THE SCIENCE OF PUBLIC HEALTH

ACTUAL AND POTENTIAL ACCOMPLISHMENTS

THOMAS PARRAN, JR., UNITED STATES PUBLIC HEALTH SERVICE, SPRINGFIELD

The title of this paper may be somewhat misleading, in that public health in itself is not a science in the sense that physics, chemistry and zoology are sciences. It has been defined as a science and as an art, but a clearer conception seems to me to be that public health in the abstract is a relative state of being, and that as a profession it exists not as a distinct science, but levies tribute from all the sciences, gathering to itself knowledge from many sources and applying this knowledge for the conservation of our vital assets. If public health were considered merely as a branch of medicine it would be difficult to measure its accomplishments. Every branch of science has contributed its share towards improvement of the common weal, but who can measure exactly the contribution of each? Considering public health, however, as a field of activity created by a levy upon the best knowledge of all the sciences, an appraisal of its accomplishments becomes more simple, and credit for them spreads over the whole field of science. It is in this spirit that I approach the subject.

ACCOMPLISHMENTS DURING THE PRESENT CENTURY

For the sake of simplicity I will limit my discussion of public health accomplishments to the present century, since it is here that the most rapid strides have been made in human conservation and since statistical records, even now by no means complete, are more comparable since 1900. The last quarter of the 19th century saw the foundations laid upon which modern public health has been builded, but in its practical application, until recent years, it has been more of a promise than a fulfillment. Even now there is a gross disparity between the science and the practice of public health. There is too great a lag between the acquisition of scientific facts concerning the prevention of disease and their practical application by and for the mass of the people.

Between 1900 and 1923 the average span of human life in the United States has increased from 49 to nearly 57 years—eight years added to the life span.

Deaths of infants under one year of age per 1,000 live births have decreased from 160 in 1900 to 71 in 1923.

Typhoid fever has decreased from 31.3 to 6.8.

The death rate from tuberculosis has been more than halved during the same period.

Without going into detailed figures for all of the preventable diseases which are shown in Table I, suffice it to say that if the death rate which existed in this country at the beginning of the century now prevailed, five hundred thousand additional deaths would occur each year. Although the improved mortality experience has been most marked in the younger years of life, it has not taken place at the expense of the older age-groups. Between 1910 and 1920, for instance, the life expectancy improved in every decade of life.

TABLE NO. I.

Mortality rates in Illinois for the year 1923 from certain specific causes in Chicago; and in the rest of the State.

	Chicago	"Down-State"
*General Death Rate (per 1,000)	11.7	12.3
Typhoid Fever	1.2	6.6
Scarlet Fever	2.9	3.6
Measles	7.2	9.1
Whooping Cough	4.8	9.6
Diphtheria	12.7	11.1
Tuberculosis—Lungs	70.5	74.0
Influenza and Pneumonia—all forms	145.5	147.5
Dysentery, Diarrhea and Enteritis	32.1	46.6

(*All other rates per 100,000 population)

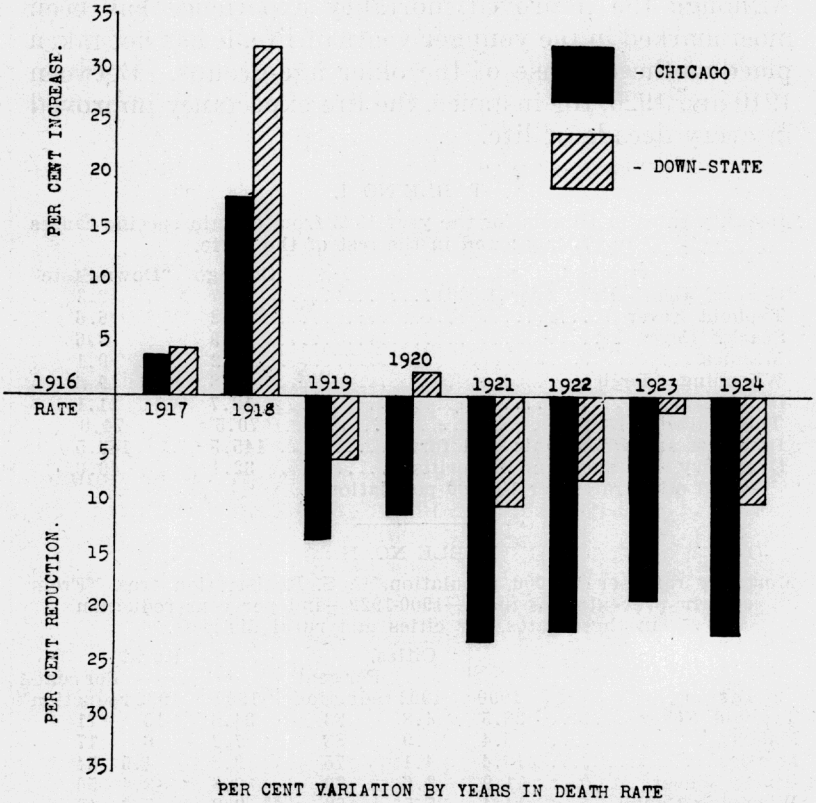
TABLE NO. II.

Mortality rate per 100,000 population, U. S. Registration area. From certain preventable causes—1900-1922—and per cent reduction in these rates, for cities and rural districts.

	Cities.			Rural.		
Disease.	1900	1922	Per cent reduction	1900	1922	Per cent reduction
Typhoid Fever	28.5	4.8	83	34.6	10	71
Malaria	5.4	.9	83	7.2	6	17
Measles	16.4	4.1	75	9.8	4.5	54
Scarlet Fever	11.9	3.6	70	6.8	3.4	50
Whooping Cough	14.4	5.5	62	9.8	5.6	43
Diphtheria	52.4	15.6	70	26.5	14	48
Influenza	24.2	23.6	3.	29.6	38.3	
Tuberculosis (pul.)	204.1	83	59	138	85	38
Diarrhea and Enteritis (under 2 years)	116	35.1	70	56.2	30	47

HEALTH PROGRESS HAS NOT BEEN UNIFORM

In analyzing mortality during recent years, it is interesting to note the difference which exists between different areas and particularly between the urban and rural areas of the country. For several years Chicago has had a more favorable mortality experience than the rest of the state. Nor is this a unique experience. The large cities of the country generally have overcome their natural handicaps, and their death rates compare favorably with their rural neighbors. Since 1917, rural areas in New York state have shown a higher death rate from all causes than have the cities of the state. Illinois is



PER CENT VARIATION BY YEARS IN DEATH RATE FROM ALL CAUSES FOR CHICAGO, AND FOR DOWN-STATE.

(1916 Death Rates Taken as Base Line).

rapidly approaching this condition. In 1922 the death rate in the U. S. Registration area from all endemic, epidemic and infectious diseases was higher in the rural than in the urban areas (rural—186.3, urban 180.4 per 100,000 population).

Of more interest even than this present relative status of city and rural health is the trend of death rates in these two groups during this century. Without exception the rate of decline has been more rapid in the cities, so that at present the rural death rate from tuberculosis, typhoid fever, diphtheria and a number of other preventable causes is higher in the rural districts than in the cities. (See Table No. 2.) Although the decline in the death rate from most preventable causes is gratifying, this is not the case with some of the items on the list. In particular, cancer and diseases of the heart are exceptions to the general trend, and the death rates from the pneumonias and from accidents are still too high. Infectious diseases still cause 35.1% of all deaths.

MORBIDITY DATA

Records of sickness are not available in sufficient extent and completeness to be used alone in determining the state of health of a community. Therefore, little account can be taken of many disabling and yet not killing diseases. With lowered death rates it is known that sickness likewise has decreased, but to what extent is not known. Estimates as to the prevalence of common colds, of certain other minor contagions, of malaria, and of hookworm disease must of necessity be inexact since they can be determined only by special surveys among limited groups. It is stated as a rough approximation that every death represents 100 cases of sickness, and it has been estimated that the average person suffers disability from sickness approximately 8 days per year.

EVALUATION OF HEALTH ACTIVITIES

Morbidity data, then, are not complete, and although mortality data furnish a reliable index of health conditions in large populations, especially when considered over long periods of time, they do not suffice to furnish

a current measure of the health status of smaller groups of population. This fact has been recognized by health authorities, and recently an effort has been made to evaluate community health by comparing health activities. All activities directed towards disease prevention and health promotion may be divided into certain constituent items of service, and an arbitrary value placed upon each item. In assessing a value to the several items of health service the general guides must be:

(a) The relative economic importance of the disease or group of diseases.

(b) The relative preventability of the disease or group of diseases.

(c) The conjectural value of those services not directed specifically against particular diseases.

(d) The psychological response of the people to the service.

By such a method of evaluation the relative efficiency and the relative adequacy of a community's health service may be determined. It follows logically that standards of health service can be set and that health departments may be classified and grouped in a manner similar to the present grouping of medical and other schools. The details of working out such a classification are difficult, and health authorities now are not in full agreement as to the feasibility of such a plan, but it is believed that the day is not far distant when the term "standard health department" or "grade A health department" will be in common usage.

By such a method a community can measure the efficiency and adequacy of its health service and compare it with the health service of similar communities. Such a comparison in itself should serve as a stimulus in providing better health organization, and will enable the public to measure the returns from its health expenditures.

POTENTIAL ACCOMPLISHMENTS

Thus far actual accomplishments in the field of public health have been considered. It has been noted that great variations exist between the present health status

of the different states and cities, and between rural and urban districts. What can be expected from this all-embracing science of public health and the art of its application during the next half century, for instance? To prophesy what the future holds in new discoveries in the field of public health would soon lead one into the realms of fantasy, and at best would be pure guesswork. That additions to scientific knowledge of disease prevention will be made, we know, but the nature and extent of these additions,—whether they be in chemotherapy, in immunology, in nutrition or in some other field, we do not know.

Suppose then we disregard fascinating speculations as to new discoveries which may wipe out some of our modern plagues, and confine our estimates to an appraisal of the potentialities which public health holds if present scientific knowledge is thoroughly applied throughout the country. What potential results are attainable now? In order to err on the side of concervatism, I shall take as the goal which should and can be reached figures in excess of the present minimum death rates (adjusted) of individual states,—rates which are entirely possible of attainment as a national average. The objection may be offered that differences in racial, climatic or other conditions exist which vitiate this basis of estimation. To such objection the fact is submitted that the individual state has a population group more or less cosmopolitan; and granted that climatic influences exist which predispose to certain diseases, this same factor is apt to influence favorably some other group of diseases. Further, it will be conceded that no state has reached the maximum of efficiency in its health service throughout the state, but that it falls short of potential accomplishments by a large margin.

Applying this basis of estimation, the general conclusions reached are that the average life span can be increased from the present 57 years to the Biblical measure of three score and ten; that our present infant mortality rate can be cut in half; that the same may be done with tuberculosis; that typhoid fever and dysentery may be practically eliminated; that diphtheria and scarlet fever can be reduced 75%; that the pneumonia death rate can be materially reduced, leaving

it chiefly as "a friend of the aged"; that malaria and hookworm disease can be banished; and that the economic welfare of the people may thereby be promoted, as can be done by no other means.

The fact that such a large proportion of disease can be prevented in the United States by the application of well known principles should in itself be a spur to further and more effective public health effort. This fact is all the more impressive and the need all the more imperative when we consider that this reduction will take place chiefly among the younger and most productive age groups. Another point which deserves emphasis is that this reduction in preventable sickness and postponable death can be brought about by an expenditure of funds well within the financial ability of every community. Businesslike and scientific expenditures for public health will yield a greater return on the investment than any other expenditure of public funds. Space prevents me from elaborating fully the proof of this assertion.

Without dwelling further upon the general possibilities in the saving of human life through applied public health efforts, let us pass to a more detailed consideration of the methods by which the objectives may be attained.

METHODS NEEDED IN PUBLIC HEALTH WORK

In order that the great mass of the people may receive more fully the benefits to be derived from the practical application of preventive medicine, several basic principles must be borne in mind. These may be summarized as: (a) coordination of effort; (b) application of business principles to health service; and (c) a critical evaluation of current practices with a keen sense of relative values.

In the field of public health the time has arrived when the greatest need is not for differentiation and specialization, but for integration, synthesis and unification. This coordination of effort needs to involve all the sciences represented here today. Very few of you are pursuing science in the abstract; your constant endeavor is to seek new facts in science so as to apply these facts for human betterment. No one phase of science can proceed

far in itself, disregarding all others. Each is closely interwoven with the others and can flourish best, not at the expense of related lines of endeavor, but as a part of an orderly scientific progress.

The predominant need is for a better coordination of the theory and practice of medicine as applied to individual and to community health problems. Hardly less needed is a similar coordination of other branches of science with public health, to which they are inevitably related.

Finally, coordination of effort is needed even within the field of public health itself. The whole problem of health and disease needs to be studied as one problem and not as a series of unrelated subjects.

BETTER HEALTH SERVICE NEEDED

From a practical standpoint this means a unified program of public health under single and competent leadership. It pre-supposes a full-time health officer who studies the health problems of his community, determines upon the most logical program, having a due regard for the relative values of different problems and the procedures, and unites the efforts of all agencies towards their solution. It presupposes adequate health organization, national, state, city and county, supported by an intelligent public opinion.

What should comprise the duties of an adequate health department?

HEALTH EDUCATION

First and most important is health education. Education of the mass of the people must precede any advance by society, and the accomplishments of public health have been due to public enlightenment as to the essential facts of disease prevention and community health promotion.

The field of health education furnishes an example of the coordination of effort between the sciences which I have mentioned. The educational authorities can do much and should bear the primary responsibility for health education during the school age by incorporating in the curricula of the schools adequate courses, suited

to the age of the child, dealing with the various phases of personal and community hygiene. The physical well-being of the child is so directly correlated with his mental growth as to be a very vital concern of school authorities.

CONTROL OF COMMUNICABLE DISEASES

It was for the control of epidemics that health agencies were first created, and although the policy of a health department should be constructive rather than defensive, although it should deal with the positive phases of health promotion as well as with disease prevention, still the prevention of contagion is a fundamental activity of any health department. Efforts at disease control embrace not only quarantine of known cases, but scientific epidemiological investigation of all cases to search out the source of infection as a basis for its elimination. Adequate laboratory service, too, is indispensable to effective health service, and for such diseases as smallpox, typhoid fever, diphtheria and scarlet fever, active immunization of the susceptible population furnishes an added method of attack.

Tuberculosis causes about eight per cent of all deaths, and a constructive program of control should be carried out. The methods which are proving effective are too well known to be recounted here. Almost all health activities influence tuberculosis prevalence, just as efforts directed against this disease benefit general health. A campaign against venereal diseases, participated in by all agencies interested in social welfare, should occupy a part of every health program.

CHILD HYGIENE

Efforts to improve child health are productive of most gratifying results. More can be accomplished in this field when it is considered as an integral part of a general health program than by any other activity. Education of expectant mothers concerning prenatal and infant hygiene, instruction in infant care, the examination of school children for physical, dental, nutritional, and mental defects,—all are necessary health activities.

SANITATION

The provision of safe water and milk supplies and of sanitary methods of sewage and excreta disposal constitute a primary duty of any health department. Recent outbreaks of intestinal disease in Illinois due to water pollution show how incompletely this fundamental sanitary need is met in some communities. In all except the largest cities of the state little or no supervision of milk supplies is maintained.

HEALTH PROMOTION

Nor is the saving of human life the only aim and function of public health. It seeks not only to prevent disease but to promote health. It has a positive as well as a negative mission. Efforts to enhance physical and mental efficiency are assuming an increasing importance in present health practices. Witness the interest in the correction of childhood defects, in improved nutrition, in increasing physical fitness by rational living,—all are ends in themselves by enabling people to live in the fuller enjoyment of life, as well as an additional means to the end of preventing disease by increased resistance.

MENTAL HYGIENE

Mental hygiene is all too slowly finding a place in public health procedures as psychologists, eugenists and biologists make clear the scientific facts upon which it is based. Quality as well as quantity of populations must be given increasing consideration. There are some overenthusiastic specialists who would have us desist from our usual public health endeavors because, they allege, these efforts serve to protect the unfit. Such a view is not in accord with the facts as known at present. Resistance to disease bears no correlation with mental unfitness. The preventable diseases take their toll among all. The mentally strong and the mentally weak suffer alike. Then, too, there is that vast group in the twilight zone in which either heredity or environment may be the dominant factor in determining whether the individual will be an asset or a liability to society. Who can evalu-

ate the factors in every case? Until science can furnish more clearly the basis for such an evaluation, efforts to mitigate unfavorable environmental factors should not be lessened.

I am not minimizing the importance of the known facts of heredity, or of the hygiene of the mind. They furnish a challenge to the whole scientific world, whose imperious duty it is to bring these facts persistently to the mass of the people to the end that society will take at least the first and most necessary steps in protecting itself from the menace of the unfit. Mental hygiene becomes an increasingly important phase of public health, which is added to but which does not lessen the necessity for physical hygiene. Thus it is seen that education, medicine—in its research and in its application—bacteriology, chemistry, engineering, biology,—all have a very definite relation, and need to have a very definite correlation with public health.

LOCAL HEALTH ADMINISTRATION IN ILLINOIS

Having outlined the scope of the activity of a modern health department, let us review briefly how fully these minimum standards of health practice are met in Illinois:

There are in the state 2717 separate health jurisdictions, each with a board of health. In this total of 2717 health jurisdictions there are only 430 in which the health officer is a physician, and of these physicians only eight are full-time health officers. The remainder are part time, poorly paid practitioners who must look to their practice for their major income. More than 2250 health officers are untrained laymen who occupy the position usually by virtue of their position as village clerk or township supervisor. Manifestly health progress under such a system is impossible. The township and village are too small a unit for health government. For effective rural health work the county has proven the logical unit. The laws of the state, however, do not permit counties under township government to organize a health department. The first need in Illinois, then, is enabling legislation which will permit counties to appoint a health officer and to provide him with sufficient assistance to

carry out an effective country-wide health program such as I have outlined. Efforts are now being made by the State Department of Public Health to secure such legislation.

The next need is the active participation of all individuals and organizations, and particularly the leaders in scientific thought represented here today, in educating the mass of the people of the state as to the value and economy of an adequate and efficient health service in which all agencies, working for whatever phase of public welfare, are united in a common purpose.

CONCLUSIONS

In concluding these remarks, I know of no better way of emphasizing the community of interests which exists between all the sciences, and especially the dependence of public health for its sustenance upon so many branches of science, than to quote the words of that master scientist and teacher, Sir William Osler:

"The salvation of science lies in a recognition of a new philosophy—the scientia scientiarum of which Plato speaks: 'Now when all these studies reach the point of intercommunion and connection with one another and come to be considered in their mutual affinities, then, I think, and not till then, will the pursuit of them have a value.'"