

# FRONTIERS FOR PREVENTION<sup>1</sup>

Myron E. Wegman<sup>2</sup>

*Developing a balanced approach to today's health problems means paying greater attention to the strategy of prevention. This strategy should encompass environmental measures, self-care activities, and health education; it should carefully weigh the prospective costs and benefits of proposed preventive measures; and it should see that such measures are tailored to the needs of the various specific groups within the general population.*

## Introduction

In choosing a title for this lecture<sup>1</sup> I have deliberately sought to explore the two meanings of the word "frontier"—that of a geographic boundary between two nations and that of an ideological boundary for new concepts, new methods, and new advances in public health. My dual thesis is that the frontiers we have crossed in medical and public health science make it imperative that we put more, not less, emphasis on prevention, and that the frontier between the United States and Mexico offers unusual opportunities to advance the cause of prevention.

On the ideological frontier, our concept of prevention has broadened dramatically in recent years. We speak not just of preventing disease but also of preventing the consequences of disease. This may well be expressed in a phrase that I believe states very well the real goal of public health: to

help everyone die young—as late as possible. We seek a better quality of life for all.

This comprehensive approach to the health problems of our times has generated much greater concern about personal health services, and this by itself has been an important step forward. On the other hand, the very size of the medical care burden in our society and elsewhere has demanded so large a share of available resources and so much attention by trained technical personnel that the development of preventive services has suffered seriously—not only in the United States, but also in Mexico and indeed throughout the world.

To achieve a balanced approach, with adequate attention to both preventive and curative medicine, we need to assess current health problems. This century has seen major advances against morbidity and mortality in the field of infectious diseases. An examination of age-adjusted death rates in the United States, for example, shows a 94 per cent decline in communicable diseases between 1900 and 1967—a period in which the overall rate of chronic diseases changed hardly at all. Furthermore, most of the decline in communicable disease

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<sup>2</sup>John G. Searle Professor of Public Health and Dean Emeritus, School of Public Health, University of Michigan.

mortality was due to decreasing morbidity, and this in turn was directly attributable to socioeconomic improvement and organized public health measures. In fact, for communicable diseases as a whole, over 80 per cent of the decline took place before 1940—that is, prior to the antibiotic era.

Of course, since then advances in specific therapy have reduced the amount of infectious material in the environment and have thus favored still lower morbidity. Yet the epic progress made against many diseases without specific therapies—diseases such as poliomyelitis, smallpox, measles, and whooping cough—underline the great benefits to be expected from investment in sound and demonstrated preventive techniques. Nevertheless, these benefits have not been distributed evenly among our peoples; and the failure to achieve complete immunization coverage in congested urban areas has set the stage for serious recurrences of diseases which were thought to have disappeared. These are serious problems throughout the world, since failure to protect any major segment of society—whether for lack of services, lack of motivation, or other reasons—causes all of society to be endangered.

It should be noted that morbidity due to one group of infectious diseases, the venereal diseases, has not diminished. Despite (or perhaps because of) effective therapeutic agents, gonorrhoea is the most frequently reported infectious disease in many developed countries, and syphilis is not far behind. Our weakness here is in the social and motivational area.

Prevention of infectious disease, actual or potential, is still a major part of public health. Eradication of smallpox from the Western Hemisphere gives cause for rejoicing, and the prospect of complete worldwide smallpox eradication is exciting. The achievements to date have clearly shown what can be done when the nations of the world really work together.

The striking decrease in communicable

disease mortality, however, must not blind us to the great unknowns demanding further research. In some ways the search for an influenza vaccine is at a stage comparable to the search for a poliomyelitis vaccine in the 1930's and 1940's. If we think just of the economic savings, not to mention the human gains, resulting from development of polio vaccine, then we can justify pursuit of even doubtful leads against influenza. Money and resources are needed.

### The Strategy of Prevention

These facts are not new, and my excuse for repeating them is to bring into bolder relief the continuing—indeed expanding—need for greater attention to the strategy of prevention. That is, we must use the specific preventive and environmental protection measures that are the cornerstones of public health in a way that concentrates on our current potential and current needs. Besides acknowledging the special needs of various groups, such a strategy must recognize general needs of the whole population. These general needs can be classified under the broad headings of environment, education, and personal health care.

A safe environment—particularly one supplied with good and sufficient water, food, and housing—not only provides a basis for preventing communicable diseases but promotes better overall health as well. Let me note that I consider the need for a sufficient quantity of easily accessible water to be paramount, especially with regard to preventing diarrheal diseases, still major world-wide killers.

This is not the proper time to discuss environmental needs in detail. The subject is too large and too important to do it justice in this presentation. Nevertheless, I do want to emphasize the importance of giving priority to those environmental matters most directly related to morbidity and mortality, to stress our increasing

understanding of the interrelationships of environment and life style, and to note how both of the latter affect our leading killers—heart disease and cancer.

Education, customs, and individual examples are all-important in developing good health habits and a sense of personal responsibility for one's health. It does little good to teach schoolchildren that hand-washing after going to the bathroom is important if there is no soap and water in the school bathrooms. Nor does it do much good to try and persuade people that it is *not* necessary to take pills for every minor symptom if the newspapers, radio, and television are full of specious advertising for one magical remedy after another. I view the constant pressure of drug advertising as pernicious, and I believe we would help to avoid drug reactions, to improve health, and to save huge quantities of money if we could take the drastic step of discontinuing all drug advertising. Of course, this would adversely affect the pharmaceutical industry to some extent, but perhaps not so much as one might think. In fact, the president of one of the largest drug manufacturing companies in the world told me personally just three months ago that he would not object to discontinuing such advertising.

The matter of good health habits has received much recent attention. Breslow, one of the great leaders in preconizing prevention, has pointed out the importance of a regime of simple health habits in preventing heart disease. It is exceedingly difficult to change health habits, but it seems clear that the examples set by leaders and by persons who are admired is probably more important than pamphlets or lectures. This is nowhere better illustrated than in the case of cigarette smoking. The dangers of smoking and its relation to lung cancer, emphysema, and heart disease have been clearly demonstrated. Yet there has been only minor change, if any, in the number of people smoking. One can argue that it is

difficult for a confirmed smoker to stop, but it hardly seems likely that the young would continue to start smoking unless they were imitating someone else. A good example of this health education problem is given by what happened at a high school in Ann Arbor, Michigan, where I live, when the Surgeon General first issued the report condemning cigarette smoking. Instead of turning against smoking, many students equated its dangers with maturity, saying such things as "Anyone can stop smoking, but it takes a *man* to face lung cancer!"

Personal health care, the third great avenue for preventive activities, seeks both to forestall the initial occurrence of disease, through anticipatory measures, and to lessen the consequences of disease, through early detection and prompt treatment where effective treatment is available. To achieve these objectives, a society must possess a health care system which recognizes the importance of prevention and which provides more than just a "complaint-response" mechanism. Assignment of priority to development of broader and more comprehensive public health plans has recently become a focal point of WHO attention and interest—especially with regard to the way such plans may be carried out in various parts of the world.

### **Primary Care: The Examples of Cuba and China**

Wide variations are possible in primary care systems. Consider, for example, the cases of China and Cuba. In China the first level of care is provided by the "barefoot doctor"—a worker or peasant who has received minimal basic training in the essentials of first-level medicine, including preventive activities. Though selection and training of barefoot doctors are interesting

subjects for study, these procedures are not unique. What is unusual is the system under which these part-time peasant and worker doctors can refer serious-seeming cases to centers with better-trained personnel and more sophisticated resources. It is not unusual to find large city or provincial hospitals handling complicated cases referred to them by barefoot doctors. It is also worth noting that this overall approach was emphasized in the widely circulated dicta of Chairman Mao, whose first two health priorities were "Stress prevention" and "Stress rural health."

In contrast, primary care in Cuba takes quite a different tack. The Cubans also have an interrelated multilevel system including everything from rural clinics to advanced urban centers, but their first level of care is provided by teams of physicians and nurses trained in the "primary" specialties. Each such group includes an internist, a pediatrician, a gynecologist-obstetrician, and a part-time psychiatrist. Each physician works with a nurse, so that the patients become accustomed to seeing one or the other, as indicated. Preventive activities are a paramount concern of these teams, which use each patient's record for close follow-up of health conditions and for carrying out desirable preventive procedures at the proper time. This whole approach clearly requires extensive preparation of health personnel well-indoctrinated about the basic importance of prevention. Cuban medical schools were expanded and reoriented for this purpose.

These are just two examples. There are many other plans, in both developing and relatively more developed countries, which have the comprehensive goal of providing complete first-level care coverage along with referral services, as necessary. The particular plan, I think, is less important than the quality, availability, accessibility, and acceptability of the care it provides, as well as the adoption of a preventive approach.

## Two Types of Preventive Health Care

Preventive health care may be divided into two fundamental types: anticipatory care, such as immunizations given to prevent a disease from ever occurring; and management care, designed to minimize the consequences of a disease which has already begun. The latter type—which involves screening, early diagnosis, and prompt therapy—has aroused particular interest in recent years. This has led, in turn, to the advocacy of annual examinations that are sometimes very elaborate, preemployment examinations, predischarge examinations, and other attempts to evaluate health status.

### *Physical Examinations*

If preventive examinations are to be developed on a meaningful basis, however, these procedures must be scrutinized from the standpoint of their effectiveness and their cost-benefit ratio. Can the examination procedure be extended to all those in need of it? Ought not the choice of procedures be adapted to the needs of different population groups? Can information be obtained in other ways that will avoid using so much expensive medical time?

A significant and too often overlooked contribution to the field of periodic examinations was an exhaustive analysis of school health services in New York City. This work was carried out in the late 1930's by a team headed by Dr. Dorothy Nyswander.

These researchers first considered the effectiveness and productivity of various procedures, not from the standpoint of the "numbers of defects found," but rather in terms of the benefit eventually provided. A particularly critical look was taken at such traditional and hallowed procedures as the annual physical examination, mandated at that time by state law. In most cases these examinations were found to be so routine that they were largely unproductive, with costs far outweighing the benefits received.

An experiment was then designed which clearly showed that guided observations of students by nonmedical personnel could spot cases needing care more quickly and effectively than annual physical examinations. The system of routine annual examinations was completely abandoned and was replaced by a single but more thorough examination of each student entering school; this was followed by additional examinations only when teacher observation plus review by the school nurse suggested the need. The results were enormously better than those produced by annual physicals, and the children derived far greater benefit.

### *Resource Allocation*

An important principle we can derive from Nyswander's study is the need to be selective in one's approach and to adjust one's goals and programs to the resources that are available or likely to become so. In a school system one has, by definition, a teacher. If that teacher can be interested in health problems, he or she can quickly be trained to perform simple screening procedures, such as vision-testing, and can be taught the important symptoms of chronic diseases and poor development. A plan can thus be adapted to the physician time available, recognizing that when physician time is scarce it is better used for training nonmedical personnel than for conducting physical examinations.

This leads us to the next step. Given the basic resources available, how can we best match our knowledge of specialized needs with the kinds of services to be provided? A logical approach is to establish, in the words of Dr. Breslow, a preventive package for various special population groups.

To illustrate this process, I use a grid (Figure 1) with the various population groups to be considered on the vertical axis and the major avenues of approach—the

environment, educational work, personal health care—on the horizontal axis.

The population groups on the vertical axis are ones long known to require certain specific health services, and some of them may have special environmental and educational needs as well. Three of the seven groups (infants and young children, school-age children and adolescents, and the aging) are defined in terms of growth and development; nevertheless, the concept of separation by age should, in fact, be extended further to subdivide those groups in accordance with other characteristics. The whole life-span may thus be divided according to the need of each age group or subgroup for particular procedures. Breslow suggests five-year periods, a reasonable proposal after adolescence if adapted to physiologic rather than chronologic age.

To illustrate how the concept of particular preventive services for special groups might work, two examples are treated in slightly greater detail in Figure 2. This treatment, however, is still neither complete nor exhaustive, being limited to selected comments on recent developments or points of special interest.

### **Maternal Health**

Historically, pregnant women were one of the first groups recognized as a suitable focus for preventive work. On the other hand, the very reason for their separate consideration—the reproductive cycle—suggests that preventive activities ought not to wait until pregnancy has started. Preparation for motherhood needs to begin in the school years and earlier. This is partly because the health care received in infancy and childhood affects bone growth, pelvic adequacy, and thus pregnancy and delivery.

In many parts of the world, including more and less developed countries alike, spectacular declines in maternal mortality have been directly correlated with progress in providing prenatal care. Much of this

Figure 1. A grid of preventive health activities adapted to special groups.

	Environmental measures	Educational measures	Personal health care	
			Anticipatory measures	Early detection and treatment
(1) Pregnant women				
(2) Infants and young children				
(3) School-age children and adolescents				
(4) Working people:				
(4a) Homemakers				
(4b) Agricultural workers				
(5) Groups exposed to special social or environmental conditions				
(6) The Aging				

progress has been achieved through improved nutrition—a key factor in preventing eclampsia—and through arranging for the delivery to occur at a place which will ensure adequate medical treatment, at hand or close by, and maximum protection against infection.

Nevertheless, maternal health programs concerned only with medical care are incomplete. Worldwide tragedies like the thalidomide disaster have driven home the importance of the environment, macro and

micro, for fetal health. Not enough attention has been paid to fetal sensitivity to toxic agents and the consequent need of pregnant women for special protection. The association of birth defects with rubella has shown that virus infections, not all of which behave alike, can pass through the placenta. A multifaceted attack thus needs to be mounted. This should include both general immunization programs against certain virus diseases and the protection of pregnant women, particularly those in industry,

Figure 2. Examples of some entries on a grid of preventive health activities.

	Environmental measures	Educational measures	Personal health care	
			Anticipatory measures	Early detection and treatment
(1) Pregnant women	Avoid exposure to substances or medicines toxic to fetus Avoid exposure to virus diseases like rubella Arrange for a safe site for delivery Ensure adequate protein intake	Knowledge about fetal and child growth Knowledge of freedoms and precautions of pregnancy Preparation for childbirth Understanding of dangers of cigarette smoking Knowledge of nutritional needs and the advantages of breast feeding	Rh immunization if necessary Tetanus booster	Early initial evaluation, including pelvic measurement and blood and urine analysis Regular assessment of weight, blood pressure, and urine
(4b) Agricultural workers	Protect against pesticides Protect against heat and sun Promote use of safe implements and machinery	Promotion of accident prevention Understanding of insecticide and fertilizer toxicity	Tetanus immunization	Regular review of suspicious symptoms Periodic screening, according to age group, for blood pressure and electrocardiogram For women: periodic Pap smear and breast examination For children: according to age group

against exposure to toxic substances in the materials they touch, the air they breathe, the water they drink, and the food they eat.

Prenatal nutrition has received increasing attention as we have learned more about the influence of intrauterine nutrition on fetal development. Among other things, we now know that nutrition during the period of most active brain growth is a key determining factor in the development of mental and physical ability.

In addition, it would seem obvious that a safe environment for delivery is essential. Recently there has been renewed interest in utilizing the home because it is a warmer, friendlier, quieter place than the often impersonal hospital. The home *can* be satisfactory, but only if physical facilities are adequate and if specialized consultation and backup services are readily available in the event of complications.

Pregnancy is a period when most mothers are receptive to education about both themselves and their children. This is an excellent time for instruction in birth planning, an essential concept for the mother who wants the best for her children and family.

Turning to anticipatory health care services, perhaps the best-established measures involved here are immunizations. To cite one striking example, a new frontier in prevention has been opened up by our growing understanding of erythroblastosis fetalis, a severe and often fatal anemia of the newborn. The disease itself was recognized only as recently as 1930, after blood incompatibility relating to the Rh factor was discovered. What happens is that when the father is Rh-positive and the mother Rh-negative the first pregnancy is unaffected, but the mother is sensitized and further pregnancies may suffer. Treatment is difficult and frequently unsatisfactory. On the other hand, it was recently found that if an adequate diagnosis is made of the situation prenatally, then it is possible to immunize the mother immediately after delivery and protect the next pregnancy.

This is a wonderful example of a disease that can be prevented when the underlying physiologic cause is recognized and the necessary specific action is taken in time. Primary prevention of the disease can be achieved by screening early and by instituting preventive immunization at the proper time.

### Occupational Health

In choosing a second example I am influenced by the place of this meeting. In preparing for my presentation, I read much of the diary notes of that great President of Mexico, Lázaro Cárdenas, who has always been one of my heroes. Not only did I find that Dr. Gustavo Baz, with whose name I am honored to be linked on this occasion, was President Cárdenas' surgeon but that on a visit to this state of Sonora in 1939 he became involved in the problem of silicosis in the miners of Cananea. It is characteristic of his interest in the common man that he was so concerned about the health of workers.

Occupational health and work hazards have received enormously increased attention over the past few years. I prefer to define occupations broadly, as indicated by the reference to "homemaker" (the world's most common occupation) in Figure 1; and I should like to comment here on the next most frequent, agriculture, which is of special interest to the United States-Mexico border region.

Environmental safety has always been a crucial problem in agriculture, but the hazards have now grown greater. Many people fail to realize that there were more injuries and deaths at the turn of the century from agricultural accidents than there are today from automobiles. Yet today there is still a fundamental need for protection against dangerous agricultural implements and machinery, and there continues to be a need for protection against the sun and heat, as there has been from time im-



memorial. Now we have the additional need for protection against man-made hazards such as pesticides and certain fertilizers, which are essential for maximum yields but which require careful handling to protect the human beings who apply them.

Even the Romans of the second century AD knew that miners could acquire chronic diseases from their working environment. Today, while lung diseases of miners are still important, our new and greater concern is with malignant neoplasms induced by chemicals added to the air, to food, and to other parts of the environment in contact with man. Preventive work in this area requires both careful laboratory pre-testing and a system for monitoring effects once a chemical has been introduced into our surroundings. Such chemical additives are vital to the agricultural improvement that the world depends upon, so the task is to draw the fine line that sets off those chemicals too dangerous to use.

Farm workers appear to have an even greater need for health education than does the overall population, because of the inherent isolation of rural areas and because of the farm workers' greater dependence upon their own resources. For these reasons they should be especially well-informed, not only about special problems involving pesticides and diseases transmitted from animals to man, but also about their own bodies, common diseases, and the reasonable limits of self-reliance. Among the many obstacles to be overcome in providing such information, one of the greatest is the relatively high rate of illiteracy in rural areas.

It is also true that workers in general have a special need for certain kinds of health services related to their occupations. This field is generally spoken of as "occupational medicine." There is, however, another possible approach—that of using the workplace as a focus for *all* medical care. Most companies in the developed countries are hesitant to get into this, but the Chinese

experience is directly relevant. To be sure, in Chinese society everyone works, making it less difficult to concentrate health services at the workplace. Organization of such services is relatively simple at large enterprises, where a health center can keep records on everyone connected with the establishment. Small industries, small farms, and migrant workers obviously present great difficulties, but these problems should not be insoluble, and the advantages of utilizing the workplace for this purpose are many.

### **Border Health Work**

Occupational health also provides a logical way to turn the discussion back to the other frontier, the geographic one between Mexico and the United States. One of the unusual features of this frontier is the frequency with which migrant workers cross it, either for the working day or for longer periods. Even now, however, I suspect that most border guards do not think much about the health of the migrant, regarding him only as a potential source of disease. That is, they probably take the traditional view of the frontier as a barrier to infection. Historically, quarantine has been looked on as an almost military type defense, and only in recent years has the futility of thinking that this quarantine approach would solve all problems become evident. The Pan American Health Organization and the World Health Organization have worked hard to make the International Health Regulations practical, and the list of notifiable diseases contained therein has become shorter and shorter. Many now believe the usefulness of this list and of the quarantine approach is nearing an end.

What is obviously of much greater importance is the parallel development of cooperation across the border for general improvement of people's health. This is better prevention—an attack at the source of the problem—and it is more conducive to

achieving that level of good health which, in the words of the preamble to the WHO Constitution, is "fundamental to the attainment of peace and security."

In emphasizing these facts I am saying nothing new, for one of the great glories of this border has been the evidence of collaboration by the two sides. I recall many years ago hearing how a new health unit on the Mexican side had arranged to carry out laboratory tests for a U.S. county health center that was more poorly endowed. Extension of such collaborative efforts is clearly to be desired.

What is unique on this frontier, compared with frontiers in other parts of the world, is the presence of the United States - Mexico Border Public Health Association — a voluntary association to stimulate and expand governmental efforts and with wide membership on both sides of the border. This voluntary association—made up of both health professionals and nonprofessionals—has a strong potential for continuing to spread its influence in the future. I have in mind such activities as the establishment of regional task forces or the drafting of comprehensive reports at the annual meeting—so that the actual instances of collaboration could be systematically documented in terms of the priority areas defined by the association's governing bodies. My experience suggests that when one has the responsibility for reporting regularly, this can be a stimulus to increased—and increasingly productive—activity. In this vein, I feel that the U.S.-Mexico Border Public Health Association could give renewed emphasis to a comprehensive approach to prevention, and it is this comprehensiveness that I wish to stress.

For example, would it be useful to set up continuing meetings with representatives of the immigration and customs authorities on

both sides of the border to review additional possibilities for contributing to public health programs? This suggestion is made, to be sure, in ignorance of how easy or difficult it is to work with authorities who carry out essentially police functions. Nevertheless, customs and immigration officials are people interested in their own health, and I suspect their interest in other aspects of health programs could be aroused.

### Conclusions

In summary, I have tried to emphasize that the new frontier in health is directed at development of a comprehensive approach to prevention. This approach should involve subprograms targeted at specific groups, and tailored to their needs. Such groups, in turn, should be defined in terms of age, development, physiologic status, occupation, or other criteria. It is especially important that the overall program be a balanced one that covers both preventive and curative measures and that concerns itself with the environment, with education, and with personal health care.

Two quotations from English poets strike me as being related to our topic. Alexander Pope cautioned a careful approach to innovative concepts, an approach which has considerable merit in controlling rash acceptance of unsupported ideas. Pope said,

"Be not the first by whom the new is tried,  
Nor yet the last to lay the old aside."

Pope's advice is appealing, but if taken literally it could mean an end to progress. Perhaps what is needed is to consider Pope's counsel along with Browning's:

"A man's reach should exceed his grasp,  
Or else what's Heaven for?"

## SUMMARY

An address to a frontier organization invites attention to new frontiers of prevention as well as to the health problems, and the opportunities, inherent in a geographic frontier. At the forefront of today's preventive strategy is a comprehensive approach which, without slackening the search for new techniques and resources, is adjusted realistically to current needs and current capabilities.

Health requirements of all the population include concern with the environment, with education regarding health, and with personal health services. To cite selected examples, more attention to adequate water supplies is still at the heart of the attack on diarrheal disease, a major worldwide killer. Ineffectiveness of past health education efforts is illustrated in how easily we succumb to excessive drug advertising.

An effective health care system must be active in prevention and not just be a complaint-response mechanism. Newer emphasis on primary care involves such a concept, which may be contained in systems varying as widely as that in China, where it is based on the "barefoot

doctor," to that in Cuba, based on teams of fully trained doctors and nurses. The specific system in any country is probably less important than the quality, availability, accessibility, and acceptability of the care provided—and the adoption of a preventive approach.

Preventive health strategy is best implemented by a targeted approach to the various specific groups of the population—a technique often called the preventive package. Detailed measures may be subsumed under the major headings of environment, education, and health service. For example, pregnant mothers and their unborn children need to be protected against environmental exposure to viruses and chemical toxins; are influenced by the education for motherhood received before, during and after pregnancy; and are affected by preventive health care received in the mother's own childhood.

Health workers on both sides in a border area may find innovative ways to combine their efforts as they work with non-health officials concerned with normal intensive behavior.