mental diseases.

✢ This paper gives an opportunity to acquaint epidemiologists with some of the characteristics of morbidity data on the mentally ill and some of the challenging research problems that this field presents. Because of the complex nature of the problem, epidemiologic research on the mental disorders is bringing into the public health field professional personnel from such disciplines as psychiatry, psychology, sociology, anthropology, and psychiatric social work. For the most part, persons trained in these professions have not been exposed to the philosophy underlying the epidemiologic approach to the study of disease and to the statistical methods used in such studies. This paper, therefore, will also give an opportunity to provide these professionals with some background material on two basic morbidity indexes used in studying the occurrence of disease in population groups.

Definitions

Incidence is defined as the number of new cases of a disease occurring within a specified period of time. "New case" must be carefully defined as, for example, the first or initial attack of a disease during an individual's lifetime. The incidence rate is computed by taking the ratio of the number of new cases (as defined) in the specified interval to the appropriate population exposed to risk. This rate may be made specific for a variety of factors, such as age, sex, marital status, geographic area, and socioeconomic status.

Prevalence is defined as the number of cases of a disease present in a population group as of a specified interval of time, i.e., it is the number of cases existing at the start of an interval plus the new cases developing during the interval. As Dorn [1] points out, "the length of the interval of observation must always be specified if a prevalence rate is to be correctly interpreted, for we may speak of the number of persons who are sick at any time during a given day, week, month or other arbitrary interval." The characteristics of individuals who are to be counted as a case must be carefully defined, as for example all persons who have "active" disease within the interval of study. The prevalence rate is computed by taking

the ratio of the number of cases in the specified interval to the number of people in the appropriate population group for which the rate is being determined. The rates may be made specific for age, sex, geographic area, socioeconomic status, etc.

Usually the prevalence rate can be determined more easily than the incidence rate since it can be estimated by a single case-finding survey of a population group. This is particularly true for the chronic diseases, but this should not obscure the fact that the incidence rate is the fundamental epidemiologic ratio. The fundamental nature of this rate has been emphasized by Dorn,[1] Doull,[2] Sartwell and Merrell,[3] and others. In discussing infectious diseases Doull states, "In general terms and assuming no restrictions on exposure, incidence is dependent upon the balance which exists between resistance of the population and pathogenicity of the microorganism. This balance may be called the force of morbidity." The analogy between this concept and concepts that have been proposed with respect to the incidence of mental disorder in the population is apparent. Incidence of mental disorder would seem to be dependent upon the balance which exists between resistance of the population and those forces and stresses—biologic, cultural, psychologic —that produce mental disorder. Doull further states, ". . . prevalence is more complex. It is the resultant of the force of morbidity and those factors which determine whether the interval between onset and termination shall be long or short, whether a disease shall be acute or chronic."

In more formal terms, incidence measures the rate at which new cases are added to the population of sick persons and—in conjunction with the decrement rate, i.e., the rate at which the disease is "arrested," "cured," or at which affected individuals are removed from the population by death—deter-

mines the size and composition of the sick population. Thus, the prevalence rate of a disease is a function of the incidence rate and the duration of the disease.

Hypothetical Examples

These concepts may be illustrated by three hypothetical examples dealing with the variables incidence, duration, and prevalence. These examples show the effect of different assumptions regarding duration of disease on the resulting prevalence rate in a stationary population with a constant annual incidence rate of a specified disease.

Let us assume that there are three communities each with a stationary population of 100,000 people that have always been free of mental disorder. Suddenly, in 1940, 1,000 individuals become psychotic for the first time in communities A and B and 2,000 in community C. Further, to simply the problem, let us also assume that these people all become psychotic on January 1, that they are immediately hospitalized on that day and that there is only a single type of mental disorder involved. Thereafter, on January 1 of every year, 1,000 new cases of the same disorder always appear in A and B and 2,000 in C. Let us also assume that the sick individuals are released from the hospital at some specified rate and that release from the hospital is equivalent to cure of the disease, i.e., the interval between date of admission and date of release is equivalent to duration of the disease. Table 1 shows the prevalence in each

Table 1—Illustration of Ways Three Hypothetical Prevalence Situations Develop in Three Different Communities Under Various Assumptions of Incidence and Duration of Disease

Community A. Assumptions: 1,000 new cases annually, each of which occurs on January 1 of specified year; 100 patients annually are cured in each cohort of such new cases. The prevalence count will stabilize at 5,500 cases on January 1, 1949.

Cohort of Year	Patients in Hospital on January 1 of Specified Year										
	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950
1940	1000	900	800	700	600	500	400	300	200	100	0
1941		1000	900	800	700	600	500	400	300	200	100
1942			1000	900	800	700	600	500	400	300	200
1943				1000	900	800	700	600	500	400	300
1944					1000	900	800	700	600	500	400
1945						1000	900	800	700	600	500
1946							1000	900	800	700	600
1947								1000	900	800	700
1948									1000	900	800
1949										1000	900
1950											1000
Total	1000	1900	2700	3400	4000	4500	4900	5200	5400	5500	5500

Community B. Assumptions: 1,000 new cases annually, each of which occurs on January 1 of specified year; 10% of those ill at the beginning of each year are cured during that year. The prevalence count will stabilize at 10,000 cases on January 1, 2007.

Cohort of Year	Patients in Hospital on January 1 of Specified Year										
	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950
1940	1000	900	810	729	656	590	531	478	430	387	348
1941		1000	900	810	729	656	590	531	478	430	387
1942			1000	900	810	729	656	590	531	478	430
1943				1000	900	810	729	656	590	531	478
1944					1000	900	810	729	656	590	531
1945						1000	900	810	729	656	590
1946							1000	900	810	729	656
1947								1000	900	810	729
1948									1000	900	810
1949										1000	900
1950											1000
Total	1000	1900	2710	3439	4095	4685	5216	5694	6124	6511	6859

Community C. Assumptions: 2,000 new cases annually, each of which occurs on January 1 of specified year; 40% of those ill at the beginning of each year are cured during that year. The prevalence count will stabilize at 5,000 cases on January 1, 1956.

Cohort of Year	Patients in Hospital on January 1 of Specified Year										
	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950
1940	2000	1200	720	432	259	155	93	56	34	20	12
1941		2000	1200	720	432	259	155	93	56	34	20
1942			2000	1200	720	432	259	155	93	56	34
1943				2000	1200	720	432	259	155	93	56
1944					2000	1200	720	432	259	155	93
1945						2000	1200	720	432	259	155
1946							2000	1200	720	432	259
1947								2000	1200	720	432
1948									2000	1200	720
1949										2000	1200
1950											2000
Total	2000	3200	3920	4352	4611	4766	4859	4915	4949	4969	4981

community on January 1 of each year under the following assumptions with respect to the duration of illness in each cohort * of new cases:

Assumption 1, Operating in Community A: In each cohort of 1,000 new cases 100 people annually are cured.

Assumption 2, Operating in Community B: In each cohort of 1,000 new cases 10 per cent of those still ill at the beginning of each year are cured during the following year.

Assumption 3, Operating in Community C: In each cohort of 2,000 new cases, 40 per cent of those still ill at the beginning of each year are cured during the following year.

Although the annual incidence, that is, the number of people developing a mental disorder for the first time in each year is the same in community A and B, the prevalence rates on January 1 of each year differ considerably after the first two years. For example, on January 1, 1950, in community A, the prevalence becomes stationary at 5,500 patients, a prevalence rate of 5,500 per 100,000 or 5.5 per cent. On the other hand, in the community B, the prevalence increased steadily to 6,859 or 6.9 per cent on the same date. It can be shown that this rate will stabilize at 10,000 per 100,000 or 10 per cent at about the year 2007. In community C, where the annual incidence rate is 2,000 per 100,000 or 2 per cent, twice the rate in the previous examples, the prevalence reaches 4,981 cases per 100,000 population on January 1, 1950. In this population prevalence will eventually become less than in the other two examples, stabilizing at 5,000 per 100,000 or 5 per cent at about the year 1956.

These examples illustrate that although the prevalence of a disease differs among communities, the inference cannot be drawn that the community with the highest prevalence also has the highest incidence. Indeed, the community with the highest incidence had

the lowest prevalence. Since the prevalence rate is a function of the annual incidence and the duration of the illness, it should be clear that interpretation of differences in prevalence between communities is dependent on knowledge of these two factors.

Not only do the above considerations explain how differences in prevalence rates for a single disease develop between communities, they also explain how differences develop among prevalence rates for several diseases within the same community. Thus, if disease A has a higher prevalence rate than disease B, the difference can be accounted for as follows: (1) higher incidence for disease A associated with longer, equal or even shorter duration for disease A than disease B; or (2) equal incidence for disease A and B associated with longer duration of disease A than disease B; or (3) lower incidence in disease A with disproportionately longer duration for disease A than for disease B.

Illustrations

The above principles may be illustrated by a consideration of indexes that have been used to measure the incidence and prevalence of mental disorders requiring admission to hospitals for the prolonged care and treatment of mental disorder. An index of the incidence of these mental disorders is the first admission rate, defined as the number of persons admitted for the first time to prolonged care mental hospitals per 100,000 population. An index of prevalence of these disorders is the number of persons actually resident in the hospitals for prolonged care at the end of the year per 100,000 population. These indexes may be made specific for age, sex, etc.

Both indexes have limitations discussed fully elsewhere.[4-6] To illustrate, the date of first admission to a mental hospital is not necessarily coincident

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* A cohort is a group of persons, each of whom has some common characteristic.

with the date of initial attack of mental disorder. Indeed, as more community treatment facilities develop, as the number of psychiatrists engaged in private practice increases and as treatment methods become available that can be used by general practitioners for maintaining persons with mental disorders in the community (such as the tranquilizing drugs), considerable time may elapse between date of onset of disease and the date it may finally be found necessary to commit an individual to a mental hospital. Also, the number of patients resident in these hospitals on any one day is not a complete count of the number of people in a community who have a psychiatric disability. Nevertheless, there are certain types of data available on hospitalized psychotics which are not available on the non-hospitalized population. For example, the time interval elapsing between date the patient is admitted to the hospital and date the patient is returned to the community or dies in the hospital gives one measure of duration of disability associated with certain hospitalized psychiatric disorders and makes it possible to illustrate how differential duration of hospitalization produces differences between resident patient and first admission rates.
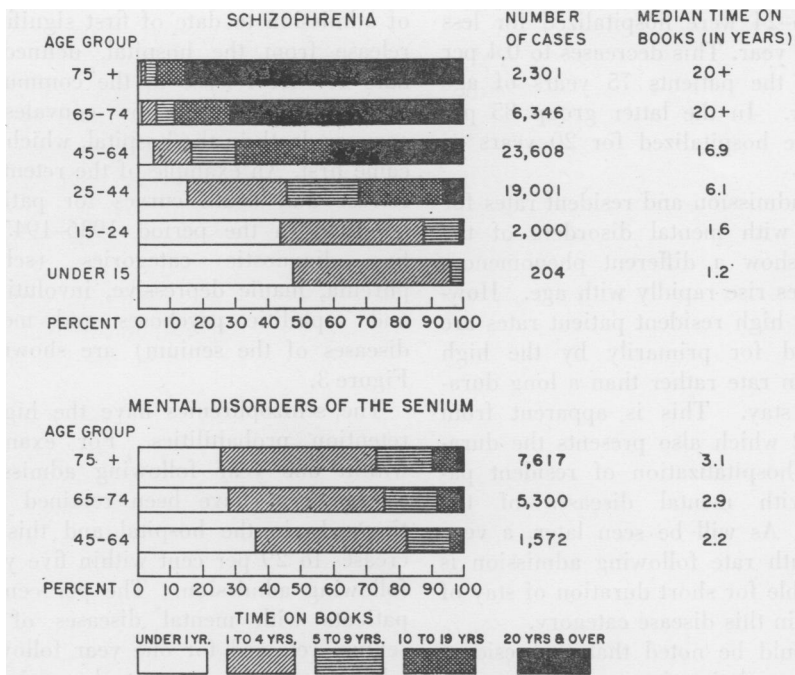
Let us now consider differences between first admission and resident patient rates for all mental disorders combined, schizophrenia and mental diseases of the senium (cerebral arteriosclerotic and senile psychoses combined) (Figure 1).

The resident patient curve for all disorders increases continuously with age from 14.1 per 100,000 in the age group under 15 years of age to 1,272 in the age group 85 years and over. The first admission curve is at a considerably lower level and has a different form. Thus, the curve rises from a low of 10 per 100,000 under 15 years of age to about 84 per 100,000 in the age group 25–34 years, stays at about a level of 90 per 100,000 in the age groups 35–44, 45–54, and 55–64 years and then makes a rapid ascent to a maximum of 467 in the age group 85 years and over. Because of the large number of disorders involved and of the variations in the age at time of admission for patients with these disorders (see for example reference 5, p. 4), the total resident patient rate is difficult to interpret. It is instructive to examine the differences
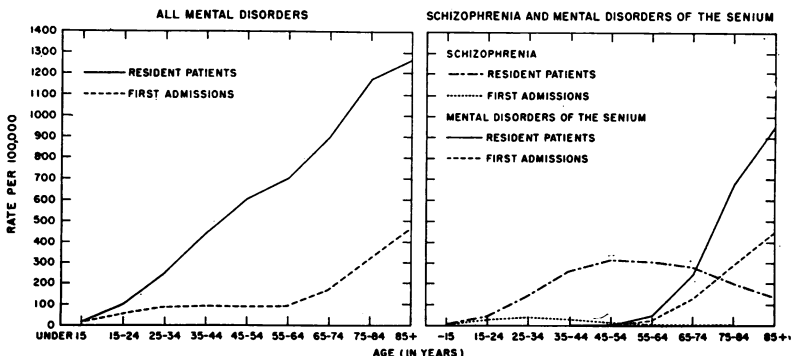
[1] Source: Patients in Mental Institutions, 1952, Part V (in Preparation), National Institute of Mental Health, Public Health Service.

Figure 1—Age-Specific First Admission and Resident Patient Rates per 100,000 Civilian Population, State Hospitals for Mental Disease, All Mental Disorders and Selected Mental Disorders, Both Sexes, United States, 1952.[1]

Figure 2—Per cent Distribution by Time on Books and Median Time on Books of Patients Resident in New York State Civil Hospitals for Mental Disease, Both Sexes by Age and Selected Diagnosis, March 31, 1955.[1]

between resident patient and first admission rates for two important groups of patients, the schizophrenics and patients with mental diseases of the senium.

The first admission rate for schizophrenics rises from a low of 2 per 100,000 in the age group under 15 years to a maximum of 41 in the age group 25–34 years and declines steadily with advancing age. The resident patient rate rises steadily to a peak of 318 per 100,000 in the age group 45–54 years, decreases slowly to about 285 in the age group 65–74 years, and then to 140 in the age group 85 years and over. The high resident patient rate in the older age groups is a resultant of the accumulation of cases in the hospital. That is, the resident schizophrenics in the age groups 45 and over consist primarily of

cases who have aged in the hospital rather than of new admissions in these age groups. Evidence of this fact can be obtained from Figure 2 which presents the distribution of resident schizophrenics in the New York State civil hospitals on March 31, 1955, by age and duration of hospitalization as measured by the interval between date of current admission and March 31, 1955.* The proportion of cases hospitalized for long periods of time increases markedly with advancing age of patient. Thus, 44 per cent of the pa-

* This interval actually represents length of time patient has been on the books of the hospital for the current admission. Although data similar to that reported by New York State are available for the patients hospitalized in 16 of the 17 Model Reporting Area States, the machine tabulations have as yet not been completed for the combined experience.

tients 15–24 were hospitalized for less than one year. This decreases to 0.4 per cent for the patients 75 years of age and over. In the latter group 85 per cent were hospitalized for 20 years or more.

First admission and resident rates for patients with mental disorders of the senium show a different phenomenon. Both rates rise rapidly with age. However, the high resident patient rates are accounted for primarily by the high admission rate rather than a long duration of stay. This is apparent from Figure 2 which also presents the duration of hospitalization of resident patients with mental diseases of the senium. As will be seen later, a very high death rate following admission is responsible for short duration of stay of patients in this disease category.

It should be noted that the resident patient population is a residue population. It is a heterogeneous mixture of the residues of various cohorts of patients admitted over long periods of time—indeed from the date the hospital opened to the present day—and depleted through release and death at differential rates specific for age, sex, diagnosis and a variety of other factors that have influenced the movement of patients during the history of the hospital.

More direct evidence on differences in duration of hospitalization and the way such differentials account for differences between distribution of diagnostic categories in first admissions and resident patients can be obtained only from studies which follow groups of first admission to determine what proportion are still in the hospital, out of the hospital, or dead within specified periods of time following admission. An example of such a study is that done on first admissions to Warren State Hospital during the period 1916–1950.[5] Cohorts of patients specific for age, sex, and diagnosis were followed from date

of admission to date of first significant release from the hospital, defined as date of first release to the community on direct discharge or convalescent care, or death in the hospital, whichever came first. An example of the retention, release and death curves for patients admitted in the period 1936–1945 in five diagnostic categories (schizophrenia, manic depressive, involutional and syphilitic psychoses and mental diseases of the senium) are shown in Figure 3.

The schizophrenics have the highest retention probabilities. For example, within one year following admission, 49 per cent have been retained continuously in the hospital and this decreases to 29 per cent within five years following admission. The per cent of patients with mental diseases of the senium retained for one year following admission is 31 per cent, decreasing to 8 per cent within five years after admission. The differences in retention probabilities are a reflection of the differential rates of separation. The separation probabilities are highest for patients with manic depressive psychosis and mental diseases of the senium and lowest among the schizophrenics. However, in the manic depressive category a very high proportion of the separations are released alive and a very small proportion die in the hospital, whereas for patients with diseases of the senium the situation is reversed. Although the schizophrenics have a relatively high release rate, with 45 per cent released within one year following admission and 61 per cent released within five years, their total separation rate is lowest because of the relatively low death rate.

If we compare the percentage distribution of diagnoses at time of admission among the first admissions in the five diagnostic categories shown in Figure 3 with the corresponding distribution for those retained continuously for five years we find some striking differences.

The schizophrenics constitute 39 per cent of this group at time of admission and 65 per cent of those hospitalized continuously for the five years, while for the mental diseases of the senium the corresponding percentages are 31 and 14 per cent, respectively.

Similar differences can be shown by considering the fate of patients in relation to age at first admission. The youngest patients have the highest release rates and lowest death rates and the oldest the lowest release rates and the highest death rates (Figure 4). Variations in release and death rates by age and diagnosis are rather interesting but will not be dwelled upon here.[6]

The preceding is only a partial explanation of the ways these differences occur in the composition of first admission and resident patient populations, since, following release to the community, some patients will be readmitted. Indeed, the composition of a mental hospital population is a resultant of medical, social, environmental, economic, and administrative factors which have produced current and past rates of first admission, current and past rates at which patients are released to the community or die in the hospital, and current and past rates at which patients are readmitted to the hospital. Knowledge of these rates over the years is necessary for a complete understanding of the population dynamics of these hospitals.

Time trends in the incidence and prevalence of a disease may also be affected by prevention and control programs. A major objective of the public health movement is to prevent the occurrence of disease, if possible, and to develop treatment procedures to shorten the course of a disease, or to lengthen the course by prolonging life. The effect of such programs is illustrated by considering changes in the first admission and resident patient rates for syphilitic psychotics in the state hospitals of the nation in the period from 1939 to 1952 (Table 2). There has been

Selected Diagnoses - All Ages - Both Sexes
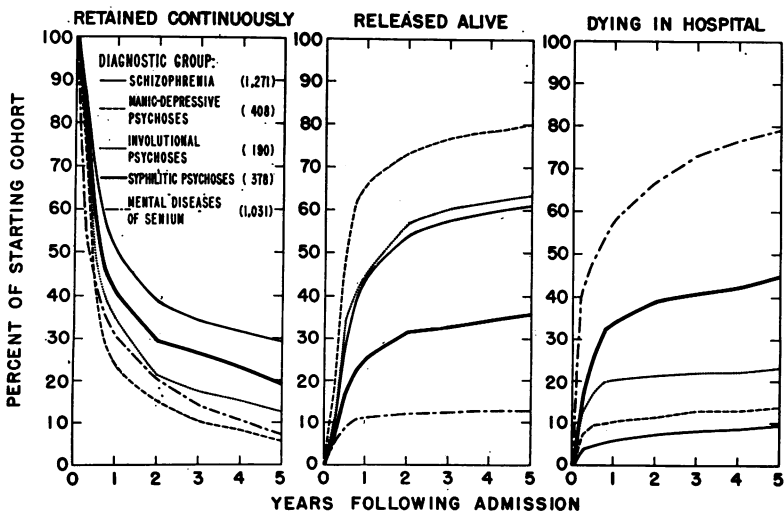
Figure 3—Per cent of First Admissions Retained in Hospital, Released Alive and Dead Within Specified Periods Following Admission to Warren State Hospital, Warren, Pa.: 1936–1945. Selected Diagnoses—All Ages—Both Sexes.

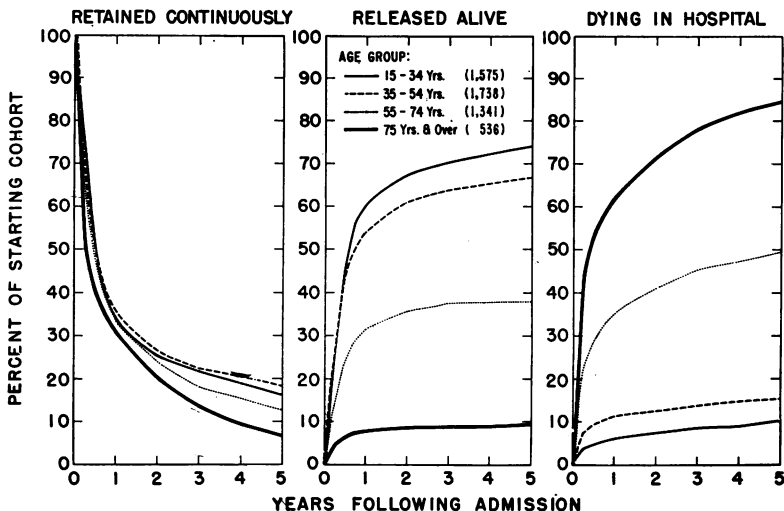All Mental Disorders - Selected Admission Ages - Both Sexes

Figure 4—Per cent of First Admissions Retained in Hospital, Released Alive and Dead Within Specified Periods Following Admission to Warren State Hospital, Warren, Pa.: 1936–1945. All Mental Disorders—Selected Admission Ages—Both Sexes.

a slight increase in the total resident patient rate during a period when the total first admission rate has decreased by 73 per cent. The decrease in first admission rates has resulted in a decreased resident patient rate only in the age groups under 45 years. This has been counterbalanced by an increased accumulation of patients at the older ages, particularly 65 and over, a result of specific treatment programs which have reduced the high fatality rates once associated with this disorder.

Further evidence is obtained from the Warren State Study which shows a striking change in the chances of release and death of syphilitic psychotics first admitted during the period 1916–1950 (Figure 5). There has been a consistent increase over the years in the proportion of patients retained in the hospital. This has resulted from a marked decrease in the proportion of patients dying without corresponding increases in the proportion of patients released. If the 1916–1925 cohort is compared with the 1946–1950 cohort within one year after

admission, the percentage of patients released has increased from 14 per cent to 39 per cent and the percentage of patients dying has dropped from 56 per cent to 18 per cent. This has resulted in increasing the percentage of patients retained from 30 per cent to 43 per cent.

Discussion

The preceding examples were presented to emphasize the differences between two commonly used morbidity indexes and to demonstrate that the principles that describe the dynamics of other illnesses in population groups also apply to the mental disorders. Since prevalence is a function of incidence and duration of disease, comparison of prevalence rates between various population groups, social classes, age, race, and sex groups cannot be interpreted until we know the role of the basic variables—incidence and duration—in producing a given prevalence situation.

I do not wish to leave the impression that the prevalence rate is not a useful

index. As Sartwell and Merrell [3] have said: "The kind of morbidity index which is chosen in studying a disease will depend upon the kind of information desired; thus, the medical care administrator will at times simply be interested in the prevalence of severe cases of a disease in order to estimate the number of beds needed, or the health officer may wish to know what population group will yield the most cases if a screening test is applied. The epidemiologist, however, is constantly seeking as complete a picture as possible of the distribution and course of the disease in specific segments of the population in order to arrive at an understanding of its etiology, pathogenesis, and control."

The purpose of epidemiologic investigations of the mental disorders is to discover associations that may lead to the determination of factors—biologic, psychologic, familial, socioenvironmental—that cause these disorders, and which are responsible for the disability they produce. These associations are determined by studies of the rate at which disease develops in various population groups and in various segments of these populations, and the differential duration of disease and mortality in affected individuals. The proof of etiologic relationships must then be sought through more extensive clinical or experimental investigations.

If we are to learn more about the role played by socioenvironmental variables in the production of mental disorder then we must extend our knowledge of the incidence of these disorders in various population groups. Similarly, if we are to understand the influence of these variables on the course of specific men-

Table 2—Age-Specific First Admission Rates and Resident Patient Rates for Syphilitic Psychoses, United States, 1939 and 1952

Age	First Admission			Resident Patient		
	1939	1952	Per cent Change	1939	1952	Per cent Change
Total (15 years and over)			Rates per 100,000 Population *			
Crude	8.0	2.1	— 73.8	25.9	26.0	+ 0.4
Age Adjusted †	8.6	2.3	— 73.3	28.0	28.7	+ 2.5
15–24	1.0	0.4	— 60.0	2.2	1.8	— 18.2
25–34	6.7	0.8	— 88.1	14.2	5.4	— 62.0
35–44	14.1	2.7	— 80.9	41.2	25.4	— 38.3
45–54	13.1	4.4	— 66.4	51.2	64.1	+ 25.2
55–64	11.0	4.1	— 62.7	45.3	57.6	+ 27.2
65 and over	4.7	2.5	— 46.8	18.7	37.1	+ 98.4
			Number of Patients			
Total (15 years and over)	7,781	2,532	— 67.5	25,276	31,484	+ 24.6
15–24	231	71	— 69.3	533	346	— 35.1
25–34	1,409	183	— 87.0	3,013	1,259	— 58.2
35–44	2,567	594	— 76.9	7,485	5,573	— 25.5
45–54	2,010	786	— 60.9	7,857	11,492	+ 46.3
55–64	1,150	568	— 50.6	4,753	7,997	+ 68.3
65 and over	414	330	— 20.3	1,635	4,817	+194.6

* Rates per 100,000 population as of July 1939 from series P45, No. 5 and 1952 from series P25 No. 121, Current Population Reports, Population Estimates, Bureau of the Census, U. S. Department of Commerce, Washington 25, D. C.
† Adjusted to age distribution of population of the United States as of July 1, 1952. Series P25 No. 121.

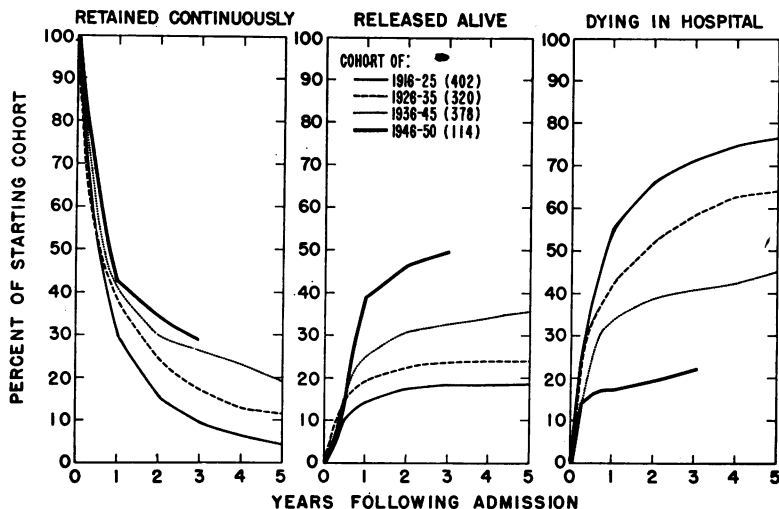**Syphilitic Psychoses – All Ages – Both Sexes**

Figure 5—Per cent of First Admissions Retained in Hospital, Released Alive and Dead Within Specified Periods Following Admission to Warren State Hospital, Warren, Pa.: 1916–1950. Syphilitic Psychoses—All Ages—Both Sexes.

tal disorders, then we must also study variations in remission, relapse, and mortality rates. Studies of prevalence alone leave these basic questions unanswered.

These points may be illustrated by a consideration of two studies of mental disorders carried out in recent years which have investigated the relationship between social stratification, culture and mental disorders in which the morbidity indexes have been determined from prevalence type data. The first of these projects is a study of social structure and psychiatric disorders carried out in New Haven, Conn., by Hollingshead, Redlich, and associates,[7, 8] and the second, a study of mental disorders in the Hutterite population of the United States and Canada by Eaton and Weil.[9]

The New Haven project was designed "to discover whether a relationship does or does not exist between the class system of our society and mental illnesses." Five hypotheses were being tested of which the first two are pertinent for this discussion: (1) "the preva-

lence of treated psychiatric disorders is related significantly to an individual's position in the class structure of his society"; (2) "the types of psychiatric disorders are connected significantly to an individual's position in the status structure."

The basic data used to test these hypotheses were derived from a psychiatric census in the New Haven area. There were 1,963 persons found to be under treatment on December 1, 1950: 66.8 per cent were in a state hospital; 4.2 per cent in a VA hospital; 1.9 per cent in a private hospital; 8.1 per cent under treatment in a clinic; and 19.0 per cent under care of private psychiatrists. The persons in the census were further subclassified into five social classes on the basis of residence, occupation, and education. Class I consists of individuals in the highest socioeconomic position and Class V in the lowest. Comparison of the distribution of persons under psychiatric treatment by social class with a similar distribution for a sample of the "normal" popu-

lation demonstrated a strong inverse relationship between social class and the prevalence of treated mental disorders. There were striking differences between the proportion under various types of treatment. To use the extremes, in Classes I and II combined, 63 per cent were under care of private psychiatrists and 14 per cent in a state hospital, whereas in Class V the corresponding percentages were 3 and 85, respectively. The differences were statistically significant.

A point to be kept in mind in interpreting indexes of the type used in this study is that the proportion of the population with a particular type of mental disorder who are under a specified type of treatment on any one day is a function of the rate at which affected individuals come under the type of treatment and the length of time the affected individuals stay under such treatment. Our previous data on differences between diagnostic composition of first admissions to mental hospitals and resident patients may be used to illustrate this point. Although the first admission rate (i.e., the rate of coming under hospital treatment) for one disorder is high, if the separation rate is also high (i.e., average duration stay in the hospital is short), patients with this disorder may constitute a relatively small proportion of the population under treatment on any one day. On the other hand, a disorder with a relatively low admission rate may constitute a high proportion of patients under treatment because of a relatively long duration of stay. Thus, the fact that an inverse relationship exists between social class and prevalence of treated mental disorder does not mean necessarily that a similar relationship exists between the rate at which people enter into treatment and social class. Nor does it mean necessarily that a similar relationship exists between social class and the rate at which the mental disorder develops

(incidence). The number of people with a particular mental disorder who are under a specific type of treatment on a given day is a resultant not only of the incidence of that disorder but also of the availability of various types of psychiatric treatment facilities and a series of medical, social, economic, environmental, personal, familial, educational, legal and administrative factors which determine who receive treatment in the various facilities and how long they stay under such treatment. Thus, much additional research is needed to determine how much of the observed difference in prevalence of treated mental disorder between various classes of the population is due to differences in (a) incidence (the rate at which the disorder occurs), (b) the rate at which individuals come under treatment, and (c) how long they stay under the care of these treatment facilities.

The Hutterite study investigated the occurrence of mental disorders in a religious sect residing largely in North Dakota, Montana, and Manitoba. This group was reputed to be one in which mental illness was practically nonexistent. A team consisting of social scientists and a psychiatrist surveyed a large number of Hutterite villages to secure data on all known cases of mental disorder and to examine persons reported as possible cases of mental disorder. This study failed to substantiate the impression that Hutterites were almost free of severe mental illness. The morbidity index used in the analysis of the data was one termed the lifetime prevalence rate, defined as the ratio of all active and recovered cases of mental disorders alive at the end of the enumeration period to the total population. Thus, in a population of 8,542 Hutterites, enumerated as of August 31, 1951, 199 persons (23.3 per 1,000 population) were found to have been affected by a mental disorder at some time during their lifetime, and were still

living on the stated date. Of the cases found, 53 were cases of psychosis, yielding a lifetime prevalence rate of 6.2 per 1,000 for these disorders. These rates are also presented specific for age, sex, and type of mental disorder.

In effect, this index is a determination of the proportion of a population alive on a given date who have a history of an attack of mental disorder. It should be apparent that this index is an inappropriate one to use if the focus of the research is to determine the influence of culture on the rate at which mental disorder occurs. The proportion of a population surviving to a given date with a history of a disease is a function of the incidence rate, the mortality of persons who have ever had the disease and the mortality of the nonaffected population. The fact that lifetime prevalence would differ between two or more cultural groups does not mean that incidence differs. Indeed, incidence may be equal while the duration of life following attack by the illness differs. For example, there may be two primitive cultures A

and B with an equal rate of incidence of mental disorder. Culture A's attitude toward the mentally ill is a protective one and everything possible is done to prolong their lives, whereas culture B's attitude is just the opposite. Thus, in A the interval between onset of illness and death would be considerably longer than in B and as a result lifetime prevalence in A would be higher than in B.

Mortality is a factor that can not be overlooked in epidemiologic studies of mental disorder. Although little is known about mortality in psychiatric patients who have never been hospitalized, or in those who have been released from a hospital, it is known that mortality rates experienced by mental hospital patients exceed greatly mortality rates of persons of comparable age and sex in the general population.[10] There have also been striking time trends in mortality among patients who were under 65 years of age at time of admission. To illustrate, consider the changes in mortality experienced by patients admitted to Warren State Hospital in the

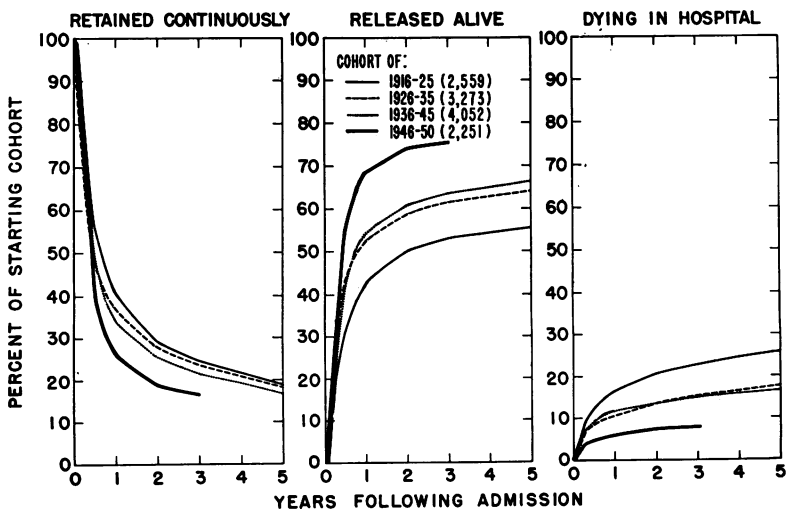**All Mental Disorders—Under 65 Yrs.—Both Sexes**

Figure 6—Per cent of First Admissions Retained in Hospital, Released Alive and Dead Within Specified Periods Following Admission to Warren State Hospital, Warren, Pa.: 1916–1950. All Mental Disorders—Under 65 Years—Both Sexes.

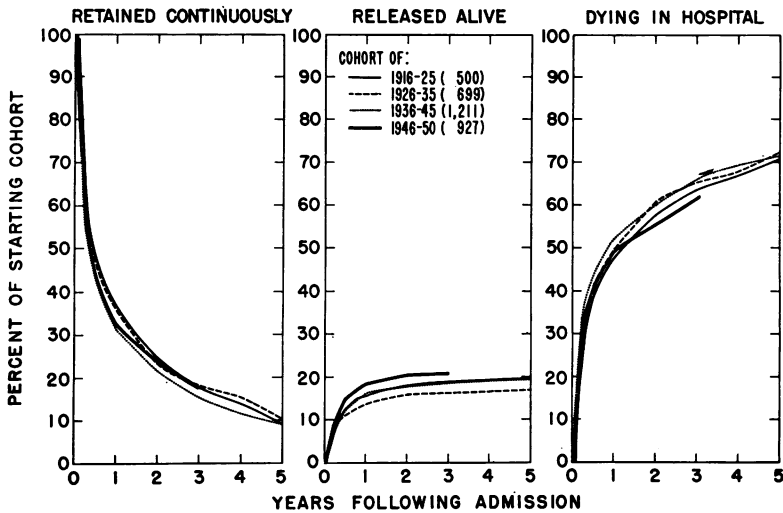**All Mental Disorders–65 Yrs. and Over–Both Sexes**

Figure 7—Per cent of First Admissions Retained in Hospital, Released Alive and Dead Within Specified Periods Following Admission to Warren State Hospital, Warren, Pa.: 1916–1950. All Mental Disorders—65 Years and Over—Both Sexes.

period 1916–1950 (Figure 6). Among patients in this age group first admitted in 1916–1925, 17 per cent died in the hospital within one year following admissions and 23 per cent within three years. Among patients admitted in the period 1946–1950, the corresponding percentages dropped to 6 per cent and 8 per cent, respectively. The above data apply to the experience of these patients during first admission status.

To obtain their complete mortality experience, i.e., to determine what proportion of the first admissions were dead within, say, three years following first admission including patients who died in the hospital and those who died in the community following release, the deaths among the patients released would also have to be determined and added to those who died in the hospital. Making a conservative estimate of the number of such deaths and adding these to the number who died in the hospital, we can state that of 100 first admissions under 65 years of age in the period

1916–1925 approximately 63 per cent would still be living three years after hospitalization and 27 per cent would be dead. Among 100 first admissions in the period 1946–1950, 90 per cent would still be living three years after first admission and 10 per cent dead.

As can be seen from Figure 7, the mortality following admission for the patients 65 years and over is much more severe, with about 50 per cent dead within one year following admission and at least 60 per cent dead within three years. There has been little change in this picture over the years.

Thus, it should be clear that data on trends of survivorship as well as of incidence rates are needed in order to explain variations in lifetime prevalence rates of mental disorders between population groups.

Conclusion

Our knowledge of the epidemiology of mental disorders must be extended

beyond that gathered through studies of mental hospital populations and the studies of either treated or true prevalence (i.e., treated plus untreated cases) of mental disorders. To accomplish this, it is essential that several basic issues be resolved so that comparable data can be gathered in different population groups. The first is to obtain agreement on what constitutes a case of a specified type of mental disorder. The second is the development of standardized case-finding methods for detecting cases in the general population, and standardized methods for their classification. The third is to devise methods for measuring duration of illness, that is, the interval between onset of disease and periods of remission, and for characterizing the psychologic status, the degree of psychiatric disability, social and familial adjustment, and physical condition at various intervals following onset of disease. The fourth is to evaluate the effect of treatment on such indexes. It is to solve these major research problems that the epidemiologist and statistician need the help of the psychiatrist, psychologist and social scientist.

Armed with the tools derived from such research it will be possible then to determine the differential rates at which the members of various population groups develop specific mental disorders, pass through various stages of disability, achieve various stages of recovery or die. It is only through such studies that we will advance our knowledge of the incidence, duration, and prevalence of mental disorders.

REFERENCES

1. Dorn, Harold. Methods of Measuring Incidence and Prevalence of Disease. A.J.P.H. 41:271-278 (Mar.), 1951.
2. Doull, J. A., Guinto, R. S., et al. The Incidence of Leprosy in Cordova and Talisay, Cebu, P. I. Internat. J. Leprosy Vol. 10, 1942.
3. Sartwell, P. E., and Merrell, M. Influence of the Dynamic Character of Chronic Disease on the Interpretation of Morbidity Rates. A.J.P.H. 42:579-584 (May), 1952.
4. Proceedings of the Conferences of Mental Hospital Administrators and Statisticians: (1) First Conference, February, 1951. PHS Pub. No. 295, 1952; (2) Second Conference, February, 1952, PHS Pub. No. 266, 1953; (3) Third Conference, April, 1953, PHS Pub. No. 348, 1954. Washington, D. C.: Gov. Ptg. Office.
5. Kramer, M.; Goldstein, H.; Israel, R. H.; and Johnson, N. A. Disposition of First Admissions to a State Mental Hospital: Experience of the Warren State Hospital During the Period 1916-1950. Pub. Health Monograph No. 32. Washington, D. C.: Gov. Ptg. Office, 1955.
6. ————. Application of Life Table Methodology to the Study of Mental Hospital Populations. Psychiatric Research Rep. No. 5 of the American Psychiatric Association (June), 1956, pp. 49-76.
7. Hollingshead, A. B., and Redlich, F. C. Social Stratification and Psychiatric Disorders. Am. Sociol. Rev. 18:163-169 (Apr.), 1953.
8. Redlich, F. C., Hollingshead, A. B., et al. Social Structure and Psychiatric Disorders. Am. J. Psychiat. 109:729-733 (Apr.), 1953.
9. Eaton, J. W., and Weil, R. J. Culture and Mental Disorders, Glencoe, Ill.: Free Press, 1955.
10. Malzberg, B. Mortality Among Patients With Mental Disease. Utica, N. Y.: State Hospitals Press, 1934.

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