The Administrative Value of Statistics To a Local Health Officer

By BERWYN F. MATTISON, M.D., M.P.H.

In medical school teaching, at least, biostatistics is usually associated with the school's department of public health and preventive medicine. One might almost say that statistics is "blamed on" the public health physician. And yet, with a few outstanding exceptions, little really useful information has been available to show health officers the quantitative relationships between morbidity, mortality, population characteristics, and public health services.

Kinds of material available include: crude birth and death rates; specific mortality rates for a few communicable diseases; reported case rates for a few diseases; and from some State offices of vital statistics, annual figures on population characteristics (usually from the most recent Federal census)—age, race, sex, and occasionally marital status—on rather broad geographic area breaks.

Also, most public health administrators have provided themselves with total health service figures for: public health nursing visits; type of care supplied—tuberculosis, infant, antepartum, bedside care, or general health supervision; and similar figures for sanitation personnel activities in terms of total inspections by type of establishment.

Unfortunately, the cross relationship of health services to population served, or associations of differing population patterns with differing specific mortality or case rates were usually missing. Nor were the sanitation inspection figures usually related to the total need in terms of the number of institutions of the various types inspected and results attained in securing abatement of violations for any particular inspection unit.

Perhaps I am unduly skeptical, but I have found that local health officers initiate very few new health programs. Health programs are usually either inherited—witness those in tuberculosis, child health, venereal diseases, communicable diseases, sanitation, and public health nursing—or are thrust upon the health officer by some higher authority. Civil defense, cerebral palsy, and municipal water fluoridation are typical programs.

This does not mean that original contributions in administrative public health cannot or should not be made from the field. It does imply, however, that most of the original contributions made by local health departments are in terms of changing service programs through a continuing evaluation of their effectiveness. In a local area, this results in shifting emphasis from one part of a public health program to another, rather than in a summary abolition of old programs or initiation of new ones. Hence, the vital necessity for consciousness of quanti-

Dr. Mattison has been commissioner of health for the Erie County (N. Y.) Health Department since its organization in 1948. The county department provides health services for the cities within the county, including Buffalo, as well as the townships. *This paper was presented at the Second Conference on Public Health Statistics, School of Public Health of the University of Michigan, Ann Arbor, June 20.*

tative factors in both program control and evaluation.

Local Area Statistics

There are several ways in which vital statistics and health indexes can be used to improve program control. For instance, mortality figures can be brought down to a local area, even in a large city. In Buffalo, N. Y., the only figures originally available were the State mortality rates for the entire city. The health administrator needs more information than that. He can use rate groupings by census tract or by ward units to point up the problems of control, since they vary as much within the city as they vary from county to county, or from State to State.

Mortality data by local area and similar information about reported morbidity and current population patterns—age, sex, race, economic status, crowding, family size, marital status—serve as a firm basis for shifting sanitation and nursing personnel where they are most needed. The map of Buffalo shows the relationship of the child population, as determined by birth rates for census tracts, to the frequency and distribution of well-child clinics. Only by combinations of such information can our limited facilities and services be utilized to their maximum advantage.

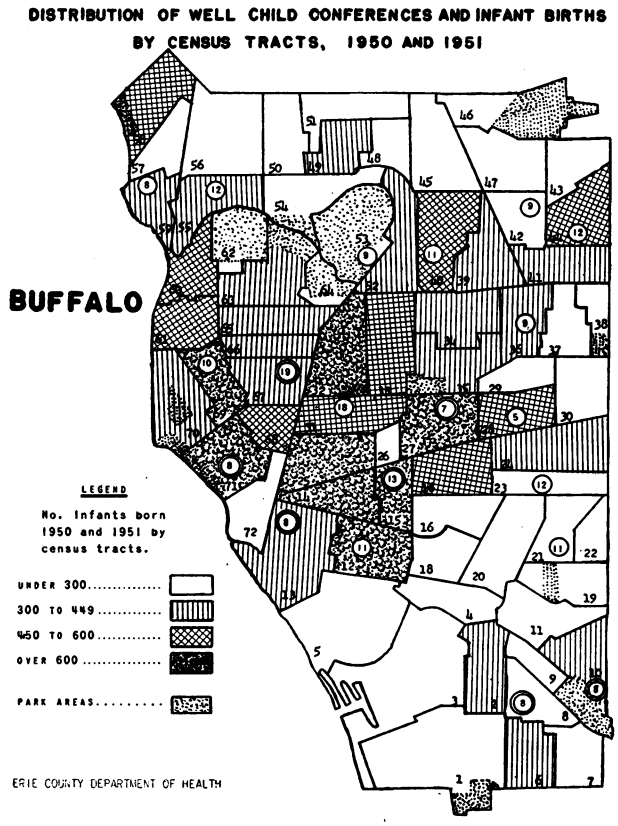
Nor is it sufficient to have only the geographic distribution of morbidity and mortality facts. They must also be put in their proper relationship to chronology. These patterns vary too and certainly must be anticipated by the health officer in allocating vacations and other shifts of personnel service within each calendar year.

Program Planning

Sometimes a little advance planning, together with a consciousness of the requirements of certain basic data in the analysis of any health problem, converts the routine procedure into a most valuable fact-finding operation.

Smallpox Epidemic

A few years ago, a small but sharp outbreak of smallpox occurred in New York City. Both within the city and in its suburban areas, a large number of vaccinations and revaccinations were performed in order to block the further spread of the disease. In one community nearby, the health department performed approximately 30,000 immunizations. This meant somewhat frenzied activity on the part of the small department for a few days. However, plans were made for the return of approximately 10,000 vaccinated persons for reading and interpretation of their vaccination reactions. Also, schedules were prepared for completion at the time of their return. The schedules provided information on age, sex (race was omitted as unimportant), date of last vaccination, if any, and other relevant facts. Thus, after the smoke had cleared away, the results of revaccinations on more than 8,000 individuals, when tabulated, provided informa-



A desirable use of local statistical data is illustrated in the above map prepared by the Erie County (N. Y.) Health Department. Similarly, a handbook of maps for Buffalo and Erie County (by census tracts, by wards, or by townships) shows mortality data by cause of death and other statistical data as well.

tion about the duration of immunity, at least insofar as it could be measured by the vaccination reaction, that was unknown before.

Poliomyelitis Season

Another use of existing records as well as special study records may be mentioned in connection with the policy of banning immunizations during the poliomyelitis season in New York State last year.

From a field study, it was found that children over 6 months who had received immunizing injections in a period preceding a poliomyelitis outbreak had definitely higher attack rates of the disease than children not so injected. On this basis, it was recommended that no immunizations be given to children of that age during the summer months.

Little attention was paid to the fact that the absolute number of cases of poliomyelitis occurring during the second half of the first year of life was extremely small.

In Erie County, N. Y., we were concerned about the possible effect of this policy on our diphtheria control program. So we inquired further: first, so far as poliomyelitis was concerned, how many children could have been affected by this change in immunizing procedure if the new policy had been in effect during the preceding two epidemics in this area; second, how much loss of actual immunizations against diphtheria was associated with the new policy.

By checking poliomyelitis reports for the two preceding epidemics, we found that only 11 out of 500 cases (or about 2 percent) had occurred during the first year of life. Thus, if as many as 50 percent of the cases in that age group contracted poliomyelitis because of the former policy of immunizing through the summer months, then not more than 1 in 100 cases could have been affected by eliminating the immunizations.

Diphtheria Immunizations

Following the poliomyelitis season in 1951, we kept close check on attendance at our immunization clinics and well-child conferences during the remainder of the fall and early winter. A review of these records for a district of more than 110,000 people indicated that not only was there no compensatory increase in attendance at either type of clinic following the season, but that the total figures lagged noticeably behind those of the preceding year. Actually, instead of the 413 diphtheria immunizations given at the clinics in 1950 between July 1 and October 14, only 81 were given during the same period in 1951. According to our 1951 policy, all were children under 6 months. A total of 332 children past that age failed to receive protection during 1951 who might have been so protected if the 1950 immunization rate had prevailed in 1951. When we considered the failure of the compensatory increase during the fall months, there was found to be an over-all decline of 58 percent in total immunizations given in our clinics for that district during the interval from July 1 to November 30, 1951, as compared to the same period in 1950.

Because of these considerations, we have liberalized our current policy for completing immunizations of infants under 1 year of age. Season will be disregarded—at least in the absence of a definite epidemic of poliomyelitis.

Program Control and Evaluation

Apart from vital statistics and health indexes, another group of records which form the basis of quantitative program control and evaluation is the health service records in a local department of health.

Nursing Records

For many years, we have used the State public health nursing service records. These are based on daily and weekly service records and are hand-tabulated by each nurse every month. This was time-consuming. Two years ago, we changed over to a "mark-sense" card for reporting each nurse's daily activities. No hand tabulations of these cards are necessary; they are turned in at the end of each month for machine-sorting. The greater flexibility of this system is obvious. It eliminates the clerical time formerly required of each nurse. It also makes possible rapid and accurate monthly analyses of activities in each subdistrict, and periodically, for supervisory purposes, a detailed analysis of each nurse's case load. Best of all, it makes possible the occasional spot-checking of

different activities not ordinarily recorded in detail.

In each of these special analyses we obtained more data about our nursing services and about the individuals served. Some of the special sorts made during the past year include an individual case count and a count of individual families receiving nursing service; accident information in homes visited; details of arthritis case visits; and nursing and physical therapy services given to cerebral hemorrhage patients.

It should be noted that all public health nursing service records, as well as all sanitary inspectors' service records, are kept according to census tracts so that services can be related to population and environment.

Sanitation Records

Until the past year, sanitary inspection records were chiefly listings of visits without any particular relation to the total size of the problem. Our figures now, however, show the number of places by type (hotel, boarding house, etc.), as well as the number inspected each month. Provisions are made for measuring, to some extent, the effectiveness of each service. To do this, we changed from weekly service records, which were hand-tabulated at the end of each month, to a daily time sheet indicating type of establishment, type of activity, and the time involved, together with a mechanical punch card prepared in the biostatistics office to which material is transferred directly from the daily time records after coding by that office. Here again, a great deal of clerical time is saved, and a much closer relationship can be established between type of service given and the total problem in each area.

Value of Records

Another example of the value of complete and usable service figures can be mentioned. In one district, shortly after the establishment of our relatively new county-city health department, the "undue amount of time spent in conference" was locally criticized. It was true that members of the public health nursing service, formerly without adequate supervision, required intensive in-service training at first. This meant many conferences and some additional travel time in bringing the staff to the central office for training. However, analysis of the records showed that the increased conference time paralleled an increased utilization of field service time, which was indicated by the number of nurse visits per 100 hours of duty. This point was immediately accepted, and criticism ceased.

One of the unmet needs of administrative program control and evaluation is the further development of ways for relating the efficiency of services to changes in health indexes. In spite of all of our vital statistics and service record figures, little has actually been done to relate the two.

Program Indexes

One outstanding exception, in New York State, is the venereal disease control program. It has developed program indexes which are most useful. We have the number of cases of early syphilis reported each year and the proportion known to be under treatment. We have the number of new cases of early syphilis interviewed for contacts and the number of contacts named. We know the number of previously unreported cases of syphilis discovered among the contacts named. We also know the proportion of reported cases under treatment that have been observed for at least a 12-month period after treatment. Many of these indexes give fairly simple checks on the effectiveness of field procedures in use from day to day.

Unfortunately, indexes for other programs are not so well developed as in venereal disease control. In tuberculosis control, we know the number and classification of reported cases and the mortality rate by age, race, and area of residence. But there are many relevant factors and associations which are not usually available.

Tuberculin surveys to determine infection rates in different age groups are sporadic rather than routine in most communities. In Erie County, N. Y., we spot check elementary and high schools to determine the rapidity with which children in those age groups are becoming infected, but we have little information about the pattern of infection either in the preschool group or in the age groups beyond

high school. We assume that factors like crowding and other housing conditions are intimately associated with the spread of and mortality from tuberculosis. And yet, with the exception of mortality and case-report rates by census tract, little of this relationship can be clearly quantitated.

An attempt is under way in Buffalo to get basic nutrition data by surveying selected school-population groups for early stigmata of nutritional deficiencies. That information, when it is complete, may possibly be related to the factors of crowding, annual income, family size, and tuberculinization to give us a better idea of the mechanics of tuberculosis spread.

Of course, it is now possible, with the final information available from the 1950 Federal census, to show the relationship between some of those social factors and the occurrence of various chronic diseases. Much more needs to be done. For instance, in Erie County we are attempting to describe quantitatively the fate of minimal cases of tuberculosis picked up asymptomatically by survey methods and to compare them with the fate of minimals picked up in our clinics after they have sought care because of symptoms. Basic physiological differences such as this in the host-parasite relationship cannot be lost sight of in making administrative decisions as to the effectiveness of special programs.

Health Patterns

The shifting age pattern of poliomyelitis epidemics is well established. The relationship of that change in age pattern to sanitation, housing, crowding, and similar social factors is less well understood. Similarly, we are only beginning to be conscious of the real significance of delaying infection from poliomyelitis and other communicable diseases until they affect groups having higher mortality and more crippling defects. It is easy to shut our eyes to the fact that our efforts in sanitation, let us say, may be actually neutralizing our efforts in communicable disease control, if we think in terms of resultant mortality and crippling. Yet these associations can be quantitated too.

During the past 15 years, there has been a marked drop in the maternal mortality rate in New York State. Recent analyses show that two plunges in a downward trend occurred in 1936 and 1946. The first has been attributed quite properly to the introduction of sulfa drugs and to a sharp decrease in the component deaths from puerperal infection. The second interruption has been attributed by some to the more widespread use of antibiotics and blood or blood substitutes. But let us go beyond the patients to the population.

Since World War II there has been a sustained increase in the birth rate; a lower age at first marriage; a lower age at first childbirth; and a disproportionate increase in the average number of children born to better educated and higher economic groups. All of these factors would tend to decrease the maternal mortality rate as they would bring more and more births into experience groups which we know to be associated with more favorable rates. Without detracting from the importance of the antibiotics and the greater availability of blood transfusions, I submit that we must always consider the denominator as well as the numerator of our changing health indexes.

Program Promotion

Another administrative use of statistics by the local health officer beyond planning, control, and evaluation is program selling or promotion. To the local health administrator, it is useless to know what programs are desirable for his community or how effective they can be unless he can persuade the community of the need for such programs and get financial support.

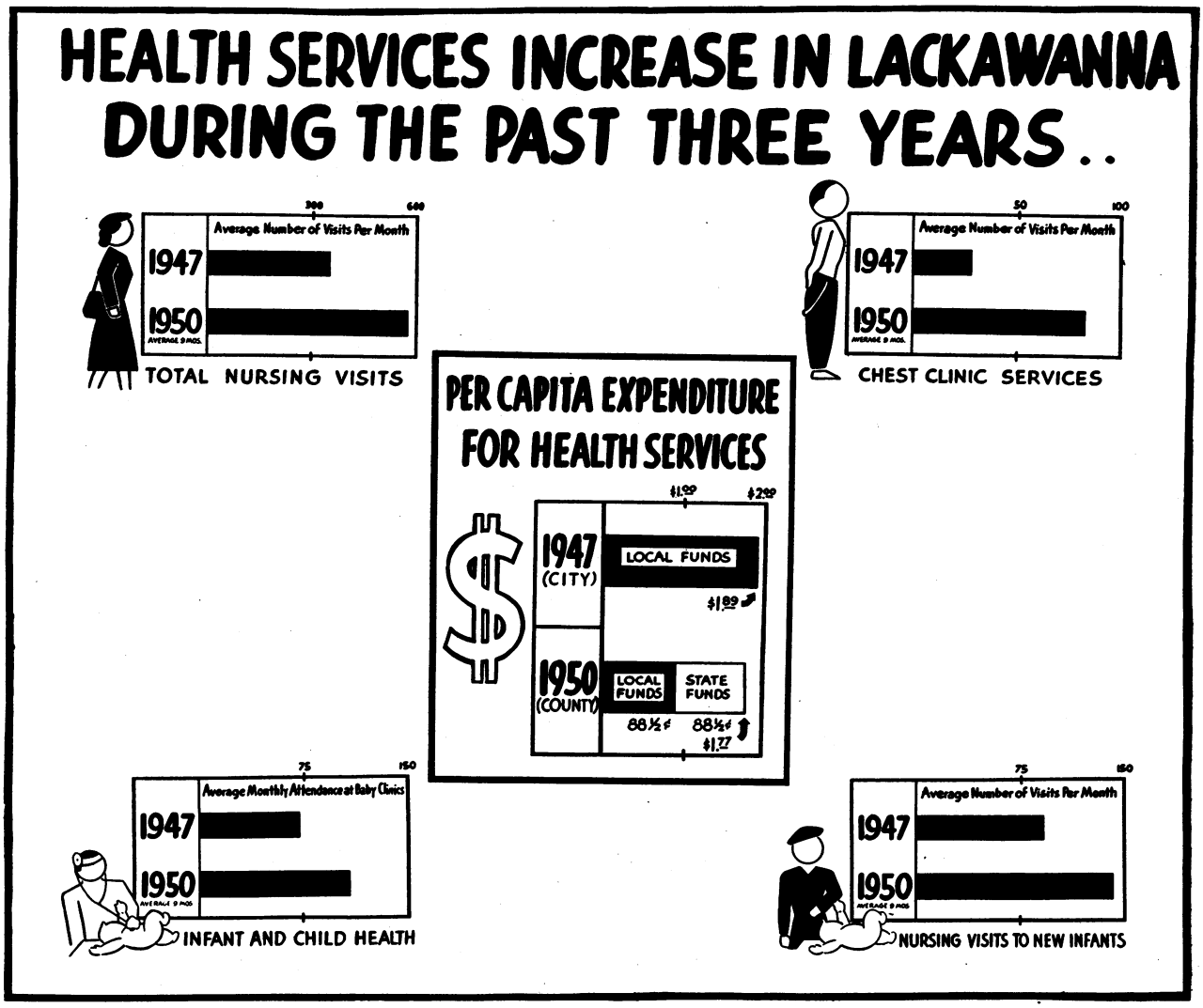
Statistics can play an important role in this phase of our responsibility. First, refer to the chart which illustrates the services available to one district (Lackawanna) within Erie County before and after the institution of the county-city unit there. By simple bar diagrams, the comparison of services and costs was brought home so forcefully that this one chart alone played a definite role in quieting criticism and obtaining acceptance of the new organization in that particular area.

Meeting Criticism

Another example of program selling is the approach to answering criticism of our crippled children's program. The State medical rehabil-

itation program system for approval of qualified specialists giving services to crippled children was thought to be unduly restrictive. A few physicians in the community were doing most of the work for county and State programs, it was said. An analysis of our records demonstrated that the criticism was without foundation. The services provided by 46 physicians cost from $237 to $915 a case, according to type of service. Findings of the children's court showed that less than 10 percent of the parents were able to pay part or all of the costs of special surgery.

The value of surveys should also be mentioned. A recent survey of approximately 1,100 Erie County physicians by the Western New York Committee for Education on Alcoholism revealed that a great preponderance of the responding Erie County physicians believe the educational program of the committee, during the past 3 years of operation, brought more chronic alcoholics under medical care. The survey also indicated a real recognition on the part of the practicing physicians of the need for further education on alcoholism. Eighty-eight percent of the respondents said the need is important, and gave the committee a convincing argument for local community



Display of the above chart picturing comparative costs for selected health services in Lackawanna, N. Y., contributed successfully to the acceptance of a new city-county health department in Erie County, N. Y.

chest support. This kind of argument is obviously more telling when backed up by the quantitative opinion expressed in a survey than when it is merely the subjective opinion of a few individuals.

Appraising Exhibits

The health exhibits appraisal made by our office of health education at the county fair has been most useful to us. Devised as a method for improving exhibit materials at the fair, the appraisal consisted of a time study, a professional evaluation, and a visitor preference poll. The microblood diabetes detection booth was by far the most popular service program with individuals going through the fair's health building. Here again, as in the alcoholism survey, quantitative information covering hundreds of visitors polled was more impressive when brought to the attention of sponsoring agencies than any number of theoretical considerations. Again, the continued financial support of the diabetes detection program may be related to the survey.

Use of Statistical Services

Statistical services at the local level can be provided by a trained biostatistician or by an office of biostatistics utilizing all grades of statistical training, beginning with the untrained junior clerks, but under the supervision of a trained biostatistician; and by other personnel with graduate training in public health who should have had some foundation in statistical techniques. Recruitment of personnel for statistical work at the local level is necessarily difficult unless the local health department is situated near and working closely with a university offering some courses in statistics. In-service training, at least in mathematical statistics, is usually difficult and probably not feasible. However, many of the functions of collecting basic statistical data—the registration of births and deaths and reporting of morbidity—can be handled by statistical clerks, who benefit greatly by such in-service training.

State-Local Relationship

What statistical services should be supplied by the State department of health? Whether the local department is large or small, there are standards of uniformity which can be supplied only from the State level. Reporting of disease and death and birth registration should be standardized by the State health department. Frequently, this is not simple. Querying of death records may occur at four levels—the local registration district, the local health department, the State health department, and the Federal agencies. Only by agreement on forms, coding, and procedures can this information be standardized.

Few local health departments have either the statistical machinery or the funds to purchase mechanical statistical services. Yet most of them have, either on an annual or accumulative basis, masses of vital statistics, of service records, and of other quantitative information from which much more could be learned through machine analysis if available through the State agency.

The statistical division of the State department of health should provide consultation services on special problems in the local health district. These problems might be in the setting up of record forms (where statistical advice should always be sought), on the planning of field studies or surveys, and wherever possible, on the localization of morbidity and mortality figures on census tract or other small unit bases.

Related to this, most local departments must depend upon the State office of vital statistics for intercensal population estimates, without which localization of service record figures and other vital statistics can mean little.

The State biostatistician can help in still another area by assuring some degree of uniformity to the state-wide vital statistics reports. This would seem to be self-evident, but too often from year to year the tabulations available are not directly comparable with preceding tabulations, either because of different table arrangements, different population breaks, or different age groups.

The Local Biostatistician

In most instances, the State health department is the only training ground available for local health department biostatisticians. This does not mean that experience with the State unit necessarily qualifies the beginning biostat-

istician for local health work. There should definitely be a two-way interchange between local and State health units for the beginning biostatistician to see the problems as well as the advantages to be met at both levels. Some functions are best performed at the local level. Death certificiate querying is a point in illustration. The local health administrator knows his physicians personally and knows the hospital record room personnel. Because he is familiar with local medical teaching practices, he is much better equipped to obtain the basic death data than someone miles away who is less familiar with the local situation.

Similarly, most work with local service records can be done only in terms of the local administrator's knowledge of what goes into the records. However, in training as well as in the other areas of cooperation between local and State departments, effectiveness of any joint activity will depend on the degree of understanding and acceptance of each department by the other.

Finally, there are at least four basic ways in which the well-trained biostatistician can help the local health administrator. First, he can improve the quality of basic vital statistics and service data available locally by guiding in-service training and hospital staff indoctrination on birth, death, morbidity, and service reporting. Second, he can extend the scope of morbidity occurrence data by guiding local morbidity surveys of nonreportable disease and health conditions. Third, he can encourage the most effective use of statistics and quantitative thinking in the local department of health by constant participation in staff conferences, through consultations with other staff members, and by promoting the use of optimum methods of collecting and handling available data. Fourth, he can strive toward the development of service-yield indexes by working with the field staff in providing ways of relating service figures to appropriate yields in improved social factors related to those local service activities.

The problem of communications is important if each member of the health team, including the biostatistician, is to contribute his utmost wherever possible. To make such contributions possible, the opportunity for communication must be provided.

It is the health administrator's responsibility to bring together, systematically and frequently, the program directors, the field supervising group, and such staff specialists as the biostatistician, the health educator, and the personnel director. This we do in Erie County through monthly division and bureau conferences—seven in all. There is no excuse on either side to plead ignorance of the mutual opportunities for working together. Demonstration of needs—and help in meeting needs from both directions and over a lengthening period of time—point up the value of staff conferences.

Conclusion

The local health officer finds it most important to relate vital statistics and health services, not merely to geographic areas, but according to the characteristics of the people living in those geographic areas.

Statistical services can serve as program aids—in planning, control, evaluation, and promotion.

Because statistics are intrinsically quantitative, it is easy to overlook the quality or validity of base data. A continuing effort should be made in the local health department to broaden the scope and improve the accuracy of these base data.

More work must be done to demonstrate measurable relationships between disease and social factors. These relationships are part of the anatomy and physiology of a community, which, with its prevalent pathogenic parasites, may determine the community's pattern of health and disease.