THE INFLUENCE OF EPIDEMIOLOGY ON PRESENT DAY METHODS OF CONTROL OF COMMUNICABLE DISEASE

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Read before the Vital Statistics Section of the American Public Health Association at the Fifty-first Annual Meeting, Cleveland, October 17, 1922.

EPIDEMIOLOGY may be defined as the science or study of disease as it occurs in groups, and is thus distinguished from disease processes and their manifestations in the individual. By its derivation it can be considered to apply to any disease which affects the *demos* or crowd, and should not for our present purpose be limited to the study of only such diseases as have epidemic expression, as this term is usually applied to the acute communicable diseases. We can, therefor, properly include within the scope of epidemiological studies such conditions as cancer, silicosis, renal calculus, rheumatism, smelter chills, pernicious anemia, rickets, and even such social disorders or diseases as unemployment.

Accepting then for the purposes of the present discussion the broadest possible application of the term epidemiology, let us specify briefly wherein present day methods differ from those of earlier periods in the control of communicable disease. The main differences appear to be: (a) in the creation of specific immunity; (b) in the detection of specific immunity; (c) in the abandonment of gaseous fumigation except for the destruction of insects and vermin; (d) in shortening the periods of isolation; (e) in relying mainly upon concurrent disinfection at the bedside for the destruction of infectious discharges; (f) in detecting early, missed, and carrier cases of infection; (g) in controlling the purity and sanitary safety of water, milk and human-handled, uncooked food; (h) in destroying facultative or obligatory intermediate insect and animal hosts of pathogenic organisms; (i) in recognizing the primary responsibility of the private physician, and of the individual patient, and his family, in the control and prevention of communicable diseases, rather than relying chiefly upon the authority and administrative action of the health officer.

The above present day methods of communicable disease control have in the main been arrived at after practical testing in the field, of theories of disease control developed from laboratory experiments and clinical experiences.

The methods of the epidemiologist are those of the detective, the application of deductive logic based upon accurately observed and recorded facts as premises. His chief tools have been mortality and morbidity statistics, bacteriology and medical diagnosis. He is to the community what the internist is to the hospital, a diagnostician availing himself of all human knowledge to the end that the natural history of the disease be disclosed for the practical benefit of the patient.

The abandonment of gaseous fumigation at the termination of those infections spread commonly through discharges from the respiratory and intestinal tracts, and the substitution therefor of medical asepsis and the technic of concurrent disinfection in the sickroom, have been perhaps the most important of the many changes in procedure brought about by analysis of a long series of epidemiological studies, mainly bacteriological in character. The detection and control of early, missed and carrier cases of the communicable diseases, and the intimate correlation now maintained by good health administration between notification of suspected infection, laboratory verification and clinical diagnosis, and the

sanitary control of such features of environment, as public water and milk supplies, have, of our relatively recent procedures, been made necessary by the proofs of causes and effects presented by the epidemiologist in studying the manner of spread, the duration of incubation period, and the period of communicability of the various common communicable diseases.

The dispensaries established for the early detection of incipient tuberculosis and for the diagnosis of and earliest possible treatment of the venereal infections, and even those now established for the prenatal care of the expectant mother and for the supervision of the health of infants, can properly be credited to an intelligent understanding of cause and effect, as demonstrated by analysis of groups of patients, and causes of deaths, by epidemiological methods.

Public-health procedures should be based solely on the proof of practical success of administrative or educational measures presented by the epidemiologist. At present we are very weak in the chain of evidence upon which we base our present methods, or our attempts at control of whooping cough, scarlet fever, poliomyelitis, influenza and common colds.

The influence of the epidemiologist on public health practice is akin to the effect of sound clinical diagnosis and autopsy protocols upon slipshod medical diagnosis and gun-shot drug therapy.

Even public-health education is gradually reflecting the accuracy and logic inculcated in the health organization by the epidemiologist. The timely movement for periodic medical examination of the presumably healthy person of all ages, is but a logical step for the early recognition of the many preventable diseases, whether communicable or not, which the diagnostician of the community tells us are cured, checked or prevented only when detected before they are commonly noticed by the average individual.

Epidemiology then,—the study of disease as it occurs in groups,—includes the application of all the sources of information which may contribute to our knowledge of the cause, association and prevention of diseases, whether they are yet known to be preventable or not. Often the facts of epidemiology are the first which include an intimation even that there are preventable aspects in a particular disease.

The application of epidemiology in the study of communicable disease is that of the diagnostician of group incidence, upon whose opinion must be determined individual policy, or action within the group, and the reaction towards, or protection against, or by the group of other groups or the community as a whole.

Public health administration policies should be determined and their methods evaluated and the results analyzed constantly by epidemiological methods.

Many private and some public-health agencies have permitted disproportion in their program, error in statement, special pleas, and even public deception in their pronouncements because of the lack of an epidemiological conscience and ability in their directing personnel.

Although primarily applied to the study of so-called epidemic spread of disease, the methods of the epidemiologist are equally applicable and essential in the study of endemic and sporadic incidence of communicable diseases, and the occurrence of any sicknesses which develop as groups of cases.

The limitation in our control of communicable disease is apparently due more to the lack of thorough logical action upon our present information, than to insufficient specific proof of the cause and means of transmission of these affections. The epidemiologist must be referred to if public-health education is to be honest, consistent and effective in teaching the public to share intelligently in the control of communicable disease.

It would appear that the most impor-

tant function of a health officer is that of the epidemiologist. All other public-health functions either contribute to the knowledge of group disease or they are the means by which this knowledge is applied.

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Man's Efficiency and the Factors Which Influence It.—Two types of efficiency are spoken of in connection with the animal body. One type is the mechanical efficiency in the engineering sense—i.e., the ratio which exists between the heat equivalent of the external muscle work done and the energy output of the subject during the performance of the work in question. This problem has attracted many workers, and there seems to be a general consensus of opinion that the efficiency of man in the performance of external work is *about* 20 *per cent. gross and* 25 *per cent. net.* In the other type, industrial or productive efficiency, the capacity of the individual to perform effective work is dealt with, judged, for example, by his output in unit time. So far as the worker is concerned, the whole object in industrial efficiency is undoubtedly to get the greatest output with the minimum of effort. The determination of mechanical efficiency is fairly readily carried out, but it is very difficult to get an accurate gauge of industrial efficiency. At bottom they are closely related, and both are physiological problems.

There are *at least four factors* which play predominant roles in the attainment of maximum efficiency—viz., *the rate* of the performance of work, the amount *of rest offered* or taken by the subject, *the rhythm* with which the work is performed, and the *work habits* developed by the worker.—E. P. Cathcart, *The Lancet* (London), No. 5167, Vol. CCIII, Sept. 9, 1922, pp. 547-548.