Some Essentials of Sickness Statistics.*

BY

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PART 1. DESCRIPTIVE SICKNESS STATISTICS.

Papers such as Mr. Albert H. Mowbray's "Age, Occupation and Residence as Variants of the Rate of Sickness" (*Proceedings*, Vol. III, p. 213) and the numerous briefs presented to committees of American legislatures during the health insurance campaign of the winter of 1916–1917, indicate the necessity for a connected statement of the essentials of sickness statistics, their nature, limitations, uses and practical bearings. The following discussion, taken from notes prepared for a text on general social statistics, is offered as an initial study of the subject in its broad practical aspects. The refinements which ought to characterize a final reaction to the problem of sickness statistics will be left to other students who may have opportunity to carry on further inquiry.

The briefs so far available show a variety of concepts of the facts of sickness, of its causes, incidence, duration, practical social management and of its immediate and remote consequences. The opinions and impressions offered our American legislatures during the past winter have very much the same general characteristics of those which prevailed during the agitation for social reform in England under Earl Grey, Russell, Peel, Palmerston, Disraeli and Gladstone. There was a mighty conflict of opinion and a dearth of thoroughly digested facts. We have but to view the work of the seventh Earl of Shaftesbury—statistician and statesman—in England and to reflect upon the social reforms which followed in that country from his steadfast adherence to ascertainable facts, to impress us that we, in America, must insist upon an impartial, thorough search for the facts of sickness if we would build a durable insurance and public health structure. Simple dependence upon European experience and upon our primary reactions to the

* Part of a chapter from "Essentials of Social Statistics: A Manual for Students of Casualty and Social Insurance." (In preparation.)

few social facts of sickness we have, cannot serve us for any considerable period.

The facts of sickness may be determined in two ways and by two professional groups: *intensively,* through inquiry into the structure and functions of the human body in health and in disease; and *extensively,* through inquiry into sickness as a *mass phenomenon*—into its occurrence, duration, nature, causes and effects among and in groups of mankind. The medical profession is charged with the *intensive* study of sickness and of health; the social statisticians must continue their important function of studying sickness *extensively.*

The extensive method may be considered in two parts: (1) Statistical *description* of sickness, or the collection, editing and tabulation of crude data, and (2) graduation and higher *critical analysis* of tabulated data.

Historical Aspects of Sickness Statistics.

The extensive study of sickness has proceeded since 1773 in England when Francis Maseres in his "Treatise on the Doctrine of Life Annuities" (2d vol.) published his approximate sickness tables in connection with a bill for voluntary workmen's sickness and old age insurance, introduced by a Mr. Dowdeswell into the House of Commons. The sickness table and hypothesis of Price followed.* Research into sickness experience was continued in England by Oliphant (1824), Ansell (1835), Finlaison (1853 and 1854), Neison, senior (1857), Ratcliffe (three investigations, the last for the period 1866 to 1870), Neison, junior (1882 and 1900), Sutton (1896), Watson (1903) and Hardy and Wyatt (1911). These investigations were largely limited to Friendly Society experience.

In Italy, an investigation of sickness experience was published as early as 1879.†

In Germany, Karl Heym (1855) seems to have been the pioneer in statistically studying sickness. He prepared a sickness table, using the Finlaison 1846 to 1850 data as a base. Heym later published tables in 1878 and in 1884. From Heym's 1884 table

* "Observations on Reversionary Payments," VI edition, Vol. II, p. 473. London. 1803.

† "Statistica della morbosità ossia frequenza e durata delle malattie presso i soci della società di mutuo soccorso." Rome. 1879.

the memorial on old age and invalidity insurance was prepared for the Reichstag session of 1888–1889. Further tables of importance were Bleicher's (1900), for the sick benefit society of Frankfurt and Mayet's relating to the experience of the Leipzig Local Sick Benefit Society over the years 1887–1905.* The chief tables for Switzerland are those of Kinkelin (1880), based upon Heym's 1878 table, and Moser's 1884–1893 Berne Cantonal Sick Benefit Fund table.

In the United States we have available only the Billings morbidity tables of the 1880 and 1890 censuses, the records of a few fraternal societies and of some industrial establishment benefit funds, the community sickness censuses of Messrs. Frankel and Dublin; some data from casualty companies writing health business, and a few tables on acute and chronic diseases published by the Commonwealth of Massachusetts are also available.

The continuous registration of infectious or other diseases has had a rather checkered career in the United States. So far as known, the effort of the Michigan State Board of Health, beginning in 1876 under the direction of Dr. Henry Brooks Baker, was the first moderately successful attempt to make certain diseases compulsorily notifiable. There was a similar movement for sickness registration in Massachusetts in the same year under leadership of Dr. F. W. Draper. The registration of such diseases has met with modest success for many years in a number of cities like Providence, R. I., Philadelphia, Pa., Boston, Mass., Newark, N. J., and New York City. The reports of these cities have been thoroughly studied in a series of monographs by Dr. Frederick S. Crum on epidemic diseases in the United States.† Since the endorsement of the Model Bill in 1913 for the reporting of a number of communicable and other diseases, a nation-wide revival of interest in disease registration has taken place. In 1916 an "Area of Known Disease Prevalence" was proposed and in 1917 a set of standard morbidity tables was endorsed for use in presenting the data of reportable disease. This recent work of developing fairly satisfactory statistics of sickness by continuous registration has been

* An excellent account of these Mayet tables may be found in the *Spectator* (N. Y.) for July 14, 1910.

†"Statistical Studies of Measles, Whooping Cough, Diphtheria and Scarlet Fever." Reprinted by the Prudential Insurance Company of America, Newark, N. J.

under the direction, and largely at the inspiration, of the United States Public Health Service.* There have been several endeavors to utilize the data of private medical practice and of hospital experience in the United States. These are discussed historically in Mr. F. L. Hoffman's "Statistical Experience Data of the Johns Hopkins Hospital, 1892–1911," pages 7 and 8,† and in United

From these preliminary historical remarks, it will be seen that States Public Health Reports, June 15, 1917.‡

there is a sound basis of much preparatory work in the United States and elsewhere for the discussion of a comprehensive plan of sickness statistics, a plan which will have for its aim the gathering of data on the occurrence, nature, duration and social consequences of serious illness. Let us examine the main characteristics and sources of sickness data, the technical methods for developing these sources and the end-results we may reasonably hope for.

Chief Characteristics and Limitations of Sickness Statistics.

Each of the fields or subjects of research in social statistics has its limiting definitions, its bases of agreement upon what constitutes and what does not constitute the fact under discussion. In mortality statistics. we have only to classify the individuals under observation as to whether they are alive or dead; the process of classifying persons as to whether they are sick or well, however, involves the prime difficulty of defining sickness and health "for purposes of this act." The life insurance actuary is concerned only with "the quick and the dead," but the casualty statistician and actuary, in compiling his crude descriptive data, must prepare to dispose, according to definition, of the numerous states of being in between undoubted health and undoubted sickness; furthermore he must distinguish the transitory or temporary sickness or injury from the sickness which is prolonged, or which becomes permanent in its effects.

If we include injuries and the effects of injuries, and mental diseases, our term "sickness" may be defined as any objectively

* *See:* Dublin, Louis I. "The Reporting of Disease: the Next Step in Life Conservation." Assn. of Life Insurance Presidents. 1914.

† Johns Hopkins Hospital Reports—Monographs. New Series, No. IV.

‡ Also as Public Health Reprint No. 402. Gov't Printing Office, Wash., D. C.

or subjectively apparent abnormality or anomaly of structure or function of the human body or of its parts.

Perhaps the most satisfactory fundamental approach to a statistical study of sickness is to establish two practical, however arbitrary, classes of such abnormalities or anomalies of structure or function of the human body or of its parts; the first class should include those sicknesses which impair living and working efficiency, or which endanger the wellbeing of others (as, for instance, communicable diseases), and the second, those diseases and conditions which have no appreciable economic or social effect upon the life or work of the affected person. The second class we can reject at present from our statistical group of "sick" persons. This latter group of illnesses, while of interest to the practitioner of medicine, will probably continue to elude serious statistical study, and our inquiries had better be confined to the first class of totally or partially disabling sicknesses and injuries. Wherever the second group of illnesses enters into a mass of cases, it should be segregated and studied independently, if at all.

Further Classification of Serious Sickness and Injury According to Degree and Duration of Disability.

In the first category of serious sickness we place abnormalities or anomalies of bodily form or function which impair living and working efficiency; in other words, we segregate those sicknesses or injuries which interfere with the earning of the livelihood of persons gainfully employed, or with the other daily pursuits of life, such as school attendance in the case of children, or household duties for domestically occupied women. This impairment or disability may be either *partial* or *total*. Partial and total disabilities may be either *temporary* or *permanent*. (This nomenclature is, of course, common to the field of workmen's compensation statistics.)

The oldest tables of sickness we have at hand, those of Price, deal with sickness involving "incapacities of labour, produced by sickness or accidents." The incapacity was further classified as warranting benefits of "bed-lying pay" and "walking pay."* Our modern classification of sickness or injury according to extent of disability, and as to bedfast or ambulant nature, are evidently not new!

* Price, *op. cit.*, p. 474.

Let us view the sources of sickness data, and in connection with each of the sources, the technical problems of compiling the facts for the use of public health officials, social economists, insurance technicians and other students.

Sources of Data Suitable for Statistical Study of Sickness.*

The several sources of sickness data from which it is practicable to secure fairly satisfactory returns for statistical purposes are shown categorically below. Each of the sources has its peculiar excellencies and deficiencies and these must be taken into account.

Sources of Statistical Data on Sickness.

I. General population experience.
   - *a.* Continuous registration of sickness and other causes of physical disability.
     1. Communicable diseases.
     2. Other reportable diseases.
     3. Accidents.
        Industrial accidents.
        Traffic or other highway accidents.
   - *b.* Enumeration of sickness by the census method.

II. Experience of special groups in the population.
   - *a.* Hospitals and other institutions giving medical, surgical or nursing care.
     1. General hospitals.
     2. Special hospitals and sanatoria.
        Tuberculosis, cancer, mental diseases, drug addiction, factory hospitals.
     3. Dispensaries.
     4. Convalescent homes.
     5. Correctional and penal institutions.
     6. Institutions for the aged and for the infirm.
     7. Public health nursing experience.
   - *b.* Army and navy medical, surgical and sanitary service.
   - *c.* Health and accident insurance societies and companies.
   - *d.* Industrial groups under medical and insurance observation.
   - *e.* Private medical practice.

* In the succeeding text, for purposes of brevity, sickness will be taken to include injuries and effects of injuries.

Let us view in detail some of the principles and practice of descriptive sickness statistics when considered according to this classification.

I. General Population Experience.

Continuous Registration of Sickness in General Populations.

The continuous registration of a limited number of diseases had its origin in public dread of certain diseases such as Asiatic cholera, yellow fever, smallpox and malaria.* The work by Dr. Trask, cited below, gives a full historical note on the development of continuous registration of sickness and on the expansion of the list of notifiable diseases with the evolution of American public health administration.

The essentials of continuous registration of sickness recognized in modern American vital statistical practice are set forth below:

1. The combined voluntary effort and co-operation of the states in the enactment *and enforcement* of a uniform, or model, law.

2. A standard reporting blank, providing for items such as sex, age, occupation, residence, diagnosis, etc.

3. Compliance with the law by physicians, householders and others charged with the duty of reporting.

4. Tabulation and publication of the data reported to the U. S. Public Health Service for areas with fairly satisfactory registration conditions, including facilities for verifying diagnoses and reports. Tabulation practice should follow accepted standards.†

With these essentials provided for, we may expect the following data which are common also to nearly all sickness statistics:

a. Attack, or morbidity, rates of various diseases and conditions according to sex, age periods, geographic areas (even sections of cities and classes of housing accommodation), season of year and, perhaps, occupation (for industrial accidents and diseases).

b. Fatality, or lethality, rates of various diseases and conditions according to the categories enumerated in (*a*). It is assumed for purposes of computing fatality rates that there is satisfactory registration of deaths and certification of diseases causing death.

* Trask, J. W., "Vital Statistics. What they Are, and their Uses in Public Administration." Supplement No. 12 to the Public Health Reports, April 3, 1914. Government Printing Office, Washington, D. C. 1914.

† U. S. Public Health Reports, "Standard Morbidity Tables," May 25, 1917, Vol. 32, No. 21, p. 773.

Attack or *morbidity rates* are computed by relating the cases recorded to the population exposed. *Fatality* or *lethality rates* are computed by relating the deaths reported for any disease to the cases recorded. *Attack* or *morbidity rates* are usually expressed as "per 100,000 population exposed" and *fatality* or *lethality rates* as "deaths per 100 cases."

c. Morbility rates, or the number of days of sickness (or of physical disability) per year per person exposed, are not yet available from data collected through continuous registration, nor is it feasible at present to expect from these sources any facts on the *average number of days of sickness per case recorded.*

It is also not practicable to make a distinction in these statistics of notifiable diseases and conditions between attack rates based upon separate *cases* reported and attack rates based upon separate *persons* affected. The ratio of a morbidity, or attack, rate for cases to the morbidity or attack rate for persons affected is called the *morbidity coefficient.* Since, in all sickness experience, the number of cases of sickness is either equal to or greater than the number of persons affected, the value of the *morbidity coefficient* is either unity, or greater than unity.

d. From statistical data of the notifiable diseases, and, in general, from all sickness data, we may compute also another value, the *daily average number of persons (or cases) sick.* This average is related in conventional practice to each 1,000 persons exposed, i. e., the full expression for this concept is: "*daily average number of persons (or cases) sick per 1,000 exposed.*"

(*e*) *Mortality rates,* or the number of deaths from various or all diseases or conditions per unit of population exposed, are also computed in sickness statistics. These rates are most often expressed "per 1,000 exposed" for all diseases and conditions combined and "per 100,000 exposed" for specific diseases and conditions. The distinction between *mortality* rates and *fatality* or *lethality* rates must be kept in mind.

It should be remarked that the ratios or averages in (*a*), (*b*), (*c*), (*d*) and (*e*) should be made available for disease, sex and age categories.

When the statistical practice of workmen's compensation and industrial accident boards shall have been standardized, the facts for work-accidents will become available by the process of continuous and uniform registration. Traffic and highway accident sta-

tistics are being made available through publications such as the 1915 and 1916 Reports of the New York City Police Department.

We have thus briefly viewed the subject of descriptive sickness statistics arising out of continuous registration processes in general populations.

Enumeration of Sickness by the Census Method.

Statistics of mortality, unemployment and sickness have been collected more or less successfully by the ordinary method of house-to-house census inquiry. The collection of mortality statistics by this method has been definitely abandoned because of gross deficiencies in registration. The attempt to register all the deaths which occurred in any one habitation during the twelve months ending with Census Day is not likely to lead to satisfactory results. The registration of social disabilities existing on a Census Day, such as unemployment and serious, disabling sickness, may be expected, however, to yield a larger measure of success. In fact, census inquiry into unemployment leads, with respect to causes of unemployment, to a fair registration of disabling sickness.

It has been argued that an enumeration of sickness according to diseases and conditions causing disability would be so fraught with evasion and misstatement as to render the results utterly worthless. This objection to sickness enumerations is of more than half a century's standing. Answering the assertion that a sickness census according to diseases was impossible, Miss Florence Nightingale,* in urging such an enumeration upon officials in charge of the 1861 Census of England and Wales, said: "The 'diseases' can be approximated also. In all the more important—such as smallpox, fevers, measles, heart disease, etc.—all those which affect the *national* health, there will be very little error. Where there *is* error, the error is uniform . . . and corrects itself. . . ."

There is in the plea for sickness enumeration by the census method no assertion that the data so collected are in any way more than approximations of the amount and character of serious sickness—sickness "which affects the national health." Considered with due temperance as approximations, the data of a properly conducted sickness census have important uses. There are definite principles to be observed in sickness census practice, and these are stated below:

* Cook, Edward T., "Life of Florence Nightingale," Vol. I, p. 437, MacMillan, 1913.

1. Certain areas must be selected and a thorough publicity campaign on the purposes of the census should be carried on. The field must be prepared for the enumerator.

2. The facts must be recorded only for whole families who express willingness to impart the necessary information. Compulsion will probably yield no results. The figures obtained should be qualified as applying to *all* persons, in families enumerated, subject to no factor of selection save that of intelligent co-operation with the enumerator.

3. The enumerator should register for both the sick and the well such items as sex and age; for the sick he should obtain a statement of the nature of the illness (physician's statement of diagnosis, if possible) and whether the sick person is able or unable to work. It might be desirable to ascertain, also, the duration of the sickness up to the date of the inquiry and whether a physician is in attendance.

The Metropolitan Life Insurance Company has demonstrated that a carefully directed sickness census can yield results of use in studying community loss from serious sickness.*

The results of sickness inquiries by the census method may be outlined briefly as follows:

1. On the basis of suitably classified numbers of persons exposed (including both the well and the sick) and numbers of cases of serious (disabling) sickness, rates may be computed to show the prevalence of sickness per 1,000 persons enumerated on the day of inquiry. It would suffice to limit the tables to a classification of main geographic areas according to sex and age classes for all serious (totally disabling) sicknesses combined.

2. The diseases and conditions reported for disabling sickness should be classified and rates should be shown for these diseases only for the important item of sex. The several disease titles may be simply classified, also, according to age incidence and perhaps according to duration of sickness (or of disability, if that fact is ascertained).

3. If the enumeration is made in the spring, it may be safely assumed that the sickness rates developed are at a maximum for the year. Upon this rational assumption, an approximation of

* Frankel, Lee K., and Dublin, Louis I., Seven Sickness Surveys in Representative American Communities. Published as reprints by the Metropolitan Life Insurance Company, New York, 1915 to 1917.

the number of days of disability per person exposed in any sex or age class may be reached if we regard each rate to be, for that purpose, the "daily average of persons sick per 1,000 exposed." The rate is multiplied into an assumed work-year of 300 days and the result is divided by 1,000 to obtain the estimated number of days of disability for work per person exposed. The resulting figure should be qualified as a conservative estimate of *at least* that "average number of days lost per person exposed."

Since characteristics of the method of inquiry and the other limiting conditions apply with equal force to the several geographic, sex and age classes of the data, the results of a sickness census should have value for comparison of the several classes so established within the census material.

II. Experience of Special Groups in the Population.

We have briefly reviewed the two chief methods of collecting the sickness experience of a general population, first, by continuous registration throughout the year and, second, by inquiry into sickness existing on an enumeration day. There are other sources of sickness data.

Special groups of the population are continually under sickness observation. There is, for instance, the population of general and special hospitals, of convalescent homes, of correctional and penal institutions, of armies and navies in times of peace and war, of industries under medical and insurance observation, and of schools. We have also to consider the groups under the observation of companies, orders, and societies conducting a health insurance business and the groups under the care of public health nursing societies. The experience of private medical practice is also a potential source of sickness data. Each of these sections of the population has sickness experience with distinctive characteristics. We cannot consider that the data of any one group cover the whole problem of sickness, however. We may consult the experience of each group for answers to a few of the innumerable questions which arise in a thoughtful study of the various facts of the social problem of sickness.

The most accessible body of data on sickness in any special group of the population is that in the experience of

General Hospitals.

General hospital service deals with the two classes of sick cases we identified in our introductory remarks—the able and unable to work. The able to work cases, and ambulant patients unable to work, are usually treated in the outpatient or dispensary department. The ward and room service deals for the very largest part with bed-patients disabled for work. In order to render statistical data for general hospitals basically comparable, the outpatient service should be studied separately and perhaps arranged for comparison with general dispensary data.

The ultimate uses of hospital sickness experience data determine the scope and methods of tabulation practice. The several main fields of service for nosocomial data are:

1. Advancement of medical and surgical science.
2. Public health administration.
3. Hospital management.
4. Social economy and medical economics.

1. Carefully prepared statistics of sickness under hospital care have in the past pointed out numerous advances in the prevention and treatment of the several diseases and conditions. Records of experimental courses of treatment such as serum therapy for infections and special expedients in surgical conditions have each been subjected to statistical analysis. Judgments on the efficacy of such courses of treatment have been based upon sound statistical demonstration. The tabulation programme for such studies is quite simple. Diagnoses are classified by sex and by age periods; lethal, recovery and other discharge rates are computed upon the basis of cases treated and the numbers discharged. The average and classified durations of cases in similar diagnosis, sex and age classes are derived.

Where important medical and surgical conclusions are to be drawn from statistical evidence, the careful statistician should employ the special analytic agencies of his art for testing the reliability of such conclusions. Many false conclusions find a way into the literature of medicine and surgery because of inexpert, incautious statistical analysis.

Perhaps the most striking example of the service which statistics, especially higher statistical analysis, can perform in medicine and surgery is the work of Pierre LeCompte Du Noüy, who developed

a "law of cicatrization" of wounds from the statistical data of the war Hospital No. 21 at Compiègne, France.* Numerous other examples could be given of distinguished services by thoroughly trained statisticians toward the advancement of medical and surgical science, founded upon properly prepared and analyzed hospital experience data. The statistical method applied in group case-analysis leads, therefore, to sound generalizations in the study of healing processes as physico-chemical phenomena. It is perhaps appropriate to suggest here the intensive statistical analysis of surgical experience with workmen's compensation cases.

2. Public health administration requires the experience data of hospitals for purposes of gauging the effect of an improvement in hospital methods in diseases such as pneumonia, typhoid fever, peurperal sepsis and its prevention, dispensary care of tuberculosis, and surgical procedures of various kinds, upon the mortality rates for these diseases.

Hospital observation on the gravity of types of cases admitted, as in syphilis, forms the basis for concluding whether the severity of several important infectious diseases is increasing or decreasing with the years. G. B. Young, for instance, concludes from the U. S. Public Health Service Hospital data for the Marine Hospital station at Chicago, that the milder lesions of luetic infection are becoming increasingly more common in proportion among hospital admissions for syphilis.

3. The statistical data of hospitals are practically indispensable in establishing administrative programmes for these institutions, for outlining broad policies governing types of cases to be admitted, for testing the effectiveness of the several systems of nursing and of established modes of treatment in relation to hospital costs.

4. Much information is at hand also in well-kept hospital records (especially for institutions such as the Massachusetts General Hospital which maintain efficient departments of social service work) on the economic and social status of patients. It should be possible to relate hospital costs to the facts of the social diagnoses of the cases, as well as to the end-results of the strictly medical problems of the patients. Finally, only hospital data of sufficient variety and of proper quality will throw light upon the social economy of medical and surgical benefits under workmen's compensation acts,

* See *Proceedings*, Vol. III, p. 269.

as indicated by Dr. Rubinow in his "Medical Benefits under Workmen's Compensation."*

Special Hospitals and Sanatoria.

Institutions specializing in the care of single diseases or conditions, or of closely related diseases or conditions, have abundant opportunities for statistical research into the broad principles underlying the causes, the treatment and the prevention of the diseases within their purview. The hospitals for mental diseases under the State Hospital Commission in New York and the Board of Insanity in Massachusetts have made substantial contributions to our knowledge of these diseases. Statistical study of masses of cases has lead to important advances in the hospital treatment of mental diseases. Further progress may be expected to follow the plans of statistical case study at present under consideration by the American Medico-Psychological Association. The same observations as to adequately displaying the data according to diagnoses, specified in terms and titles of an approved nomenclature and classification, and under sex, age, duration of treatment and condition on discharge classes, apply to the statistics of special hospitals as to the data of general hospitals. Uniformity in the basic elements of all hospital statistical data is, of course, imperative. The tuberculosis, cancer, maternity, drug addiction and other special hospitals having bed-patient service may all contribute to our growing store of statistical facts on sickness.

Dispensaries.

Considerably more than 2,000 dispensaries in the United States administer medical, surgical and nursing service to ambulant cases of sickness. These cases involve both capacity and incapacity for work.

We have seen that bed-service of general and special hospitals will give us data only for bedfast, disabling illness. Hospital statistics therefore portray only part of the problem of sickness. There remains the larger number of serious ambulant cases. The medical observation and treatment of these cases are either carried

* Rubinow, I. M., "Medical Benefits under Workmen's Compensation," *Journal of Political Economy*, Vol. XXV, No. 6, June, and No. 7, July, 1917.

on by out-patient services of hospitals, by separate dispensaries, or by private physicians as office practice. The most promising source of data on ambulant sickness is the experience of well-ordered dispensaries and out-patient services such as the Boston Dispensary, where, in 1916, nearly 25,000 new patients were served in the out-patient department.

The collection of the facts for a representative number of these services would serve to advance our knowledge of serious ambulant sickness. The data should be displayed according to whether the sick person, if an adult, is (*a*) disabled for work or (*b*) not disabled for work. The facts for each of these categories should, of course, be qualified for diagnosis, sex and age characteristics and, perhaps, for duration of the sickness (or of disability for work) in the same uniform manner outlined for general and special hospital bed-patient service.

Social Statistics of Dispensary and Hospital Service.

In the fourth section on sickness data of general hospitals, it was suggested that facts on *all* the chief aspects of the sickness problem be collected. The statistics of sickness should not stop at the medical or surgical data; the sickness itself is often only a single element of a fourfold problem. Most cases of serious sickness require (*a*) medical, nursing or surgical attention, (*b*) convalescent or aftercare, (*c*) solution of a social problem, i. e., stresses such as acute or chronic poverty, undesirable home conditions (bad housing, delinquency, other illness in the home), industrial superannuation, or other situations exist which make for recurrence of illness or retardation of recovery, and (*d*) education of the patient, of members of the family and of the community in the prevention of further sickness.

No sickness statistics may be considered even fairly complete unless representative data on the other parts of the sickness problem are presented with the strictly medical and surgical facts. Dispensaries, hospitals and other institutions with social service or follow-up departments should ascertain the aftercare needs, the social diagnoses, and the educational or preventive aspects of their cases. Analysis of uniformly recorded observations may be "scaled" after a manner advocated by the Department of Research of the Whittier School in California.*

* Williams, J. H., "Whittier Scale for Grading Home Conditions," *Journal of Delinquency*, November, 1916, p. 273.

The aim of sickness statistics should be the accurate extensive portrayal of sickness in its four-fold aspects. Until reasonably adequate statements of the facts under each of these heads are available, we must not assume that we know anything about sickness as a social problem.

Convalescent Homes.

In the present state of our ignorance of the elementary social facts of sickness, we do not know, for one thing, the period of convalescence or aftercare for the important cases of sickness which pass out of hospitals, dispensaries and private medical practice as "relieved" or "apparently cured." The exigencies of hospital economy demand that "chronics" and convalescent patients be reassigned to some sort of institutional care characterized by low unit cost.

It is only a matter of speculation today how much the burden upon the general hospital systems of the United States could be eased, if the facts of low unit-cost aftercare were made available. The study of data for general and special hospitals should be supplemented by a collection of the important facts for convalescent care, related, of course, to the same elements of statistics prescribed for these general and special hospitals.

Correctional and Penal Institutions.

The sickness and disability experience of correctional and penal institutions should be made part of a programme of the general vital statistics of such institutions. Without a proper understanding of the vital constitution of the population confined in these institutions a number of pressing problems must remain unsolved. The sickness data are of special importance in ascertaining the possible connection between certain abnormalities or anomalies of the structure or function of the human economy and the tendency toward anti-social conduct.

Institutions for the Aged and for the Infirm.

The science of geriatrics, or the special study of the diseases of old age, is of comparatively recent origin. The growth of this specialty in medicine has brought with it a demand for the collected sickness experience data of institutions for the aged. The same statistical elements apply to facts for these institutions as to general and spe-

cial hospitals. There are also possibilities of collecting qualitative social data on superannuation, old-age dependency and family disintegration which must not be overlooked.

Institutions for those persons permanently and totally disabled on account of sickness or injury have also a rich field of inquiry. Community attitudes toward the prevention and relief of permanent infirmities are still to be founded upon a summary and interpretation of current experience. There are also social data of much importance to be developed by inquiry into the facts leading to chronic infirmities and into the facilities and costs of present and prospective means of private and institutional care of the aged and infirm.

Public Health Nursing Experience.

The sickness data of public health nursing associations must be compiled on the basis and in the light of the special conditions under which each association must operate in the community which it serves. The fields of service, the attitudes of communities, the funding arrangements, the extent of hospital facilities and the administrative traditions and present policies of each association, are some of the circumstances which must be taken into account before any interpretation is placed upon the data of these nursing associations. Public health nursing in so many cities is the point of first contact between cases of sickness among the wage-earning groups of the population and the organized medical agencies of the community. When cases rightly come within the scope of public health nursing and under domiciliary medical observation, no further reference of the cases to hospital or other institutional means of combating sickness is necessary. The public health nursing societies therefore help to ease the burden which the needs of an increasing population place upon hospital facilities. It may be possible also to demonstrate from proper data that the nursing of certain diseases, provided home conditions are satisfactory, under the care of these societies, yields greater practical returns than can be obtained through other existing means.

Public health nursing data on the pre-hospital care of illness are also of great value. In fact, the public health nurse often performs indispensable service in securing proper hospital or convalescent care for cases which would in the ordinary course of events suffer for lack of such attention. The cases which continue

under public health nursing care afford information on sickness in the home which is not to be found in any other of our sources. *When properly classified as to type of case,* and further arranged according to diagnosis and sex and age, the facts of sickness recorded by these associations are uniquely valuable.

Army and Navy Medical, Surgical and Sanitary Service.

The "First Annual Statistical Report on the Health of the British Army," issued in March, 1861, and compiled by Dr. Thomas Graham Balfour, was, so far as the information at hand would lead us to believe, the first noteworthy endeavor in modern times to present the facts of serious sickness among armies. The medico-statistical reports of the armies of other countries are today also available and constitute a body of reliable data on sickness among a considerable number of adult males engaged in military service.

The annual statistical reports of our own Army are distinguished contributions to American demology. They present, for instance, the only reliable and conveniently available facts on the efficacy of anti-typhoid inoculation and of anti-malarial measures. The experience of armies in certain medico-surgical and sanitary procedures has often proved the source of inspiration for similar enterprises in civil life. The public health movement in America owes much to the medical and sanitary experience data of the War between the States. The experience data of armies and navies should therefore be considered seriously as part of the available supply of information on sickness. In fact, the favorable conditions existing in the national military establishment for continuous observation of sickness and of methods of treatment are without an equal in civil life. The Army observes and records *all* the important vital facts of its membership. The medical statistics of armies require but little qualification before being admitted freely to the general collection of facts on sickness. A few slight changes in the age classification and a display of disability figures according to *classified days of disability* are all that would be necessary at present to make the army data comparable with the tabulations proposed for civil sickness experience. Only slight use has been made by publicists of army and navy sickness data in this country, and when so made, the limitations as well as the special excellencies of the material were ignored.

Health and Accident Insurance Companies and Societies.

There is an unfortunate tendency to regard the statistics of sickness and accident claim experience as the practical equivalent of sickness statistics in public discussions on the economics and sociology of the sickness problem. Sickness claim experience, both as to rates of sickness and average or classified periods of benefit payment, is subject to many profound "artificial" disturbing factors in addition to the "natural" conditioning elements which qualify general sickness data gathered from non-insurance sources. Some of these factors found in insurance experience were enumerated by Francis G. P. Neison* as follows:

1. Methods of administration of the sickness benefits.
2. Density of population, and other community health factors, such as sanitation, modes and special conditions of urban and rural life affecting the membership of some but not of all Friendly or other insurance societies.
3. Hazards and hygiene of occupations.
4. Nature of occupations of the insured, i. e., an injury which would incapacitate a tailor would not interfere with the day laborer's work.
5. Inclusion, exclusion, or limitation of benefits to cases of chronic illness, or exclusion of cases of illness after a certain age; limitation of benefits to certain fixed periods regardless of "chronicity."
6. Relative incidence of illnesses of very short, reasonably short or of long duration in a complete experience.
7. Effectiveness of claim supervision.
8. The rate of unemployment.
9. The average wage of the insured, and the percentage of wages paid in sick benefits.
10. Personal equation of the sick person.

"It is astonishing under what real disability of sickness from the physiologist's standpoint the laborer will continue to work if not in a Friendly Society."

11. The resources of the society.

"The amount of the accumulated fund is likewise a factor in the cost of a sickness risk, for the larger the realized capital, the greater the tendency for a relaxed supervision of claims."

*"Assurance against Invalidity," *Transactions* of the Third International Congress of Actuaries, Paris, 1900, Documents, p. 109.

Loewy* indicates in addition the influence of sex composition of the membership and whether maternity benefits are included, the influence of waiting periods at the beginning of sickness or disability before benefit is paid, of the retroactive payment of benefit for the waiting period if the illness produces incapacity of more than a specified period, of the period of maximum benefit, of the inclusion of Sundays and holidays in the calculation of the days of benefit, of compulsory and voluntary membership, of a fluctuating or persistent membership list, of character of medical service, i. e., whether the certifying physician is employed by the insured or by the insurance institution, and of many unallocated external signs of simulation, *pension hysteria, "krankengeldhunger."* Any or all of these important "variants" of sickness claim experience may be present in our American data too, in addition to the "cancellation clause," indemnity limited to specified diseases, "frills," deliberate selection by self-solicited risks, etc.

There is food for reflection in the observations of these students of European sickness insurance experience.

Not all of the "artificial" factors are of the same importance; no one of them may be ignored, however, in the use of the European data so freely and unqualifiedly introduced into discussions of the problem of sickness in the life of the American wage-earner.

There are certain principles of procedure in the compilation of insurance sickness statistics which aim to offset in a measure the chief "artificial" variants. The statistical essentials are:

1. An "exposed to risk" classified according to sex and main age periods for "full-benefit" membership. If the membership is stable, this "exposed to risk" classification is simply the arithmetic average for a calendar year of the existing monthly, quarterly or half-yearly membership rolls. If the membership or exposure fluctuates decidedly, as it did in Bleicher's *Frankfurt* and *Bockenheim* society, the number of membership-years or the $\frac{\text{membership-days}}{365}$ must be used. Bleicher was the first investigator on record to use the membership-year base for the computation of sickness rates (1896).

For a society where premiums cease with the beginning of disability for work, provision must be made for the inclusion of the

* "Grundlagen der Krankenversicherung," in *Jahrbuch für Versicherungsmathematik*, 1914, p. 276. Deutsche Versicherungs-Presse, Berlin.

exposure-days of persons receiving benefit, with the exposure-days used in computing the sickness rates.

2. The number of separate *cases* of sickness should be classified apart from the number of separate *persons* taken sick. (The ratio between the two figures for purposes of record is known as the *morbidity coefficient.*)

3. The days of sickness involving total incapacity for work should include Sundays, holidays and waiting or "karenz" days, and should extend from the *beginning to the end* of the sickness. The physicians' final diagnoses are to be reported and classified in accordance with an accepted nomenclature and classification of diseases and conditions.

4. In agreement with groupings of the "exposed to risk," suitable classifications may be made of the:

(*a*) Number of cases of disabling sickness.
(*b*) Number of persons disabled on account of sickness.
(*c*) Number of days of sickness.
(*d*) Number of days of sickness benefit.
(*e*) Number of deaths.
(*f*) Diagnoses, for number of cases of sickness, number of persons sick, number of days of sickness, number of days of sickness benefit and number of deaths.

Industrial Groups under Medical and Insurance Observation.

The work of Schereschewsky,* Dublin and Harris,† Landis and Reed‡ and Robinson and Wilson§ in the analysis of physical examination data for workers in typical American industries point to the possibilities of standardizing the methods of examination and of analyzing the data. Physical examinations, including any facts disclosed upon follow-up work, give a cross-section view of the health of workmen *able to work.* Such data can not be expected, however, to supply the facts for members of an industry incapaci-

* Schereschewsky, J. W., "Health of Garment Workers," Bulletin 71, U. S. Pub. Health Service, 1915.

† Dublin, L. I., and Harris, L. I., "Health of Food Handlers," N. Y. City Dept. of Health Monograph Series, No. 17, August, 1917.

‡ Landis, H. R. M., and Reed, J. S., "Factors Affecting Health of Garment Workers," Henry Phipps Institute, 1915.

§ Robinson, D. E., and Wilson, J. G., Bulletin 73, U. S. Pub. Health Service, 1916.

tated for work. The statistics of industrial benefit funds, as cited by Hoffman for the employees of the Bethlehem Steel Company,* period 1903–1913, provide information of rare value. The collection of the experience data of these funds *in conformity to standard methods of statistical study* would constitute a body of data of the first importance in the study of sickness among American wage-earners. The American Association of Industrial Physicians has under consideration the question of medical examination standards; the field of this inquiry might be broadened so as to include standards for the medical statistics of industry available in the experience of benefit funds.

Private Medical Practice.

At the Philadelphia meeting of the American Medical Association in 1855, a resolution was offered by Dr. J. W. Thomson, and adopted by the Association, which provided:

"That . . . this association appoint a special committee for each State and Territory . . . whose duty it shall be to report its medical topography, epidemic diseases, and the most successful treatment thereof. . . ." At the same meeting Dr. J. G. Orton of Binghamton, N. Y., introduced a supplementary resolution, which appears not to have been adopted, and this resolution was substantially as follows:

"That each county medical society or . . . any duly organized medical association be requested to amend its constitution by attaching thereunto the following article:

"It shall be the duty of each member of this society to keep a faithful record of the diseases which may fall under his observation during each month, according to the classification adopted by this convention in May, 1847, *stating the age and sex, occupation and nativity of the patient, the average duration of the disease, and finally their recovery or death,* and report the same in writing to the secretary, on or before the first day of February of each year, who shall transmit a digest thereof to the State Medical Society, and also to the appropriate committee appointed by the American Medical Association for its reception."†

In the *Transactions* of the Medical Society of the State of New York, 1859, Dr. Thomas E. Brinsmade of Troy gave a classified

* "Practical Statistics of Public Health Nursing and Community Sickness Experience." Prudential Insurance Company of America reprint.

† Trask, *op. cit.*, pp. 29–30.

summary of 8,195 cases of sickness occurring in his practice during the period 1837 to 1857.* There are, therefore, notable precedents for a study of the experience data of private medical practice. In view of the importance of information which could be gleaned from properly recorded and tabulated facts of the experience of private physicians, some effort should be made by county medical societies to collect the facts, if only for the cases under treatment on a certain day, or within a certain week.

General Technical Problems of Descriptive Sickness Statistics.

We have considered in detail the contemporary sources of sickness data. There are, however, some technical considerations which underlie all sickness experience. There is first the problem of a proper nomenclature and classification of diseases and conditions including injuries and the effects of injuries.

In the preface of the first edition (1869) of the nomenclature of diseases prepared by a Joint Committee of the Royal College of Physicians, London, we find a brief declaration of the purposes of a system of nomenclature of diseases:

"For perfecting the statistical registration of diseases, with a view to the discovery of statistical truths concerning their history, nature and phenomena, the want of a generally recognized nomenclature of diseases has been felt as an indispensable condition." This preface states further that "among the great ends of such a uniform nomenclature must be reckoned that of fixing definitely for all places the things about which medical observation is exercised, and of forming a steady basis upon which medical experience may be safely built."

We have available today a number of more or less related systems of nomenclature and classification of diseases. The one most generally recognized is the "Manual of the International List of Causes [of Sickness and] of Death: based upon the Second Decennial Revision by the International Commission, Paris, 1909." This list is in the direct line of descent of the nomenclature prepared by Drs. Farr and d'Espine, as authorized by resolution of the International Statistical Congress, Brussels, in 1853. The nomenclature employed by Bellevue and Allied Hospitals, New York City, revised in 1911 to conform to the International List,

* Hoffman, "Statistical Experience Data of the Johns Hopkins Hospital," *op. cit.*, p. 8.

is the one at present most in favor for purposes of hospital sickness statistics. The existence of other and supplementary systems of nomenclature and classification, each with its special excellencies, suggests the construction of a standard manual for American use, based upon agreement between the several systems. Attention is directed to the possibility of combining the joint excellencies of the forthcoming report of the United States Public Health Service Board of Nomenclature, the United States Public Health Service tentative nomenclature of diseases and conditions and of parasites and parasitic diseases, the United States Navy classification of injuries, the nosologic system of the International Commission for the Unification of the Medical Statistics of Armies (Berlin agreement, 1907), the International Association of Industrial Accident Boards and Commissions' classification of injuries (by location, nature, and extent of injury and degree of disability), and the International List of Causes of Sickness and Death as used by the Census Bureau, the United States Army, Massachusetts General Hospital, and by Bellevue Hospital.

The classification used by the Imperial Health Office of Germany differs in no essential respect from the Bertillon, or International, Classification* and may be included for consideration with these other systems. The American Public Health Association Committee on the Accuracy of Certified Causes of Death has issued a revised report (*U. S. Public Health Reports,* Sept. 28, 1917) which should also be seriously considered in an endeavor to devise a nomenclature suitable for the general purposes of sickness statistics.

Classification of Sickness According to Gravity or Severity.

Another essential technical aid in the compilation of sickness statistics is a system for classifying sicknesses according to gravity. In tuberculosis work, we have the scaling or "stage" system of the National Association for the Study and Prevention of Tuberculosis. This system essays to divide cases according to degree of pulmonary involvement. Mr. Downey and other members of this Society's Committee on Workmen's Compensation Statistics have been at work for some time upon the problem of establishing some

* Bertillon, Jacques, "Classification of the Causes of Death," *Transactions,* XV International Congress on Hygiene and Demography, Vol. VI, p. 53.

scale for the gravity of injuries. The entire problem of "scaling" sicknesses, injuries, and the effects of sicknesses and injuries, is still open. It affords a fertile field for continued research. There is as yet no agreement as to whether the classification, scaling or grading of sickness shall be based upon the pathology or the symptomatology of a case, or upon the economic effects, i. e., loss of working time. In the preceding discussion, sicknesses were assumed to have been fundamentally divided according to whether the affected persons were (*a*) able and (*b*) unable to work. No attempt was made to provide for partial disability for work. This consideration must be left until the entire problem of scaling sicknesses and other causes of disability has been adequately covered.

Nomenclature of Social Disabilities Necessary in Study of Sickness.

Nomenclature of the social disabilities discovered in association with serious sickness is also of basic importance. The proper study of social difficulties is conditioned by the methods and results of social diagnosis. This includes of course an approved nomenclature and a classification of social disabilities and difficulties for purposes of social statistics. Miss Mary E. Richmond* in a recent work defines the principles of social diagnosis and provides a basis for a standard nomenclature and, later, for a classification of social disabilities. The Casualty Actuarial and Statistical Society of America Committee on "Social Statistics in the 1920 Census Year" is contemplating a tentative draft of such a nomenclature and classification, designed especially as an auxiliary to the study of sickness and other causes of destitution.

In a later effort, I hope to present a treatment of Part 2 of the general subject of this paper. In that discussion the statistical analytics of sickness, including some comment upon the methods of the Swiss School, will be taken up.

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