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NEED AND USE OF STATISTICS IN MEDICAL EDUCATION AND RESEARCH

by

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1. Background

As in every branch of medicine and public health, improvement in vital and health statistics will depend in the last resort on the training and ability of the personnel who in one way or another are engaged in the collection of data and their subsequent processing. Moreover, as in other fields, progress does not depend solely on the fact that the health services are staffed by very competent specialists. The entire system would fail if the essential elements in the production of the original information, namely, the medical profession, have not received adequate preparation.

Everyone knows that up to recent years medical education was directed almost entirely to preparing the physician to diagnose and treat diseases, and for that purpose use was made of clinical cases considered exclusively or almost exclusively as individuals. Little or nothing was done to inculcate in the student the importance of quantitative methods in the exercise of his profession.

In recent years, however, increasing recognition has been given to the association of the techniques of measurement with medical practice in all its facets, and it is thanks to the efforts of interested persons and institutions that the preventive and social aspects of medicine are now an integral part of medical education.

In this connexion, it may be said that, with respect to the Americas and to postgraduate education, this movement of renovation has been considerably quickened in the past decade. The seminars on the teaching of preventive medicine held in 1955 and 1956 under the auspices of the Pan American Sanitary Bureau, the national conferences held in the countries of the Region, and the Technical Reports of WHO Expert Committees have been important factors in this movement. They have definitely affirmed the conviction that medical schools are responsible for preparing general practitioners suited to the social and medical needs of the population they are to serve. In other words, it has been recognized that the medical schools must fulfill the traditional mission of training physicians capable not only of diagnosing and treating diseases, but also of performing such other functions as society demands. That objective cannot be met unless the medical school provides the physician with the aptitudes and attitudes that endow him with a spirit of scientific research, that enable him to become fully cognizant of the natural history of health and disease, and help him to understand human beings not only as individuals but as part of their social group; in sum, the medical schools must help the student to envisage man concretely in relation to his complex physical, biological, and social environment.

The problem posed has been fully dealt with in the literature. I cannot therefore hope to put forward new ideas, but I shall try to point out some of the advantages of teaching statistics to the medical student at the undergraduate level.

2. The statistical approach

If medical schools are to fulfill the above-mentioned objectives, the education given must have an epidemiological orientation, that is to say, must be based on the study of the intrinsic nature and mutual relations of the various factors influencing the maintenance of or changes in health and sickness in the population i.e., in groups of individuals rather than in single individuals. Needless to say, such epidemiological orientation makes the statistical approach essential in the medical curriculum, since statistics are one of the basic tools of epidemiology.

The important contributions of the statistical method to the progress of medical science are well known. Mention might be made of the following:

- a) The statistical approach gives the physician the necessary scientific basis for making a critical analysis of the data, procedures, and observations he encounters in his own work and in medical literature. It also gives him the balanced outlook that prevents him from making judgements or reaching conclusions that are not justified from a scientific standpoint.
- b) The statistical approach is essential in helping private practitioners to understand the reasons for adopting the procedures used in solving the major health problems of a country and also to make use of those procedures should he become a health officer.
- c) The intellectual curiosity and investigative spirit which every physician should possess require him to have at least an elementary knowledge of the statistical methods. Medical education should try to erase the rather wide-spread impression that scientific research can be conducted only in well-equipped laboratories with highly specialized staff. A properly oriented medical training program should imbue the student with the conviction that there are ample opportunities for research in every kind of activity, and that, no matter how modest that research may be, it will still be of importance to the progress of medicine and of public health.
- d) And, finally, since the statistical method is one of the main tools of epidemiology, it is essential for a physician to have a knowledge of it to help him understand the relative values of each of the multiple factors that condition the state of health and sickness in both the individual and the community.

3. Role of Departments of Preventive Medicine

It is generally agreed that medical schools should have one organized unit (usually known as the Department of Preventive Medicine) responsible for ensuring that the epidemiological orientation is part of the curriculum. It is also generally agreed that ideally this orientation should be part of each and every department of the medical school, the Department of Preventive Medicine being responsible for seeing to it that there is neither duplication or lacunae in the teaching of the subject. To be realistic, it will be many years before that goal is reached, so that the Department of Preventive Medicine should assume direct responsibility for teaching the subject in all its aspects, among them the statistical approach.

4. Teaching the statistical approach at medical schools

Recent literature, especially the report on the South American Conference on the Teaching of Medical Statistics,^{1/} has carried exhaustive reviews of this subject, to which little or nothing remains to be added. The comments which follow are therefore intended only to raise certain points which may stimulate discussion.

It is also generally accepted that it is not the purpose of the teaching of the statistical approach at medical schools to produce specialists in this field. It is also agreed that such teaching should not be weighed down, as it frequently is, by purely mathematical considerations, since that is probably the reason for so much resistance to the subject on the part of students and even of teachers.

For example, the memorizing of mathematical formulae, excessive use of logarithms and similar procedures, only create boredom and frustration, and give the subject the reputation of being uninteresting and complicated, on the one hand, and, on the other, of being of no practical value to the medical profession. It is often recommended that this subject should be taught by physicians or other professionals closely connected with biological and social problems, rather than by "purely mathematical statisticians".

Rather than as an end in itself, the statistical approach should be viewed as a tool for creating habits of self-learning in the student, for developing his critical attitude, for instilling intellectual curiosity, and for making him capable of applying the scientific method, and of making him realize his responsibility in collecting and recording statistical data.

As to content, the experts advise that this subject could be taught under the following three headings: (a) basic notions of statistical methods and principles; (b) application of those methods and principles to medical and biological problems; and (c) elements of vital and health statistics.

^{1/} Bol. Of. San. Pan. 38: pp. 109-117, 1959.

The experts have also indicated that students should come into contact with the subject as early in their studies as possible. It has therefore been suggested that items (a) and (b) should be taught in the preclinical period, since the student will need to have a certain amount of basic statistical knowledge in order to understand such subjects as anatomy, physiology, and biochemistry. Moreover, early training in this subject will enable the student to use statistics during the clinical period of his studies. Of course, it is not always possible to do this at present for a number of reasons which need not be gone into here; but all medical schools should make every possible effort to adjust their study plans and to obtain the resources needed to arrive at this ideal situation.

As to vital and health statistics, the trend is to teach these subjects during the clinical period, which is justified by the fact that the student is by then in a better position to understand the importance of the registration of births and deaths, notification of diseases, the data that are entered in case histories, the administrative information used in hospitals and other health services; and also to understand the vital role played by the physician as a source of information.

Finally, the modern idea that preventive and social medicine is not simply a subject to be taught in a single course or courses, but rather a true component of all medical education, should apply equally to statistics. The teaching of statistics undoubtedly requires a certain amount of time to be devoted to the presentation of the general principles of the statistical method. But ideally the application of those principles should take place at the time the student is taught the various subjects that make up the curriculum. For example, the basic notions of variability and "normal limits", the techniques of experiment design and of tabular and graphic presentation, the evaluation of results through significance tests, and so forth, will be better retained by the students if they are taught jointly with the basic sciences, i.e., anatomy, physiology, biochemistry, and pharmacology. On the other hand, the techniques of population sampling and surveys, the computation and significance of rates and other indicators, the statistical study of resources and services, and so forth, should be integrated into the various clinical branches at the time the student is taught the basic notions of the organization of medical services, social security, occupational medicine, and so on.