1955 National Health Forum

AIR POLLUTION, mental health, chronic diseases, radiation, home accidents, and personnel shortages emerged at the 1955 National Health Forum, New York, March 23–25, as targets for the immediate future.

From the opening address by Ellsworth Bunker, president, American National Red Cross, to the 35th annual meeting of the National Health Council, the audience faced a series of challenges to the public health profession. Focusing on one of the challenges, Dr. Daniel Bergsma, State health commissioner for New Jersey, noted that although his State has been alert to the need for developing public protection against radiation, the swift pace of nuclear events finds current programs behind impending needs.

Mr. Bunker pointed out that, as the focus of health and welfare programs has shifted from relief of the sick and underprivileged to the improvement of the community as a whole, the need has grown to pool resources in comprehensive programs. He urged that volunteers support recruitment and training of health personnel; that they support education for improvement of mental health; that they cooperate in reducing the burden of handicapped or delinquent children; that they share in the immediate establishment of health plans for coping with national disasters; and that they encourage their neighbors to establish State and local health councils. Through such working partnerships, he said, "We can set an example of what can be done by free men to improve the welfare of the human race. This spontaneous association of men of good will can create a bridge of understanding among the nations which would overpass political antagonisms."

The probable changes in the economy, as a basis for planning future health programs, were described by Dr. Dexter Merriam Keezer, vice president of the McGraw-Hill Publishing Co., with the specific provision that he assumed that his neat trend lines would not be disheveled by nuclear weapons. He also entered a reservation posed at an earlier date by Aristotle: "It is part of probability that the improbable happens."

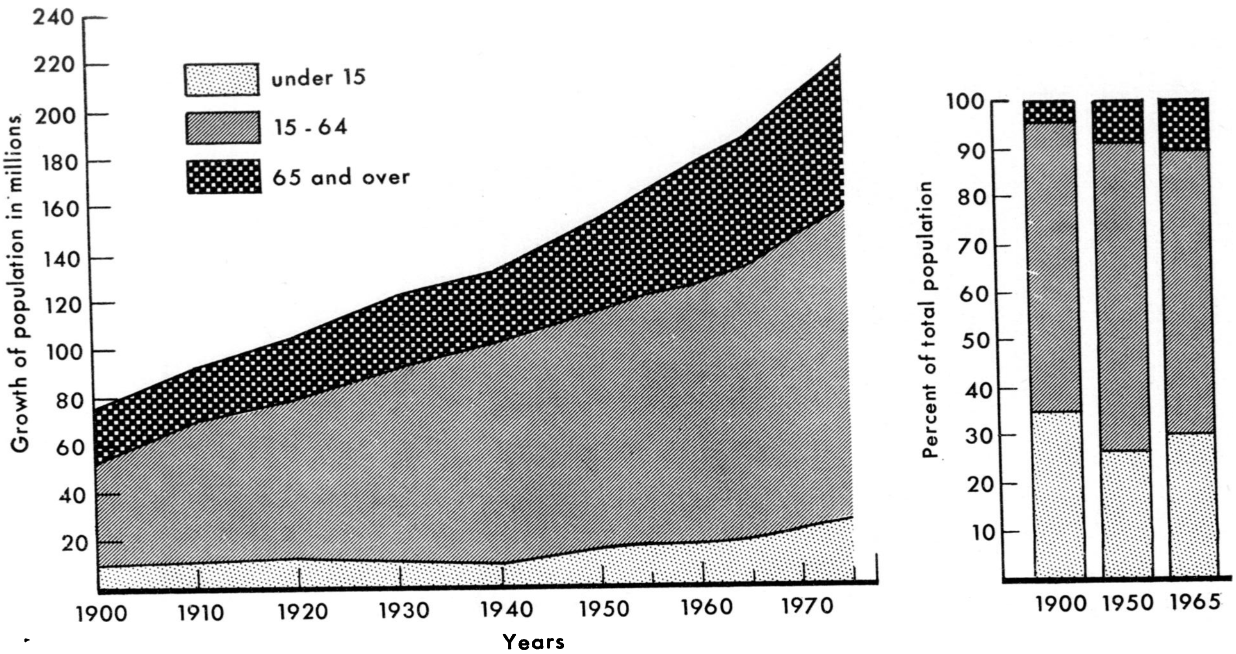
By 1965, he forecast an American population of 190 million, an increase of 26 million above the present level, a number nearly twice the present population of Canada.

He pointed out that the population is not merely aging: It is growing more at the ends than in the middle. He forecast by 1965 an increase of 25 percent in the age group above 65. They would then be 9 percent of the total, as against 4 percent in 1900. The increase for children under 15 was forecast at 17 percent, as against 13 percent in the working-age group. But he predicted that rising productivity would permit the working-age population to carry the increasing burden of children and retired elders without strain. He also predicted a slight further gain in the minute excess of females over males. For this reason, he also forecast an increase in the number of women working in industry, with possible ill effects on female life expectancy.

He said the trend to move from farms to urban or suburban areas would continue, with further aggravation of the problem of developing community health facilities in fringe areas.

Automation of many clerical jobs, he felt, would pose special mental problems for white-collar workers who place high value on the "continuity and stability of what they do." As a sample of things to come, he cited a data processing machine which with 10 man-hours does

Growth of population age groups and age groups as a percentage of the total population



This chart is based on the chart included in "Some Economic Factors in Forecasting the Nation's Health," the paper presented by Dr. Dexter Merriam Keezer at the National Health Forum, March 23, 1955.

work which formerly required 1,800 man-hours. The maintenance man for this machine requires a degree in physics.

On the whole, he foresaw great material gains in earnings and possessions, equivalent to an additional $400 per person per year in present purchasing power. Moreover, he felt that these material gains would be shared broadly by most of the population.

Dr. Otis Anderson, chief of the Bureau of State Services, Public Health Service, questioned whether, without a marked change in public policy, there would be enough health personnel and facilities to permit the economy to expand as Dr. Keezer predicted. Without adequate health services, he suggested that productivity would suffer, and the incapacity of the older members of the family population would indeed be a burden on those of working age. He advocated as a measure to offset the rise in chronic diseases a medical form of DDT: Detection, Diagnosis, and Treatment. Facilities for care and treatment of older people, he emphasized, did not necessarily imply complete nursing care or elaborate hospital facilities. A private home, properly designed and located, or household help would in many instances suffice. As to patterns of population movement, he asserted that tax structures, as broadly based as those of the typical health department, would be necessary to meet the rising demands for rural and suburban health services.

In view of the trend toward a broader distribution of income, Dr. Anderson cited figures demonstrating how protection against hospital, surgical, and medical expense has been extended to millions in the population. Most of this extension, he said, has come about since 1945, largely through collective bargaining between labor unions and management.

Dr. William A. Sawyer, consultant to the International Association of Machinists, emphasized that demands for health services are growing more rapidly than population. This is not a simple need for medical care, he said, but a need for better public health methods, a better distribution of health centers, and effective staff. The crucial question, he said, is not what economic trends will do to health services but what health conditions will do to the economy. To emphasize this point, he reported that in West Virginia, 376 families on relief were rehabilitated at less than the $225,000 spent annually on their maintenance, with the result that they now earn more than $500,000 a year.

The rise in population, suggested Dr. James Perkins, managing director of the National Tuberculosis Association, might produce crowded housing conditions which would reverse the declining trend of tuberculosis. He expressed concern also with the prospect of population movements and growth in areas, certain western States and migrant labor camps, which do not now provide adequate health services. The increased leisure predicted by Dr. Keezer would not, he said, necessarily improve mental health if we lack plans for utilizing such leisure. He stressed the point that spiritual leaders of all cultures have held that healthy minds and emotions are far more to be desired than material possessions.

At luncheon, delegates heard leaders in the field of communications discuss fundamentals of using magazines, newspapers, and broadcasting for effective health education and information.

Regulation of fluorides in public water supplies is a responsibility of the entire community, not that alone of the dentists, physicians, or

Gains and losses to the medical profession

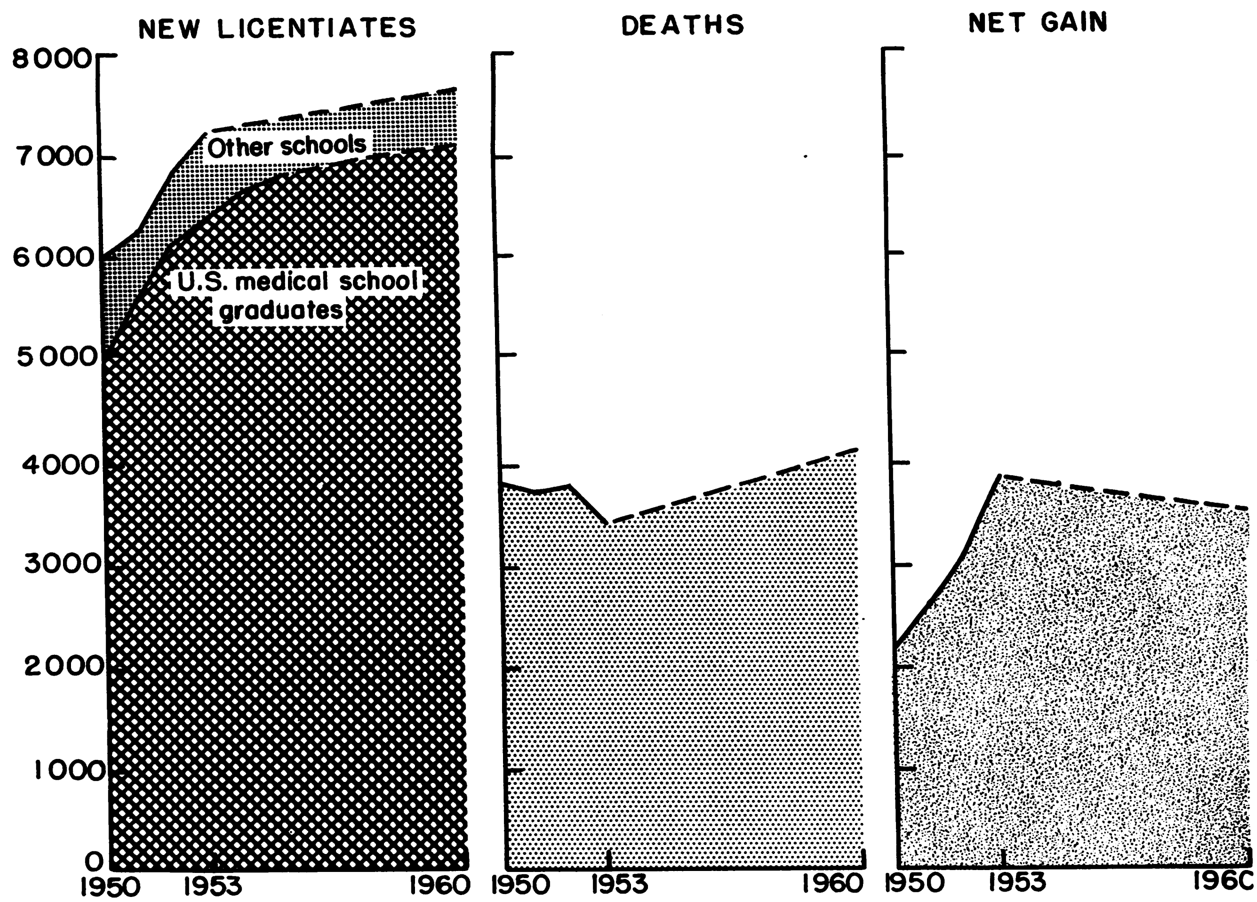


Chart prepared by the Division of Public Health Methods, Public Health Service.

If present trends continue, the net gain to the medical profession is expected to be about 3,500 in 1960. Deaths among physicians will probably rise to 4,100 in that year. Licentiates representing additions to the profession will be about 7,600. Of these, 7,100 will be graduates of approved medical schools in the United States.

the health workers, and the chief function of the health profession is to make facts available, according to a panel which included two members of the American Dental Association, Dr. J. Roy Doty, secretary of the Council on Dental Therapeutics, and Herbert B. Bain, director of the association's Bureau of Public Information. Also participating was Al Schottelkotte, reporter-columnist for the *Cincinnati Enquirer*, whose home city of Cincinnati rejected fluoridation by a referendum in 1953.

Dr. Bergsma's paper and excerpts from other addresses at the conference follow below.

In other action at the National Health Council meeting, Dr. Hugh R. Leavell, dean of the Harvard University School of Public Health, was installed as president, and Dr. Leona Baumgartner, health commissioner of New York City, was chosen president-elect.

The forum also heard a discussion of prospects for care of the long-term patient, analysis of the recommendations of the Hoover Commission on Organization of the Executive Branch of the Government, and comments on the recruitment of career workers in public health.

Radiological Health Services in New Jersey

The increasing use of more potent radiation sources, including radioactive isotopes, in this Nation and in the State of New Jersey, has already presented problems to those charged with responsibility for the preventive and constructive phases of public health administration.

Daniel Bergsma, M.D., M.P.H., commissioner, New Jersey State Department of Health, presented this paper at the 1955 National Health Forum of the National Health Council in New York City on March 23, 1955. Other papers from the forum follow in brief form.

Under the caption of "radiological health," there has developed a series of activities, unique in concept, with which official health agencies have begun to concern themselves.

Beginning in 1946, the Atomic Energy Commission permitted the distribution of an entirely new family of reactor-produced radioactive materials to authorized users for any purpose deemed by the Commission to be in the public interest. Contingent upon the sale of radioisotopes has been a series of requirements for radiological protection designed to safeguard individual and public health. We have tended to accept without comment this approach by the Atomic Energy Commission to the distribution of potentially hazardous materials. However, be assured that this is a remarkably modern concept and practice. This was possible because the Atomic Energy Commission was a governmental agency and was authorized by law so to do.

Major manufacturers of dangerous and toxic materials may label their products and indicate precautionary measures to be taken in handling the hazardous substances, but they could not take steps to reassure themselves that the precautions were being carried out.

If the control features used by the Atomic Energy Commission had been applied from the outset of the use of radiation, dating back almost 60 years, there would not now be the same uneasiness which exists in the minds of thinking individuals with respect to effects of radiation on public health.

The Atomic Energy Act of 1954, for the first time, opened the door for the development of the competitive use of private atomic energy within the United States. We can anticipate, I believe, that in a relatively short period, many of us will find in our respective jurisdictions, new users of nuclear energy.

The presence of nuclear power as a competitive process in the national scene has been stifled, in a sense, by the extreme caution necessary to provide adequate radiological health safeguards. This problem is very real. If we are to encourage the optimal growth of this awe-inspiring source of energy and simultaneously fulfill to the utmost our primary responsibilities as overseers of the environmental well-being of the Nation, we must be capable of presenting a sympathetic but firm understanding of the problems generated by this expanding activity.

Many of us had our first introduction to atomic power by way of civil defense activities. The terms "radiation monitoring," "fission products," "radiocontamination," and so forth, have become increasingly familiar to us. The single exposure, lethal dose of 450 roentgens of whole body radiation became axiomatic. It took considerable reorientation in our radiological training to meet the first peaceful uses of atomic energy: radioiodine-131 and radiophosphorus-32 in clinical medicine, cobalt-60 in industrial radiography and cancer therapy, and strontium-90 in beta-thickness gauges. We have had to develop different concepts of instrumentation and shielding designed for a maximum permissible exposure level of 300 milliroentgens per week for industrial workers.

I certainly cannot advise on how to acquire these capabilities rapidly and yet in a practical manner. However, I can describe what has been done in the New Jersey State Department of Health to develop authority and competence.

It has been demonstrated that public health engineers, industrial hygienists, and public health physicians and nurses, already well versed in the intricacies of developing sound occupational health programs, are able to adapt themselves to this new science. There should be no hesitation in the future in asking that each such staff member prepare himself to understand and apply radiological health principles. The public health administration of these principles is no different from that of any other official health responsibility.

The New Jersey Program

Our experience in New Jersey suggests that certain factors are essential to the development and success of a radiological health program:

First is training for field and office personnel.

Second is supportive legislation in order to define the scope of authority to recommend radiological health controls wherever necessary. This legal base was brought about in New Jersey by the Public Health Council of the State of New Jersey exercising its existing power with the adoption, effective December 15, 1952, of chapter VI, on radiation, as part of the State sanitary code.

This chapter is as follows:

"Regulation 1—Application of chapter.

"(A) X-ray machines and all other sources of radiation shall be shielded, transported, handled, used, and kept in such manner as to prevent all users thereof and all persons within effective range thereof from being exposed to excessive dosage of radiation. Owners or users of sources of radiation shall not expose themselves or permit others within effective range to be exposed contrary to regulations which may be promulgated by the State Department of Health relative to sources of radiation.

"(B) Every incident of exposure to radiation in violation of the aforementioned regulations or of this Chapter shall be considered a separate offense."

The simplicity and brevity of this chapter and its wide latitude for interpretation and enforcement make it a powerful instrument for radiological health control. Easily adopted departmental regulations that are amended readily, relating only to those sources of radiological health hazard demanding immediate attention, may be promulgated while the broader powers of the department in the entire field of radiological health remain unaffected.

To date the only departmental regulations which have been issued are those relating to fluoroscopic shoe-fitting machines.

Third is the preparation of a concise declaration outlining proposed activities in the field of radiological health. This is stated in New Jersey's radiological health program, formally approved on May 19, 1954. The findings of our earliest exploratory field activities were utilized to develop a realistic program.

Fourth is the ability to impart authoritative radiological health information and specialized advice to all interested parties.

Facing Up to the Problems

Now we must be prepared to operate in the realm of tomorrow and face the problems associated with nuclear power reactors, the most concentrated energy source thus far devised for peaceful purposes and, at the same time, potentially the most concentrated source of toxicity from radiation.

Every nuclear reactor produces radioactive material in direct proportion to its power capabilities. Coupled with this tremendous production and waste potential is the possible exposure to the injurious effects of ionizing radiation not only of the industrial population that is required to operate this equipment but also of every person who may come in contact with the resultant byproducts, the general population as well as the industrial worker.

Geneticists and physicists warn us that our concern must be for future generations as well as for ourselves. Exact authentic data on the effect of repeated small or moderate doses of radiation on human genetics are not available. This is not the appropriate place for a recitation of symptoms and signs or medical diagnosis or therapy for varying degrees of overexposure to radiation. However, it is quite well understood and accepted that unnecessary exposure to radiation is best avoided.

Whether or not State and local health agencies prepare themselves to answer the many questions that result from the expansion of this radiation energy field, do not doubt that this expansion will take place. We should prepare, as soon as is feasible, to be in a position to function as effectively in this area as we have in other health areas in the past.

The nuclear reactor has the greatest potential for environmental toxicity of any other installation. This fact makes it essential that a health department prepare to control the environmental health problems which will result.

A mechanism is needed whereby plans for nuclear reactors are reviewed for design safety, location, area encompassed, and other pertinent safeguards, such as alarm systems, and in some situations perhaps for population evacuation measures. Also it is probable that water, air, foliage, and soil will need to be monitored in the vicinity of such installations for baseline data, so that subsequent contamination can be readily detected.

This extensive monitoring program is more readily understood when the realization comes that the radioactive material which would be released from a nuclear reactor accident is, in part, extremely long lived and hence is more dangerous and more concentrated than those radioactive materials from an atomic bomb detonated high in the air.

However, to retain a proper perspective, it is apparent that the average State program should be founded on actual conditions rather than on eventualities that are too remote.

Very few persons are currently exposed to nuclear reactors. A far greater number of people are exposed to excessive radiation from fluoroscopic shoe-fitting machines, X-ray units, and fluoroscopy. Possibly more persons are in contact with cobalt-60 for treatment of cancer and for radiography, with beta gauges and radium and polonium static eliminators than are as yet occupied in nuclear reactor units. We must in our total planning be alert to the summation of radiation effects from all sources and also to the cumulative factor.

The radiological health program in New Jersey has crystallized within the past 3 years. We were fortunate in receiving assistance in this period of rapid growth from the United States Public Health Service, in the form of trained personnel assignments. A public health physician, experienced in local health problems and atomic medicine, was loaned for 1 year. A sanitary engineer, trained in nuclear physics, has been in charge of the program activities for 2 years. State personnel are now taking over these duties.

We have not contemplated and are not attempting rigid regulatory controls of all sources of ionizing radiation. In terms of public health administration, public health practice, and, last but not least, public health education, a tremendous task remains to be done.

Two attitudes are found among officials concerning the public health hazards connected with the use of radiation sources. One is the "police" type of control—the strict supervision by codes, ordinances, regulations, licensing acts, and the like, of anything and everything that may possibly cause persons to be exposed to radiation. We are aware of the difficulties engendered by the interpretation and enforcement of these acts when they refer to highly technical subjects.

The other attitude stems from an awareness of the fact that many uses of radiation are capable of self-regulation to a marked degree,

Patterns for Different Sized Radiological Health Units

Basic Program

Area of interest: fluoroscopic shoe-fitting machines; static eliminators; thickness gauges; industrial and medical radiography.

Equipment:

Ionization survey meter (Cutie Pie)	$275
Geiger-Müller survey meter	245
High-level dosimeter and charger	200
Personnel monitoring set	150
Landverk analysis unit	100
Total	$970

Personnel: engineer (full time); clerical; supervision (medical—part time).

Operating expenses: training; travel; expendable supplies; meetings, books, and so forth.

Intermediate Program

Area of interest: basic program *plus* medical and industrial isotopes; X-ray installations (dental, veterinarian, therapeutic); consultation (reviewing plans, laboratories, application of isotopes).

Equipment:

Basic program	$970
Plus:	
2 Victoreen R meters	1, 500
1 personnel monitoring set	150
Total	$2, 620

Personnel: supervision (medical); engineer (full time); engineer (part time); clerical.

Operating expenses: training; travel; expendable supplies; meetings, books, and so forth.

Comprehensive Program

Area of interest: intermediate program *plus* analytical laboratory (air, water, biological waste, industrial waste, film badge service).

Equipment:

Intermediate program	$2, 620
Plus:	
Laboratory scaler, mount, and timer	885
Proportional counter	360
Air-sampling equipment	500
Liquid-sampling equipment	100
Standards	50
Miscellaneous supplies	500
Film badge (contract)	500
Total	$5,515

Personnel: supervision (medical); 2 engineers (full time); physicist; clerical.

Operating expenses: training; travel; expendable supplies; meetings, books, and so forth.

such as, for example, the administration of radiation for therapeutic purposes. The effectiveness of this second attitude is based upon the establishment of mutual confidence and rapport with the professional and industrial groups who commonly utilize radiation sources.

Our basic principles, throughout, are relatively simple in statement:

1. That we desire to promote the most desirable management of radiation sources for the protection and improvement of the public health, and

2. That radiation exposure serving no useful purpose be avoided.

The foregoing represents our philosophy and experience in the radiological health field to date. The problem of practical application remains. Many may query, what do we need to start this project?

A public health radiological health program can be built up slowly from a one-man unit with limited equipment to a comprehensive program, as the need develops. A good program grows under the impetus of its own needs and potentials.

In the accompanying inset appears a suggested schedule I have drawn up for initiating and developing radiological health units. Only equipment costs are shown. This was done because travel and personnel costs can more appropriately be written in accordance with current and local situations.

Tomorrow's Atom and You

PHR brief

The path which developing knowledge has followed with respect to atomic energy has been a tortuous one. Beginning before the end of the previous century with the discovery of radium as a naturally radioactive element, there

By John C. Bugher, M.D., director, Division of Biology and Medicine, United States Atomic Energy Commission, Washington, D. C.

has been a slowly evolving understanding of what we like to think are the fundamentals of radioactivity.

It was soon recognized that the radiations of radium were capable of killing living cells and that slowly developing degenerative changes of tissues exposed to these radiations could occur. The radiations of radium were applied to medical purposes and to a certain extent utilized in industry. The extraction of radium from its parent ore, pitchblende, was a laborious and costly process. The production was quoted in terms of milligrams, and a gram of radium with a radiation value which we now call a curie, cost about $70,000. Over the years the stock of separated radium supply grew until finally about 1 kilogram had been separated.

Small as this total stock seems to be, the studies made of radium and other naturally radioactive elements led to the very fundamental knowledge on which our modern concepts of radiation protection are based. Furthermore there developed the technique of supplementing X-ray therapy with local implantations of radium and radon which have been of so much value in the treatment of many forms of cancer.

Significant as were these developments, the rate of progress was greatly increased by the development of accelerators of energy sufficient to induce nuclear reactions. The production of radioactive isotopes unknown in nature became possible for the first time, and these in turn were the keys that opened the doors to new knowledge in biochemistry and physiology. The fundamental studies of the physicists in turn led to the further great wartime accomplishments of the Manhattan Engineer District and the development of our present atomic energy program.

We now have in our hands modalities of research which only a few years ago were merely the ephemeral substance of dreams. Already there has occurred a tremendous revolution not only in the technology of biological and medical research but indeed in the concepts of the nature of material substance and the character of life itself. From that which already has transpired and has come into the field of human experience and knowledge, one may make certain predictions with reasonable confidence in their reliability. We must never forget, however, that we merely stand on the threshold of a new era of knowledge. Phenomena and concepts, of which today we do not even speculate, surely lie in the future. With these qualifications and reservations arising from the sense of our intellectual limitations, I wish to discuss a number of specific topics.

Medicine

We are in the early period of great advances in biochemistry. These will surely have profound impact not only upon our knowledge of disease but also upon the methods of diagnosis. Reactions which may be brought about in the various physical states make it possible to introduce radioactive atoms as tracers into the most complex and delicate molecules. One can visualize that the diagnostic approach of the physician of the next 25 to 50 years will revolve around the quantitative measurement of the behavior of specific enzyme systems. The laborious and crude chemical techniques of today will be replaced by precise and rapid procedures of far more discriminating character through the introduction of radioactive atoms into highly specialized compounds of physiological importance. In our future medical schools, the teaching will of necessity emphasize the dynamic characteristics of intracellular reactions which can be observed in the living state without injury to the individual.

We may anticipate that within the next 50 years epidemics from infectious agents will have ceased to be a major threat to life and health. With the possibilities that are at present foreseeable we may anticipate that the scourges of parasitism of both animals and man that retard the development of tropical peoples will have been overcome.

This changing prospect with respect to infectious disease means that we must concentrate more and more attention on the understanding of the mechanisms of physiological deterioration with age and the specific diseases of the later decades. We may anticipate that through the combined efforts of the chemist and the radiologist we will be able to release powerful radiations within pathological cells to achieve either a cure or satisfactory suppression of cells which have undergone neoplastic change.

While we may anticipate great improvement in the processing of atomic fuels, the same principles extend directly into such areas as the production of synthetic foodstuffs and the utilization of solar energy through the process of photosynthesis. Inherent are the prospects of new and greatly improved drugs for medical purposes and the production of compounds necessary to nutrition.

Public Health

It seems obvious that we are already in the midst of a profound change in the character of our public health problems. While the established concepts of epidemiology still hold, we see progressively greater preoccupation with substances which, in contrast to the living infectious agents, are not capable of multiplication but are capable of spontaneous transformation or transmutation. In the instant of release of radioactivity, the atom changes from one element to another which in some cases is capable of still further radioactive change. There is a consequent change in the behavior of the material in the chemical sense. It is a phenomenon remotely comparable to the sudden appearance of a mutation in a living cell line.

As the utilization of atomic energy for industrial and scientific purposes multiplies, as inevitably it will, the responsibility for insuring that the environment occupied by people, and by the biological systems upon which human life depends, shall not be contaminated to a level of population hazard. In general, this is equivalent to saying that the environmental contamination must be maintained at levels considerably below those considered significant as hazards to individuals.

The essentials of protection from dangerously radioactive substances are: time, distance, shielding, and containment. All radioactive substances decay and in time result in ordinary stable elements. The times required vary from minute fractions of a second to many years. The longest half-life of a fission product of any biological significance is approximately 20 years, although smaller amounts of elements of less biological consequence are formed that have half-lives as long as 33 years. Consequently, inherent in considerations of environmental radioactive contamination is the element of time.

From the standpoint of external exposure to radiation, distance is extremely important as a protective measure. Intensity falls off as the square of the distance from the source, and to this there is a further reduction from attenuation by the air. A source which may be dangerous close up may be quite innocuous at a moderate distance.

All radiations may be stopped by appropriate and adequate shielding. The character of the material used for shielding and the amount of it are partly determined by the nature and intensity of the radiation concerned.

Containment is the fourth essential factor in radiation protection. Materials which would be hazardous if released to the environment in quantity may be held in storage until radioactive decay has taken place and the levels of radiation reached are acceptable in the disposal area. At Hanford large quantities of highly radioactive fission products are held in underground tanks for many years. Materials which might be hazardous are thus kept confined and do not enter the environment where they could be a risk to life.

As with all toxic substances, there are levels of exposure to radiation and various radioactive elements internally which can be said to be safe in the sense that no significant injury may be detected over the lifetime of the individual. These permissible or tolerance levels are determined through careful study of all available information derived from human experience and animal experimentation. In the United States the National Committee on Radiation Protection considers these matters and advises on the levels which may be accepted as permissible. Their recommendations are published from time to time by the United States National Bureau of Standards.

These developments mean that the sanitary engineer and the public health worker, not only now but especially in the years to come, must give increasing thought to the control of radioactive substances in the environment and the manner in which such substances may enter the various life cycles that constitute our food chains. It requires diligence and a redirection of public health education.

That it is perfectly feasible to live and work with vast amounts of highly radioactive substances has already been demonstrated in the plants of the AEC itself. In some of these plants, the workers manipulate safely radioactive material equivalent to thousands of tons of radium. Not only has radiation injury been almost negligible in the atomic energy industry but the climate of radiological safety has resulted in better care with respect to hazards of all kinds so that the safety record of the AEC has merited special recognition. Difficult as the problems are, there is no occasion for fear that this record cannot be continued in the expanding atomic energy industry which may form one of the bases of our industrial and social structures within a comparatively few decades.

Manpower Potentials

PHR brief

Many ways are being developed to overcome the economic barriers to good care which have existed in the past. While the quality and availability of health services is rapidly expanding, however, the population of the United States is growing.

Dynamic forces will increase the demand for health workers in the years ahead.

There are unmet demands today in medical education, public health, mental and tuberculosis hospitals, and rehabilitation. Many rural areas and small towns are in need of practicing physicians. Hospitals in increasing numbers are resorting to the use of alien physicians with training which is less than adequate by our standards for house staff service. A civilian disaster of the magnitude possible today could put an incredible load on the available physicians.

By Howard A. Rusk, M.D., associate editor, New York Times; chairman, department of physical medicine and rehabilitation, New York University-Bellevue Medical Center; and chairman, Health Resources Advisory Committee, Office of Defense Mobilization.

It is often said that areas with lower physician population ratios are not economically in a position to utilize a greater number. However, the fact that in States with the poorest ratios, doctors report the longest workweek averaging 63 hours a week, and the highest average incomes, indicates that the demand for services in many of those areas is placing a heavy strain on the supply.

In dentistry, a parallel problem exists. Training facilities are being expanded. But this increase is not quite keeping up with the population, and by 1965 the ratio of dentists to population will be, we estimate, 57 per 100,000 as compared with 58 per 100,000 today.

The number of graduates of schools of nursing has been stabilized at 28,000 or 29,000 since 1951, but the number of entrants is now rising again.

The shorter patient stays and the emphasis in rehabilitation on getting the patient on his feet and returning him rapidly to a condition of independence all call for new emphasis in nursing care and have resulted in an intensification of nursing activities.

Efforts of the nursing profession to maintain the supply of professional workers and to improve their utilization have been outstanding, and there is indication that the supply situation in nursing is not as critical as it was a few years ago.

One aspect of better utilization is the increased employment of other workers for functions which do not require the nurse's special skills. The trend toward hospital staff nursing and away from private duty nursing means that more nurses are available for hospital employment.

The training of paramedical workers such as physical therapists and occupational therapists is likewise increasing although the numbers of these are still very small. But present levels of training are not at all closing the gap between demand and supply.

For each of these professions there are probably over 3,000 vacant positions today.

The demand in these areas is continuing to grow rapidly, and though the supply of graduates is increasing there is every indication that the demand will continue to outrun the supply.

For the Future

This is the time then to take a long look at the educational opportunities which we are prepared to offer, both as to quality and quantity. First, curriculum: Most of the health professions today are looking seriously at their curriculum and weighing it in relation to the total job to be done. They are looking, although perhaps still not sharply enough, at the problem of training the workers in the many disciplines to work together for the patient, to orient their planning and activities so that the best thing is done for the patient rather than the best thing for the individual category of professional worker.

A real bottleneck in education today is salary scales. This is part of a general problem which plagues the Nation, that of obtaining enough teachers and good enough teachers from the kindergarten through the whole educational process.

Getting adequate facilities is another serious hurdle in providing for professional education. Schools of medicine and dentistry and nursing are seriously hampered by lack of facilities. Schools of the paramedical professions also suffer seriously from lack of basic clinical facilities and equipment.

Thus far, however, the attacks on these problems of curriculum, of faculty, and of facilities have been piecemeal and inadequate.

A basic across-the-board necessity is money. Medical schools, dental schools, schools of nursing, and the paramedical sciences are all hampered by lack of adequate funds in carrying out the objectives of their present programs, in recruiting and maintaining staff, in developing programs to meet changing needs, and in providing the best educational environment.

The spirit of rehabilitation is in itself a spirit of dedication to the human welfare and dignity of man, regardless of his physical limitations.

In forecasting America's health, our efforts and the degree of success we achieve in developing improved health for the peoples of the world are a major factor. In our shrinking world of today, our own health—medically, emotionally, economically, and politically—is dependent upon the health of the rest of the world. To achieve that state of health, we could do well to adopt the slogan of an obscure but wise English philosopher who said 300 years ago, "If every man would but mend a man, the world would all be mended."

March of Medical Science

The title of this program, "The March of Medical and Social Sciences," in itself reflects growing awareness that health is an inseparable element in social progress and that medical science does not and cannot function in isolation from the social, economic, educational, and cultural forces in our society.

Research Advances

The problems faced by medical science are tremendous in volume, scope, and complexity. When one looks back at what medical science has accomplished over a span of several decades, he can identify the items quite easily. When one looks at medical science today and tries to pick out the most promising work, he finds the task quite difficult. But when one attempts to anticipate what progress will have been made by, say 1975, his first inclination is to look for

By C. J. Van Slyke, M.D., associate director, National Institutes of Health, Public Health Service, Bethesda, Md.

cover, and his second is to generalize and digress, because the record shows that medical progress is replete with false hopes, pitfalls, and hypotheses that cannot be confirmed. The way to progress is long and difficult, and the specific advances are anticipated only by those who possess temerity and clairvoyance.

It is possible, however, to pick out several broad general areas and to project recent progress for several years, assuming that no new variables are brought into play. I will try to confine my speculations to areas which might have meaning in terms of planning health resources for the future.

It is reasonable to assume that there will be vaccines which will be largely effective in the prevention of influenza, poliomyelitis, and the minor upper respiratory infections, including the common cold.

There could be major advances against heart disease, featuring the prevention of rheumatic heart disease by the prevention of rheumatic fever; drugs to control hypertension; and some as yet unknown means to control the fatty deposits in the blood stream which lead to atherosclerosis.

There will be improvements in cancer diagnosis. Treatment of cancer will improve, too; in addition to X-ray therapy and surgery, there may well be chemical agents of particular value against the soft tumors.

There will be new drugs useful in the management of mental illness. We shall have better knowledge of prevention. But the hard core of the problem of mental illness will remain until training and education begin to yield the professional staffs that are so desperately needed, both to study mental illness and to care for the mentally ill.

There will be a series of new drugs, both natural and synthetic, useful in the treatment of arthritis and other rheumatic diseases.

We shall have the knowledge and methods to prevent several of the leading forms of blindness, particularly among children.

There may be fewer advances in the management of neurological disorders, such as cerebral palsy and muscular dystrophy. However, new rehabilitation techniques are in process which bring some of the victims of these diseases a measure of independent self-care.

The Medical Science Spectrum

As one studies the pattern of research activities in the medical and biological sciences, it becomes apparent that while a great deal of progress is being made toward relief or amelioration of the effects of disease, we are not making the same progress toward understanding of the basic underlying causes of disease. This is particularly true for the chronic illnesses. I raise this point only to emphasize the continuing need for fundamental studies, as distinct from target-applied research, which will yield the knowledge with which we can achieve the ultimate goal—prevention.

By these fundamental studies, I refer, in part, to clinical and laboratory investigations, but I also refer to those studies involving man in his environment, both normal and abnormal. If medical science applies the knowledge and techniques of epidemiology, statistics, economics, sociology, anthropology, and related fields to these fundamental investigations, it may find that such fields have as much potential for identifying the factors in disease causation as the clinical and laboratory studies.

Medical science has concentrated on understanding the nature and modes of action and interaction of progressively smaller things. Not too many decades ago, we were studying functions of whole organs or large sections of tissue. Gradually, we reduce the dimension of our studies to the cellular level. Now we are concerned with subcellular matters. We find that even within the cell, there are relations and interdependencies which materially affect the life processes. Scientists study, for example, the role of cytoplasm in genetics, the ability of viruses to destroy certain cells but live peacefully in others, or the factors that govern cell growth and multiplication.

I do not, of course, challenge the validity of the scientific method which seeks understanding of the processes of health and disease through this microscopic and submicroscopic approach. I stress, rather, that it is time for us to also give emphasis to the study of man as a "supramacroscopic" organism, if you will, and to study the whole man in relation to other men and to the environment in which they live.

By way of illustration, we are now conducting a study of a neurological disease known as amyotropic lateral sclerosis, more commonly called "Lou Gehrig's disease." On the island of Guam, this disease is 50 times more prevalent than it is in the United States. That offers a golden opportunity for an epidemiological study. There is another study in Massachusetts, which has undertaken to follow a large population group in order to investigate and evaluate the factors involved in the development of hypertension and atherosclerosis. The investigators are not only physicians but also epidemiologists, biostatisticians, social workers, nurses, public health workers, industrial physicians, sociologists and psychologists, anthropologists, and historians—all those who can contribute to better understanding of what causes contribute to having or not having heart disease.

No Formula for Progress

Progress in medical science does not come easily. But I am convinced that it will continue in the future as it has in the past, and perhaps more abundantly. We have only to build intelligently on our experience.

The most serious threat to the ability of medical science to do the job it must do is the impending shortage of trained investigators of all kinds. Science teaching in the secondary schools has not kept pace with increasing needs. The preclinical sciences have suffered in the colleges and universities. And there are too few career opportunities in the basic sciences related to medicine and biology. We must do something immediately and constructively to resolve this issue.

Cooperative Effort

Another challenge of medical science is to achieve a more effective linking of institutions and agencies and organizations which together make up the health resources of our Nation.

I do not mean to oversell the value of coordination as such. There are times when I feel we spend so much time coordinating our efforts that the efforts themselves get almost obliterated, and coordination becomes merely entanglement. Cooperation, yes—knowledge of other programs, ability to use them as resources, eagerness to work together where interests merge, respect for the objectives and methods of other groups, desire to avoid jurisdictional disputes— these are the essence of effective cooperation in health and related fields. For example, one city has a single telephone number to answer all health inquiries in order to assure appropriate referral to the proper health agency or agencies.

We need more of this kind of cooperation. For as we get larger and older as a Nation, the health needs of the people grow and the pattern of health services changes to meet these needs.

The General Outlook

Probably the largest single factor to concern those who plan civilian health programs in this country is our changing population.

Heart disease, cancer, mental and neurological disorders, arthritis and various metabolic problems such as diabetes, blindness, and dental disease will reach even greater proportions. The future will bring increased pressures upon society to prevent or cure these chronic diseases, to prolong the usefulness of man throughout the maximum portion of his allotted years.

The emphasis on chronic diseases should not obscure the fact that serious infectious diseases are with us, too—hepatitis, influenza, brucellosis—and that any relaxation of public health vigilance is an invitation for reappearance of smallpox, typhoid fever, and other scourges of the past. This work becomes all the more meaningful when one remembers that certain major chronic diseases may well have their origin in micro-organisms. Witness, for example, the several types of cancer in animals which are known to be caused by viruses.

Another problem for the future rests on the fact that this country has become predominantly urban. This trend increases the burden of State and local health departments to maintain sanitary, healthful conditions for our 160 millions. It brings to the fore such programs as city health planning, air and water pollution, accident prevention, sanitation, and cancer that may be of industrial origin.

I think I should make special mention of two problems of major significance: mental illness and diseases of aging. Already the mentally ill occupy half of America's hospital beds and cost us well over a billion dollars in tax money alone. And the dimension of the problem is growing by $100 million a year. We must certainly find better preventive methods and more practical and adequate means of treating these unfortunates.

Related problems are juvenile delinquency, drug and alcohol addiction, the gamut of self-injurious and antisocial behavior, to be approached through both the physical and the social sciences.

So we return to my earlier reference on the inseparability of medical and social science. It is all too obvious that we must do something about effective utilization of our older people, reexamining our whole social and economic structure to find ways to help them recapture their place as useful and productive and happy members of society.

Conclusion

In conclusion, this judgment seems germane to the forward march of medical science:

We must move simultaneously toward better application of what we now know about the prevention and control of disease; toward the acquisition of new knowledge; and toward making the necessary changes in today's health structure to be ready for tomorrow's challenges.

Social Processes at Work

PHR brief

Public health workers have two major interests: acquiring new health knowledge and applying known techniques and information. In different words, public health is committed to research and to practice. Social science can aid in both. Examples from psychosomatic medicine, child study, and nutrition will indicate how social science can assist in basic health research.

By Benjamin D. Paul, Ph.D., lecturer on social anthropology, Harvard University.

Health Research

In the field of psychosomatic medicine, social scientists are exploring areas of social strain as possible determinants of ailments such as ulcers. Social mobility is one of the cardinal features of America's open class system. Striving for mobility may bring tangible benefits, but it also generates anxiety, and it is possible to study the role of mobility anxiety in ulcer formation. In recent decades ulcer has increasingly become a man's rather than a woman's disease. This may be related to men's steady loss of social status and security as a result of the ascending social position of women.

Social science is slowly building up information about, and fashioning tools for, studying personality formation. This is an important part of the field of child development, a field in which the health disciplines and the social science disciplines alike have a lively interest. Recently, for instance, Cornell, Harvard, and Yale have begun a joint study of parent-child relationships in five different villages located respectively in India, Okinawa, the Philippines, Mexico, and New England. Using nature's cross-cultural laboratory, this farflung research project is designed to test certain hypotheses concerning child training and its impact on child behavior, adult personality, and cultural values.

Still another example relates to nutritional research. Epidemiological studies and laboratory work have focused attention on the possibly critical role of certain vitamins, amino acids, and antibiotics in promoting normal growth. To test out some of these findings in the field, a nutritional research organization in Central America set up a series of experiments in five local villages. School children in each community were given a different combination of nutrients and food supplements. Periodically the nutritional status of the children was checked through blood sampling and other means. But in one of the villages the parents threatened to withdraw their children from the program, jeopardizing the conclusiveness of the ultimate research results.

To locate the sources of resistance, an anthropologist was sent into the community. These are some of the things he found out. Project personnel had unwittingly become identified with one of two hostile political factions; this led to the charge that the program was dangerously subversive. A local medical clinic and other services, intended to win village good will and cooperation, were causing more harm than good: they were not adjusted to local expectations. According to their lights, parents saw blood sampling as injurious to their children's health; they regarded blood as a nonregenerative substance. Moreover, they began to spread and credit rumors that the object of feeding children was to fatten them for export to the United States where they would be eaten: they now believed that the purpose of blood taking was to check scientifically whether the children were ready for shipment.

Once the sources of trouble were located, the anthropologist was able to suggest countermeasures to regain the villagers' confidence and allow the research program to run its full course. Here again, social science techniques furthered the cause of health research. However, social scientists are able to contribute even more perhaps to public health practice than to public health research.

Public Health Practice

The practice of public health emphasizes promotive and preventive medicine. Even more distinctively it is concerned with groups, populations, and communities, rather than with individuals in relative isolation. Social scientists by definition are equally concerned with groups and communities, although their primary urge is to acquire knowledge rather than put their knowledge to practical use; by inclination they prefer scholarship to a career of service. Yet their interest in understanding the community attracts them to action programs. By observing how communities respond to service programs they learn how communities work. Health programs in turn can improve their approach by taking advantage of the information the social scientists thus accumulate.

In working with health teams, social scientists probably cannot make their best contributions by engaging in direct service; their training doesn't usually fit them for social work. They can help in program planning, but perhaps their greatest contribution can be made in program assessment.

Assessment of Effect

Suppose a health agency is dedicated to changing a community's health habits. After a period of effort the agency wants to know: Did any change occur? Was the change the one we wanted? Were we the cause of the change?

Social scientists have techniques for supplying the answers. By means of interviews or questionnaires and using proper sampling methods, the health habits of a community are measured before and after the campaign.

In several Syrian villages it was found, for example, that hygienic habits had improved appreciably after 2 years of organized effort. Conceivably the improvement might have come about despite the health campaign and not because of it. Indeed control villages showed similar improvement during the same interval, thus making it difficult for the health workers to claim the credit for the change in their experimental village. We don't really know what happened. The answer would require use of a yardstick that measures process rather than effect alone.

Recently an interdisciplinary team engaged in an intensive campaign to alter attitudes toward the mentally ill in a fairly prosperous domestic community. Team members reasoned that an unfavorable attitude toward discharged mental patients was influencing the high rate of relapse and readmission to overcrowded hospitals. They established themselves in the town, gained the cooperation of influential persons, and used, as means and resources, motion pictures, pamphlets, books placed in the library, newspaper notices, broadcasts, speakers, small group discussions.

Before and after the campaign they collected several hundred questionnaires designed to reveal attitudes toward the mentally ill—conceptions of cause, curability, degree of personal responsibility for helping a sick relative, willingness to associate with a person discharged from a mental hospital. They twice administered the same set of tests in another town where no campaign of health education was attempted. As expected, the people there showed no significant change of attitude. But surprisingly, neither did those where the intensive campaign had been tried.

The reasons for this negative outcome were instructive. But to understand the reasons they had to investigate process rather than rest content with measuring effect.

Assessment of Process

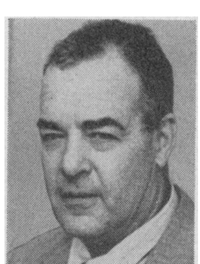
In the mental health instance, the processes responsible for the negative outcome could be uncovered by combining various types of evidence, including data from intensive interviews and observed changes in people's reaction to the education and testing team.

One of the ideas the team had sought to communicate was that no sharp line divided the sane from the insane, that personality types fell along a continuum running from the fully normal to the fully abnormal, and that most released hospital patients were therefore not essentially different from other people and should be treated accordingly.

But people in the community clung hard to their black-and-white concept of normality and abnormality. Not always certain about their own sanity, they had erected a wall of defense that sharply divided the sane from the insane. In trying to undermine this popular conception, the educators were apparently arousing deep insecurities. Without good rational defenses against rational argument, the citizens responded by withdrawing their cooperation. They showed outward apathy, attempted to withdraw, and ultimately expressed open hostility toward the project personnel.

The lesson is clear. Before trying to change old health habits and ideas for new, it is wise to ascertain what the established habits and ideas are and what psychological and social functions these beliefs and practices perform. It is in this direction that social scientists can point the way. Ultimately their biggest contribution to health programs may lie in probing beneath cases of success and failure to unravel the hidden processes that are ever at work in the community.

Marshall A. Shaffer, 1899–1955



Marshall A. Shaffer, chief of the Technical Services Branch, Division of Hospital Facilities, Public Health Service, died suddenly on May 25. Mr. Shaffer, internationally recognized for his work, was responsible for the architectural engineering phases of the hospital survey and construction program since its inception. He entered the Public Health Service in 1941 and was commissioned as engineer officer in 1945.

After graduation from Pennsylvania State College in 1922, Mr. Shaffer worked for 11 years as an engineer in Central America, Mexico, and the southwestern United States. During this time he studied and practiced architecture. He worked on the design of the Los Angeles General Hospital, the largest in the world, and won several competition awards. In 1933 he became consulting designer for the Federal Works Agency.

In 1951, Marshall Shaffer was given the American Institute of Architecture's Kemper award for "ensuring the conduct of the hospital building program in harmony with the highest ethical standards." That same year he was invited to represent the United States at the Building Research Congress in London. In 1952, he was a delegate to the Eighth Pan-American Congress of Architecture at Mexico City. At that time, he was elected president of the Plenary Session on Hospitals, the first American to be so honored.