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"Smallpox Eradication - A Lesson for Preventive Health Care"

by

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On May 8, this year, The World Health Assembly meeting in Geneva formally declared "The world and all its peoples have won freedom from smallpox ... a most devastating disease sweeping in epidemic form through many countries since earliest times, leaving death, blindness and disfigurement in its wake." The Assembly recommended that "smallpox vaccination should be discontinued in every country except for investigators at special risk" and that "an international certificate of vaccination against smallpox should no longer be required of any traveler." So concluded the first successful program for the global eradication of a disease - a disease which antedated written history and which, through the centuries, proved to be the most devastating disease known to mankind.

Disease killed > 90% of its victims - like measles, could be transmitted easily in the early days of settlement. Essentially everyone in the Americas had the disease. No one in Central Europe. ~~It spread to the Americas~~

In the Americas, lest we forget, its impact was no less. It was brought to the Americas in 1520 and within decades had all but destroyed both the Aztec and Incan civilizations. A contemporary historian wrote of the first epidemics: "When the smallpox began to attack the (native population), it became so great a pestilence among them throughout the land that in most provinces more than half the population died ... they died in heaps Many others died of starvation, because, as they were all taken sick at once, they could not care for each other, nor was there anyone to give them bread or anything else. In many places, everyone in a house died, and as it was impossible to bury the great number of dead, they pulled down the houses over them..." Mexico's population which was over 30 million when the smallpox arrived with Cortez, was reduced by 90% - to only 3 million less than 50 years later. In North America, the devastation was no less. You will recall that early settlers experienced comparatively

*Just. ...
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little opposition from native populations. This is not because the settlers were so welcome. Rather, it was because smallpox literally decimated tribes soon after contact with the settlers. All too soon, there were too few Indians to seriously oppose annexation of their lands.

Despite Jenner's epochal discovery of the first vaccine in 1796 and its rapid dissemination throughout the world, control of the disease proved to be difficult. ^{vaccine - poor quality - ...} More than 175 years later, when we began the WHO global eradication campaign, an estimated 10 to 15 million cases were still occurring annually. Forty-seven countries experienced cases in 1967 that first year of the campaign and in 33 countries smallpox was endemic. More than one billion people still lived in endemic areas. The target established by the World Health Assembly was to achieve eradication in 10 years. Gradually, the program gained momentum and year by year, country after country eliminated smallpox. ^{Oct 26 1977} Indeed, the last case occurred just 10 years, 9 months and 26 days after the program began.

^{Plan for vaccination & surveillance have asked - are you aware, - ... etc.}
^{Two years. enough reward. Int'l commission. Global commission}
^{Annuit} It was a dramatic victory. But was it a meaningful advance in the

broader field of disease prevention or a unique event without further application?

It is surprising to me today to hear individuals assert it was the latter - that we have little or nothing to learn from the smallpox program, that our goal today is primary health care and that the lessons learned from a targeted program such as smallpox eradication are irrelevant. In fact, the question is not infrequently asked as to how the program could possibly have failed given highly motivated national governments, an army of health workers, and an all but inexhaustible supply of funds.

Let me first deal with this figment of latter day mythology, as the question of possible application is relevant. Global smallpox eradication - what might now seem to have been so simple and so certain - was regarded as anything but that in 1966, when the program was decided

by the World Health Assembly. At that time, there probably was not more than a handful who believed it to be a realistic goal. The Director-General of WHO himself, both privately and publicly, stated repeatedly that smallpox eradication was impossible. Only one of WHO's Regional Directors supported the program at that time. The scientific community, the public health community were no less persuaded or committed. National governments were concerned about smallpox, no question, but few were anxious to mobilize resources for an eradication program which all seemed so certain to be doomed to failure. Illustrative of WHO's attitude is that those of us in the Smallpox Eradication Unit were explicitly instructed never to refer publicly to the ten-year time target which the Assembly had suggested since it was believed that this target would inevitably prove to be embarrassing to WHO and its member countries.

Stephenson - not remembered.

Financial support for the smallpox program was modest indeed. The regular budget of WHO provided \$2.5 million. If you divide that by 50, the number of countries in which programs had to be conducted, you will realize that this amounts to only \$50,000 per country. We actively solicited donations and many eventually were received. They were extremely difficult to obtain. How much international assistance was provided? Including the amount from WHO's regular budget, from bilateral contributions, from contributions of vaccine to WHO, the total amount of international support of all types averaged just over \$8.0 million per year. It was pathetically little - less than half of what was being spent, for example, in one year in Ethiopia for malaria eradication alone. At present construction costs, it would have served to build one 40-bed hospital in the United States. ~~to build a 40-bed hospital~~ *to build a 40-bed hospital* Through cost-benefit analyses, the ultimate analytic yardstick of the economist administrators, it was possible to demonstrate clearly that eradication and the cessation of smallpox vaccination would result in savings exceeding one billion dollars annually. One would assume that such an argument would have been decisive. It was not. One could only conclude that the economists analyze program costs and benefits to support a preconception, not to examine the relative merit of health interventions.

With so little money available, there was no choice but to depend heavily on the development of full participation of those in the existing health services. I was always amused when I was asked as to what the hundreds of thousands of smallpox workers would do when smallpox was eradicated. The armies of smallpox workers never existed. Staff exclusively devoted to smallpox were, at most, a few thousand persons. Surprisingly, however, we did find in country after country substantial numbers of health staff on government payrolls without real supervision or direction, with minimal or no drugs, vaccines or equipment, who were disillusioned and disinterested. I would say candidly that it was exceptional to find health staff who were performing at more than 5% to 10% of capacity. For them to devote time to smallpox diverted few for long from productive work.

In brief, the smallpox eradication campaign was one with limited resources both in terms of funds and assigned manpower and initially without strong commitment from either international or national authorities. Moreover, the WHO headquarters unit was comprised of just four medical officers and at no time were there more than 125 international staff working in the program. It is all too apparent that smallpox eradication was achieved primarily through the efforts of national health staff, largely dependant on national resources. Just 10 years were required.

Now the question is asked: "Are there not other problems which might be attacked in the same manner"? My answer is "no." No two health problems can be dealt with in an identical manner but there are a number of principles which are directly applicable to the health problems we face today.

First and foremost is to recognize that prevention is usually, perhaps not invariably, but usually, far less expensive than treatment. With smallpox, a decision might have been made to construct sufficient hospital beds to care for those ill with the disease. Approximately 1,000 five-hundred bed hospitals would have been needed. For the entire amount spent on the program, we might have built ^{or} ~~a few~~ such hospitals.

Now, certainly, none in their right minds would have proposed this as an alternative. Or would they? We've chosen precisely this alternative today with respect to other diseases. I can take you to hospitals where there are entire wards devoted specifically to diphtheria, tetanus, measles, whooping cough, typhoid - to mention only a few of the obvious - all wholly preventable and at far lower dollar cost (leave suffering aside) than it would take to prevent these diseases.

I'm sure that none of your patients, so well protected, would be in those wards. Your natural response is understandably to say why don't those irresponsible parents get their children vaccinated? In brief, it really isn't your problem. Or is it?

Who are your patients? From the days of the medicine man and the barber surgeon, persons in need of help have sought out a specialist who, hopefully, with drugs, incantations, magic spells or surgery could ameliorate their ills. The responsibility of the physician or the witch doctor was to do the best he could for those who sought help. Medical practice has been a problem-solving exercise involving an individual seeking help and the cure or rehabilitation of a damaged part of his anatomy - a broken leg, a malfunctioning heart, a diseased throat. And perhaps this is not surprising for if one turns back the clock say 50 years, the medical armamentarium was limited - effective interventions were few. Supportive therapy was the best that could be offered to most patients seeking help and this, ^{being not} ~~at least~~ ^{theoretically}, was best done in a one on one situation. At that time, the potential for prevention of disease was limited.

Improved water systems, the pasteurization of milk, and better sanitation served to prevent many illnesses. However, these were primarily the province of city planners and engineers. Nutritional education was undertaken by a variety of groups but the physician himself played a modest role. Smallpox and diphtheria vaccines were available to the practitioner but 50 years ago, surprisingly few were vaccinated. In 1930, only 10 states had compulsory smallpox vaccination laws and a nationwide survey conducted in the 1928-31 period revealed that only 40

percent of the U.S. population had ever been vaccinated, many if not most of these in programs executed by public health authorities. My point is simply this - that historically those served by medical practitioners have been those who specifically sought their services. The primitive state of biomedical science dictated this. However, during recent decades, progress has occurred at a logarithmic rate. The potential for the prevention of disease has likewise changed dramatically but the characteristics of medical practise ~~and the methods for remuneration of services~~ have largely remained mired in the past. ^{if} ~~the methods for remuneration of services~~ ^{have changed.}

The name of your organization, embracing the phrase, "Family Physicians" implies a recognition that the well-being of the entire family, not simply the sick individual, is ~~your~~ your concern. But can you stop there? Is not the future of medicine, of your association, a concern for the community at large?

Impressive to us throughout the smallpox eradication program was the all but total lack of interest in the program on the part of those engaged in curative medicine. It is a tragic indictment but valid. Of the many health centers I visited in so many countries, few offered the simplest of all preventive measures - vaccination. I well recall a visit which I made to West Azerbaijan, a province of Iran, in 1972. This was the site of WHO's premier model primary health care service. Well-equipped and well-staffed health centers were situated throughout the province. Major smallpox epidemics were occurring throughout the area, the first in more than a decade. I stopped at several centers to inquire about their vaccination policy. Were they vaccinating everyone who attended, only those without a vaccination scar, or whom? The astonishing reply was that there simply were too many sick people to be seen to spend time vaccinating people. I demonstrated the method whereby, in a matter of 8 seconds, each person seen could be vaccinated. There was no interest. They simply didn't regard the epidemic as their problem.

Or the health center in Afghanistan with two people explicitly assigned to perform vaccination. I asked as to how many they were

vaccinating - the reply was about 50 - each week! Not two miles away was a town of 20,000 which the health center supposedly served and where continuing major outbreaks of smallpox were occurring. I suggested that perhaps they might more profitably spend perhaps 3 to 4 days each week proceeding from house to house vaccinating the residents. I was curtly informed that if they did this, people would expect health center staff to work in the village and that people would no longer travel to the health center where they could receive "proper care."

If the curative services in their traditional roles played an inconsequential role - and, regrettably, they did, what was effective? There is a distinction to be made between the provision of curative services and preventive services. It is obvious but rarely discussed. For curative medicine, the afflicted individual seeks relief for an immediately pressing problem. A mother will carry a baby 5, 10 or even 20 miles to a health center if the baby has a broken leg. However, in the delivery of preventive services, one is asking the individual to take some action to prevent an illness or condition which is usually not an immediate threat. Thus, in the smallpox eradication program, it was rare to obtain adequate vaccination coverage among residents living more than one or two miles from a health center, even when an active health education program was mounted.

A stark parallel illustrates this more vividly. In an area where there is starvation, one can establish food distribution centers which are inconveniently located, where the people wait for hours under the most miserable of conditions and then are brusquely and unsympathetically dealt with. Most health centers and many clinics in this country can be so categorized. Let us suppose that the Colgate-Palmolive Company distributed fluoridated toothpaste in the same manner. That instead of advertising the product, of making it readily available at innumerable accessible locations, it established six or eight distribution centers in a city like this and expected the people to wait for hours in an unkempt, crowded waiting room to receive a tube of toothpaste. Or, let us suppose that they had depended exclusively on practitioners of pedi-

atrices and dentists to convey the message that this was an effective preventive measure and relied on them to distribute the product. How much would be used today? You know and I know - practically none.

Preventive medicine requires an active program of marketing and merchandising, a quite different set of activities than is required for the delivery of ^{curative} services. We found that the Fuller Brush Company and the Coca-Cola organization had much that was instructive to us in terms of advertising and distribution of the product. In planning for the vaccination of a village, it was customary to meet first with village elders, women's health committees and other groups to explain the program and to enlist their support. Plainly, this was advertising. When the vaccination teams visited, they sometimes vaccinated house by house or at collecting points not far distant from the villagers' houses. Commonly, they vaccinated early in the morning and in the evening at times most convenient to the villagers. Waiting periods were brief. Independent assessment of vaccination coverage was routine and rarely was coverage below 90 percent.

Vaccination is only one of many possible interventions in the field of preventive medicine and the ^{optional} means for effective application of such measures must increasingly rely on marketing and merchandising if they are to be effective. But there are other interventions for which such a model is not applicable - for example, the prevention of death and disability in motorcycle accidents, the reduction of assaults with handguns, or the prevention of unwanted teenage pregnancies. Here, we are dealing with problems in which social behavior and political focus play an important role. What should be the mission of the medical profession in today's world and tomorrow's? To apply splints and band-aids to the damaged organs of the victim or to play a role in preventing the injury? If programs in prevention are to be successful, I believe it is imperative that the medical profession reconsider its mission. Can it continue to function essentially as a turn of the century "mom and pop" grocery store? Serving only those who choose to visit? Dealing with each individual one-by-one? Or will we begin to consider the community's health problems as its provenance? And will

it begin to deal effectively with measures to prevent disease rather than curing it?

If leadership in prevention does not come from within medicine, I fear it will come, as increasingly it already seems to be, from public health managers. Now, I wholly support the full and active participation of persons with a variety of disciplinary skills playing a role in both preventive and curative medicine. But, without a broader understanding of the science of medicine and epidemiology, what choices will they make? Essentially those which are intended to manage an existing system better. If I may illustrate from the smallpox eradication program, we originally set out in each country to develop a 2- to 3-year mass vaccination program. When this was completed and disease incidence was greatly reduced, we expected that a special program of surveillance and containment of outbreaks would eliminate the residual foci. Had we pursued this strategy unchanged, I suspect we would have developed far more efficient vaccination programs in most countries. In some, however, because of primitive health services, political turmoil and recurring natural catastrophes, I suspect we would still be struggling today with still insufficient resources and a progressively demoralized program staff. Fortunately, capable epidemiologists were working in the field from its inception. In 1967, Foege, assigned in eastern Nigeria, arrived well before most of the supplies intended for the mass vaccination campaign. Utilizing such resources as he had or could beg, borrow or steal, he organized a primitive but effective reporting system and began intensive vaccination in villages where cases were occurring. By tracing the source of infection of each case, he identified other villages and repeated the process. By the time the supplies arrived, he could find no more smallpox. He then organized a vaccination survey to determine how well the population was vaccinated. To his amazement and ours, he found that less than half the population had a vaccination scar, indicating successful vaccination at any time during their lives. We had thought we would need vaccination levels of 80% or more to permit smallpox to be eliminated. Similar studies in Indonesia and Brazil supported the belief that the basic strategy of the program itself should be changed from one which emphasized mass vaccination to

a strategy which from the first, emphasized the detection and elimination of outbreaks. This was but one example of many in which continuing epidemiological studies of smallpox radically changed the operational nature of the program. It is an apt illustration of the need for continuing program assessment utilizing scientific expertise. A more efficient use of resources within the constraints of our original strategy could never have succeeded.

A lesson for the health field comes from a recent perceptive analysis of the current malaise in American business. This was published last summer in the Harvard Business Review. The authors examine the possible reasons for a documented increasing productivity among European industries, while American industry has tended to stagnate. A principal reason identified by the authors is that the United States has increasingly turned to the professional manager - an individual with no special expertise in any particular industry or technology who is expected to step into a position and run it successfully. In American business, these are accountants and lawyers whose energies are directed toward realization of quick profits, cash management and corporate mergers. Lost in the equation is the technical understanding and vision to identify innovative directions and to alter established strategies.

If we are to make real progress in the field of health, especially in the implementation of an ever broader available range of preventive measures, real leadership will be required. But this will require a different sort of participation on the part of the medical community than has been the pattern of the past. It inevitably will require that the scope of concern be broadened from that small group of people daily trudging to a doctor's office or even the families of those who do. It will require that each of us assume as the basis of our concern the community within which we live. It will require an active involvement with the political process to assure that the best possible legislation is passed. It will require a greater and more willing participation in community-wide programs of treatment and prevention. This is not the role communicated to us during medical school and it is not the role which most in

medical practice currently play. But for the future, if you continue to ask yourselves the question "Who are my patients?" and your reply is that the asbestos worker dying of mesothelioma is not, that the child permanently crippled by measles encephalitis is not, that the decerebrate boy injured in a motorcycle accident is not, then others, less qualified, will accept these patients ^{the responsibility for preventing these occurrences} and those in curative medicine will serve only as skilled ~~auxiliaries, as auto~~ mechanics, when what is needed is ^{and} a better health program >

Smallpox, happily, is finished but the challenges ^{and opportunities for} ~~of~~ better programs in preventive medicine are really just beginning to become evident. ~~People~~ ^{and Jim} who ^{truly} are serving in the front lines of medicine could make ^{an extraordinary} difference - The broader your horizons, however, the ^{more significant} ~~greater~~ will be your contribution.