
EPIDEMIOLOGY AND THE SANITARIAN
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This is the day of the machine and gimmick. Mechanization is commonplace and automation is just around the corner. The x-ray and the blood test appear to have replaced the stethoscope and the senses of taste and smell in the field of clinical diagnosis. The electron microscope, the ultra centrifuge and the minus 70 refrigerator are becoming bare essentials for bacteriologic investigation. The ultra expensive complicated area sample and mechanical tabulating equipment are almost a must for any respectable epidemiologic research. In such a day it is difficult to remember the tremendous contributions to our understanding of the natural history of disease made by those who practiced nothing more than careful and detailed observation of the distribution of cases of diseases in the community and subsequently applied relatively simple methods of analyses with the hope of discovering some of the factors in the environment capable of having a significant influence on the disease.

Their equipment consisted of pad, pencil, shoe leather and perserverance. That public health has been able to make a real impact on disease is testimony to their success. It is sometimes well to remember that as early as 1883, Hirsch wrote a definition of epidemiology essentially acceptable today. "Epidemiology", he wrote, "is the science which gives a picture of the occurrence, distribution and types of disease in different epochs of time and different points on the earth's surface and will render an account of the relation of these diseases to the external conditions surrounding the individuals and determining his manner of life."

Epidemiology can well be defined as a science concerned with the factors that influence the occurrence and distribution of disease in aggregations of individuals. It is basically a science of observation, of course, but it is something more than that — for as Frost has pointed out, it allows for the "orderly arrangement of the observed facts into chains of inference which extend beyond the bounds of direct observation."

As with other sciences, it is not the science itself which is of primary concern to us — the real importance being application of the scientific method and the results of its explorations to the betterment of the state of man. Epidemiology is especially suited for application in three distinct areas — firstly, the epidemiologic method has been applied to the study of the cause of disease. The method has been so successfully applied to the field of infectious diseases that its contribution to the non-infectious disease field frequently goes unheralded. While epidemiology has made tremendous contributions to the understanding of such diseases as cholera, typhoid, yellow fever, malaria, equine encephalitis, poliomyelitis, and many others, it also provided important links in the chain of inferences leading to the cause of such important non-infectious diseases as pellagra, iodine-deficiency goiter, and blindness of the premature infant (retrolental fibroplasia). Its continued application to the non-infectious field is already giving promise of providing basic information toward the eventual understanding of certain types of cancer, hypertension, coronary artery disease, accidental injury, emotional disturbances, and congenital defects.

The second important area of the application of epidemiology is in the field of disease control. If through a study of the distribution of disease in the population and its relation to environment certain important factors can be recognized which materially

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influence the occurrence of the disease, it may follow that these factors may be specifically altered or interrupted to the point where they become harmless and the disease prevented or materially reduced in incidence. It is generally true that the extent to which our disease control efforts are based on a sound understanding of the epidemiology of the disease, we have an opportunity to establish economical and efficient control programs and conversely the extent to which we are ignorant of the natural course of disease we will be wasteful and essentially ineffective. Schneider has drawn an interesting analogy. Likening the problems of disease control to those of the military, he points out that, "Epidemiology has to do with the strategic aspect, defining when and where the action may be most effective rather than with the tactical aspect relating to specific details of how the action is to be performed. Epidemiology maps out the strategy for action."

These first two areas of application depend to some extent upon the epidemiologic method but more specifically upon the utilization of the body of epidemiologic knowledge. The third area depends upon the method itself, for epidemiology as a science has an important practical usage in the public health field. No matter how well we have studied the disease or how wisely we have constructed our control barriers, more or less frequent breakthroughs still occur. To my knowledge there is no way of discovering the nature of the break in the barrier except the direct application of the methods of epidemiology to the epidemic. Observation of the distribution of the cases and subsequent analysis of the data will lead to the nature and identification of the break thus allowing for its repair.

Leavell and Clark have nicely summarized the objectives of epidemiology in public health as follows:

1. To study factors influencing departure from the state of health and to elucidate the roles of disease agents, the human hosts, and environmental factors in the natural history of disease.

2. To describe and interpret disease occurrence and distribution according to pertinent variables.

3. To provide the analytic phase for public health action.

4. To study immediate and special problems in the field of health.

5. To measure the effectiveness of preventive and control programs instituted as a result of earlier epidemiologic strategy.

The science of epidemiology, as any other science, may acquire frills and fancy dress and become exceedingly complex. It is well to remember, however, that the entire edifice of epidemiology is built upon the rather simple fact that disease is not randomly distributed in the population. All diseases are profoundly influenced by characteristics of the population and the social and physical environment of the community. Its occurrence, is therefore, directed by the age, sex, and race of the population, by the geographic location of the community, by the time of year and the prevailing combination of climatic conditions, and by a host of other environmental circumstances — few of which we understand, many of which we are still completely or partially ignorant. A careful recording of the time of onset of the disease, the age, sex, and race of the patient, his area of residence, certain selected information concerning the general environmental circumstances under which he lives, and his occupation provide the basic data for the epidemiologic method whether its application be research, disease control or epidemic investigation. In the past, these observations have been made successfully by members of a great number of formal disciplines. The general biologist, the zoologist, the meteorologist, the bacteriologist, the engineer, the sanitarian, the veterinarian, the nurse, the physician and others working individually or in teams have all made important contributions to epidemiologic observation. When one adds to the observations themselves the need for analysis in terms of possibly important environmental influences a moment's thought will make it obvious that there are few disciplines indeed which could not if called make meaningful contributions to epidemiology.

I have taken the time to dwell for a few minutes on epidemiology as a science because too often I am tempted to jump directly into its practical application in the field of public health without attempting to establish it as an important basic science. The sanitarian is indispensable to most types of epidemiologic investigations because of his special knowledge of the physical environment and its possible relationship to disease. He may appropriately be referred to as an environmental specialist. In the general day-to-day application of the science to disease control, the sanitarian supplies the skills upon which depends the implementation of the epidemiologic information. In this sense the sanitarian supplies the who, what, and how, while epidemiology supplies the why, when, and where of disease control.

The engineer and sanitarian may well be proud of their ability to supply the necessary skill to alter or interrupt the source or mode of transmission of disease which epidemiology has told them may have an important influence on the occurrence of the disease. The field of sanitation is required to be imaginative and resourceful in the exploration of new methods of
disease control, while at the same time remaining meticulous in the application of better understood methods to allow the body of knowledge supplied by the science of epidemiology to make a real impact upon the incidence and prevalence of disease.

In recent years it has become increasingly apparent that because the application of the sanitary methods requires the changing of human behavior, the sanitary must acquire a basic understanding of the motivation of human behavior and the skill to deal with it. In direct proportion to the complexity of the problem, this skill we are learning is the most difficult and time-consuming to master. I might say, parenthetically, at this point that it is my earnest belief that well trained sanitarians to a greater extent than any other group in public health have accepted this fact and are working at mastering these skills.

It is a human trait to enjoy the comfortable. Once we have mastered a method or technique or a way of doing things, it is not easy for any of us to relinquish or to delegate them to someone else while we voluntarily go through the painful experience of learning new skills or of applying what we know to entirely unfamiliar territory. While it is painful it is at the same time a basic ingredient of job satisfaction, for there is nothing more satisfying than a new area conquered.

The challenges presented to the field of environmental health by epidemiology in the past have been formidable. The knowledge that mosquitoes were essential to the spread of malaria, that water can be an important vehicle of transmission of typhoid fever, that milk is capable of transmitting a number of bacteriologic diseases, that the dispensing of food can be as dangerous as it is healthful, or that the basic ingredients of food -- meat and vegetables -- can be important sources or modes of transmission of disease, all presented tremendous challenges to the skill of the sanitary. That the diseases presenting the challenges are largely under control is a tremendous tribute to the resourcefulness and enthusiasm of the sanitary. The other side of the coin presents not so pleasant a picture, however. While we have brought many diseases under respectable control, there are many of tremendous importance about which we know virtually nothing that is presently useful in their control. Of the first ten leading causes of death in the United States in 1956, we are in virtual ignorance of the epidemiology of nine of them. As I mentioned earlier, however, epidemiologists are rigorously attacking many of these diseases, and it is quite reasonable to expect that new epidemiologic information will put new demands upon the sanitary for his skill in applying this information to disease control. Information concerning the association of certain cancers with certain elements in the environment such as the well publicized association of cancer of the lung with smoking suggests that cancer of other sites may well bear a relationship to other environmental factors, some of which may be controlled by the skills of the sanitary and the sanitary engineer. Epidemiologic studies of accidental injury in the home, on the farm, on the playground, in industry and on the highway are producing information which may soon be interpretable in terms of disease control strategy. Studies on certain types of chronic lung disease in England strongly point to an association with certain pollutants in the air. Even more serious in this regard is the fact that some of the pollutants which we know are put into the air in our general environment are capable of causing cancer under experimental circumstances. Air as a vehicle of transmission of infectious agents has been studied for years, and the many attempts to cleanse from it infectious agents have not been very effective. If the association of serious lung disease, or cancer, or other serious disease with materials in the air is confirmed, new attempts must be made to apply the skills of sanitation to the prevention of these diseases through the control of air pollution. The general effect of poor housing and other environmental circumstances conducive to the spread of infectious disease is well known. The influence of these environmental circumstances on the development of serious emotional disturbances is just now being explored. In addition it is becoming clear that as the population ages and individuals live long enough to suffer from chronically debilitating diseases and disabilities, changes in housing accommodations must be made if these individuals are to live at home and remain at least partially productive and happy during their later years.

The point I am trying to make is that we are not and will never be happy with a situation in which we know virtually nothing about how to control the leading causes of death and disability, and those working at the science of epidemiology will not let us stay ignorant. While the specific approaches to the control of these diseases are unknown at the moment, a familiarity with the history of disease control suggests that new challenges will be placed upon the skills of the environmental specialist -- the sanitary engineer, and sanitary -- as new information concerning the cause and course of these diseases becomes available.

Practically speaking, this means that the sanitary must continue to maintain the control programs with which he is now effectively controlling certain diseases with his left hand, while he stands ready to accept with his right hand new areas in which to apply
his skill. This also implies that every attempt should be made to make the present programs as efficient as possible so that the sanitarian will have time to be concerned with new areas of disease control. If the newer information suddenly becomes available, it will also mean the need for increased numbers of well-trained sanitarians. This leads me to the first thought which I want to leave with you. It concerns the training of sanitarians. I realize that in order to accomplish the job of applying the skills of sanitation to disease control it is not absolutely necessary that the why of the strategy be understood. It is reasonable to assume, however, that the more one is familiar with the full purpose of his work and the methods whereby it has been shown to be useful, the more intelligently he can apply his particular skill to the task. From my own personal experience I think also that some degree of efficiency can be expected to result if the sanitarian is familiar with the epidemiology of the disease he is controlling, as he will tend to inquire into the specific value of certain of the things he is doing and perhaps will be able to eliminate the less useful. If the facts which I have presented thus far are true, and if the train of thought is a reasonable one, it would naturally follow that a knowledge of epidemiology is as essential to the training of sanitarians as are the methods of inspection and the knowledge of human motivation. If the sanitarian is going to be as important in the future control of the many non-infectious diseases as I believe he will, the need for a basic understanding of epidemiology on the part of the sanitarian is vital to the proper growth and development of the field of public health.

One of the important applications of epidemiology to public health is the epidemiologic method itself in the investigation of epidemics of disease. It is perhaps paradoxical that as diseases come partially under control they may appear to occur in epidemic fashion because this facet of their behavior had been previously obscured. The need to apply the epidemiologic method to the diseases which we now have under control in order to promptly locate what has gone wrong in our control program will be an increasing need in the future. The final thought I want to leave with you is that unless we begin to make more active use of the sanitarian in epidemiologic investigations, we will not be able to properly meet this need and we may be rightfully accused of being wasteful of talent. This next is said in the spirit of constructive criticism and with a sympathetic understanding of why it is true, but it must be said that the degree to which disease is investigated in the vast majority of our health jurisdictions and the caliber and productiveness of these investigations is not very good. I well understand that the sanitarian frequently desires to be of help in initiating this type of public health activity but is not asked to do so or occasionally told not to do so. It is my feeling that the sanitarian must accept the responsibility of demonstrating his unique usefulness in this regard and take every opportunity to practice the science of disease investigation. An example of what I am trying to get at is the problem of foodborne disease. Inspections of food service operations and the education of food service operators are certainly important in controlling these diseases. The sanitarian has worked out certain indicators such as the temperature of washing water or of the steam table or the bacterial counts of certain implements which he can use to gauge the efficiency of the operation. I should like to suggest that while these are useful surely there can be no better indication of a break in food service operation than the occurrence of human disease as the result of the consumption of the food. The investigation of cases or possible outbreaks of such diseases cannot only lead to the discovery of what went wrong but can be used effectively as educational material for the operators. I realize that these statements are easier to make than they are to implement. I am not suggesting that all cases of gastroenteritis or diarrhea or nausea and vomiting be investigated as being possible cases of foodborne disease and I well know that the sanitarian cannot by himself work out the necessary program with the medical society or hospitals that would lead to the proper reporting of suspicious circumstances deserving investigation. I am suggesting that as the one member of the public health team well acquainted with food service operations and perhaps more than anyone else knowledgeable of the possible results of poor operations, the sanitarian may supply the inspiration for the development of sound programs of the control of foodborne disease which would include the proper reporting of cases and their prompt investigation by the health department.

In summary, I have attempted to share with you briefly a few of my thoughts concerning the importance of the science of epidemiology to the proper practice of sanitation and the immense importance of the sanitarian to the efficient and productive application of epidemiology to the control of disease. I envision the need for the sanitarian to maintain his presently operating programs while at the same time accepting new areas of challenge to which he must apply his skills. I have suggested that toward the ends, both of increasing the efficiency of present programs, and being ready to accept new areas of operation, epidemiology can profitably be more extensively included in the training of sanitarians. I have also
suggested that the sanitarian can engage in epidemiologic investigations and can serve as a stimulus to other members of the public health team for the investigation of diseases known to be transmitted by environmental factors. It should be obvious that it is my belief that neither epidemiology or sanitation can fully serve the public without the helping hand of the other.

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**Special Service Article**

**SOME PUBLIC HEALTH ASPECTS OF FOOD AND BEVERAGE VENDING**

Editor's Note: This is the third and concluding article on Food and Beverage Vending. The two preceding articles appeared in the November and December 1958, issues of the Journal.

**NEED FOR PLANNED PROGRAM**

In the two previous articles it was shown that food and beverage vending is not only an important and expanding merchandising method, but it also presents certain health problems calling for recognition and study by public health agencies.

As technology and other changes take place, regulatory groups find it necessary to adjust their total environmental health program to include them. The inspection of food and beverage vending machines presents certain situations peculiar to that industry. Unlike the public food service establishment, which is open during normal business hours and can be inspected routinely without prior arrangements, vending machines can be inspected only in the presence of the operator, or his authorized employee. Of necessity, machines must be kept locked, consequently arrangements must be made before hand so an authorized person will be present to unlock them to allow inspections to be made. At the outset, this may appear to be an undesirable situation since most inspection programs are normally conducted on the basis of the announced visit. This, however, is not a disadvantage when supervision is looked upon as an educational process. In the early development of a vending machine sanitation program, it will be found that the sincere, conscientious operator is anxious to have the meaning of ordinance requirements explained and to have the sanitarian point out to him how best to apply the principles of sanitation in his servicing and maintenance operations. Initially, the inspection program should be educational in nature both for the operator and the sanitarian. In a relatively new field such as this, cooperative effort between all interested parties is essential for the development of a sound program.

Sanitarians will know the principles of sanitary food and beverage handling, while the operator can point out the functional parts of machines and explain what is done in normal servicing operations. This should lead to a good working relationship. In addition, the sanitarian will learn quite readily which operator is conscientious in his job and which is likely to be indifferent or careless. In the latter case, more careful surveillance and supervision will be required to enforce ordinance requirements.

**PERSONNEL REQUIREMENTS AND PROGRAM PLANNING**

It is the experience of most health departments that as new industries evolve or as innovations occur in the processing, production or sale of food, program plans must be adjusted accordingly. Few if any departments have sufficient funds to employ additional personnel each time a new activity develops. However, no efficient department can afford to ignore new developments and some realignment to accommodate them must be made. This calls for re-evaluation of current activities. For example, if the food and drink establishment program is operating effectively, one or two men may be reassigned temporarily to work closely with a new industry, such as vending. Such personnel may spend full time for a limited period in order to make a complete survey of the new industry and to learn as much as possible about problems, needs and requirements. Personnel thus assigned may then work with and train other staff sanitarians until they too are sufficiently oriented to the new activity to the point where routine supervision can be assumed. In cities and large county units, sanitarians are frequently assigned specific districts, in which case vending machines operating therein may be given routine inspection on a continuing basis.

It is readily recognized that there is no set rule nor an exact formula for situations such as this. Local