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The Second Public Health Revolution

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I am grateful to you for your kind invitation to address this distinguished scientific community - a community which over 30 years I have come to know and respect as friends and colleagues. I hope you will pardon a few personal references but it was just 30 years ago that Dr. T.P. Jain and I became classmates together at Johns Hopkins and I first learned of a wonderful, historic and culturally rich area called Rajasthan. Some ten years later, as Director of WHO's global smallpox program, I became a frequent visitor as Rajasthan struggled with its last major epidemic of smallpox and brilliantly overcame it. Dr. Jagdeer and many of his colleagues who are here tonight were true heroes in that epic struggle which set the stage for the end of smallpox in all of Asia. And soon thereafter, I was introduced to a dynamic, imaginative man who tirelessly sought new challenges for this medical school and seemed to be constantly in motion undertaking three or four tasks simultaneously - Dr. Rameshwar Sharma. And finally, as Dean at Johns Hopkins, I had the privilege of getting to know a profoundly thoughtful and intelligent postgraduate student from India who was committed to the question of a better world and better India and who spent many hours with me in talking about how this might be achieved - and this was Dr. Ashok Agarwal. Finally, over the past four years, I have come to know a dynamic young group of faculty at the IIHMR who are

destined to play a leading role in India and indeed throughout the world in the delivery of health services.

As a regular visitor to India and to Rajasthan, I am particularly impressed by the accelerating progress and change which is everywhere visible. You have a right to take pride in these accomplishments. But, both here and in other countries, there is one sector of the economy, of life and culture, which is not keeping pace with development - and that is the field of health. However, the process of change has begun - and certainly it will accelerate. Over the next two decades, in both this and other countries, we are destined to witness a profound revolution in health and in health care delivery more dramatic than has occurred over the past century.

This may seem a startling statement to many of you. Why should this be? Over the past generation, the medical world - indeed the world at large, has had occasion to celebrate one medical miracle after another. New antibiotics - organ transplants - new diagnostic methods of ultrasound and magnetic resonant imaging. We have learned to probe the innermost workings of the cell, to dissect viruses and individual genomes. Indeed, a multi-billion dollar project will soon be launched to map the human genome itself. A paper published only last week suggests that the virus of multiple sclerosis has been identified - a contribution of one of your own countrymen, by the way. Renal stones can now be broken up with a new machine - the lithotripler; myocardial thromboses are being dissolved by drugs; burn patients are being treated with sheets of their own cells cultured *in vitro*. And, as we all know, hundreds of billions

of dollars have been invested and are being invested in new hospitals and treatment facilities.

To the press and to much of the more privileged world, it has been a bright new world of promise and realization with no horizons in sight. But, dark clouds have begun to appear. The nuclear accident at Chernobyl demonstrated only too vividly that modern technology is a two-edged sword and that we neither understand nor are we prepared to deal with the environmental problems of an advanced industrial age. The release of methylisocyanate at Bhopal was yet another horrendous disaster which at least some now acknowledge is only the portent of other serious accidents which are certain to occur - and against which no country is immune. And, finally, there came on the scene a new virus - called the human immunodeficiency virus - the cause of AIDS. And this has served to humble us all. Whatever the extent and brilliance of our biomedical research, there is, as yet only one, extremely costly drug available to treat the disease - and, at best, this extends life by perhaps six to twelve months. Despite optimistic rhetoric as much as four years ago, there is no promising vaccine and there are theoretical reasons to suggest that none can be created, barring a breakthrough of Nobel Prize stature.

Prevention is the only answer and we find a health care structure in our own country and others as well which has little experience or expertise in educating the population about risks; epidemiological studies in most parts of the world have been so woefully inadequate that we still are unsure of how rapidly it is spreading nor indeed do we fully understand

how; and, indeed, one can't be confident in most countries as yet about the safety even of the blood supply. How serious is the problem? Today, in one East African country, 25% of all women are infected - as are 30-50% of the babies they deliver. One-half of all hospital patients are there because of AIDS. The consensus is that essentially all who are infected will die from consequences of the disease. And the disease is spreading.

As no other event, AIDS has said to all of us that we need far more than our present curative care system of hospitals and doctors, for they can do no more than treat the sick and dying. We must have a public health system to understand how the disease spreads and to implement effective measures to prevent such spread.

Our attention over the past 30+ years has been almost wholly on curative medicine - public health has been all but forgotten. In illustration, I would note that since independence India's medical schools have increased from 17 to more than 125. Its schools of public health have remained at one. However, only during the past decade, we have begun to develop strategies which deal effectively and practically with some of the major health conditions, especially in the developing countries. As was the case in the industrialized countries before World War II, these are primarily community-based programs. The most important of these activities are presently embraced within a program called the "Child Survival Revolution." It is a universal effort in which nations throughout the world are participating, joined by such disparate groups as the World Bank, UNICEF, WHO, the regional development banks and by

Rotary International. Although much remains to be done, dramatic progress has already been made and more can be foreseen over the decade ahead. Surprisingly, however, the program and its achievements are, as yet, little appreciated. Its genesis, rationale and progress are important to understand as they represent the foundation for future applications of science and technology.

The Child Survival Revolution recognizes and incorporates the potential of simple, inexpensive community-wide interventions to prevent disease and death and to promote the well-being of children.

The genesis of the Child Survival Revolution has its origin in not one but several developments. To identify the most important helps to characterize it. An important component and its foundation, is the planned objective of providing well-established vaccines against six of the major diseases to all of the world's children - the diseases being poliomyelitis, measles, tetanus, whooping cough, diphtheria and tuberculosis. This initiative followed inexorably from the experience gained in smallpox eradication.

The smallpox program, coordinated by WHO, succeeded in only a decade, and at a total cost of less than $8 million per year in international support, in eliminating from the earth one of the most feared diseases known to man. Smallpox was a disease which, when the program began, resulted in more than two million deaths each year despite the fact that an effective vaccine had been known and available for more than a century and a half. However, an intensified program, endorsed by the

World Health Assembly, eradicated the disease in only 10 years, 9 months and 26 days. Indeed, when India made a serious political commitment to eradicate smallpox, it succeeded in less than two years! What accounted for this rapid change? First, was the finding that in most countries, trained health personnel were in surprisingly plentiful supply and that even with moderately effective supervision, they were capable of a remarkably high standard of performance and achievement. The numbers needed to effect change were really very small. In Africa, for example, most programs consisted of only 12 to 100 dedicated smallpox staff. Competent, motivated leadership, even though few in number, and a community-based strategy made the difference. Second was the discovery that villagers, when properly approached, were usually willing, in fact eager, to cooperate in the program and sometimes even could serve as volunteer workers. Third was the finding that a system for the routine notification and investigation of cases and outbreaks could be reasonably easily established and that the findings were invaluable in guiding strategy and in monitoring progress.

It seemed only logical to us that other vaccines might similarly be applied with good effect and, in the course of doing so, might serve to strengthen national health systems. Thus, as the smallpox eradication program was concluding, an Expanded Program of Immunization was launched - in 1974. At that time, less than 5% of all children in developing countries were receiving any of the vaccines which were in common use in the industrialized countries.

In retrospect, it is curious that so little effort had been made to provide vaccination, the single most cost-effective, most innocuous procedure in our entire medical armamentarium - and the simplest to administer. Quite simply, the efficacy of preventive as compared to curative procedures was not appreciated. Existing so-called health-care systems were really sickness care systems, designed to treat persons who asked for help. Gradually, the immunization program gained momentum and over recent years, progress has accelerated. Today, more than 50% of all children in the developing world are being vaccinated although India, I regret to say, is lagging in this effort. Vaccine demand has tripled in the past two years alone; poliomyelitis incidence in the Western Hemisphere has fallen to such low levels that an eradication program has begun with the objective of eliminating poliomyelitis from the hemisphere by the end of 1990. The global objective is a vaccination program which reaches 90% of the world's children by 1990. The task is not yet complete but the result, if successful, translates into the saving of more than 3 million lives annually.

A second and more recent development contributing to the Child Survival Revolution was the discovery that deaths from diarrhea could be sharply reduced if victims received by mouth ample fluids of the proper type. A simple oral rehydration solution comprised of salt and sugar was developed, a discovery in which Johns Hopkins and Indian scientists in Calcutta played a major role. The first 1,000,000 packets of such a mixture were purchased by UNICEF in 1975 and the supply lasted 18 months. Today, more than 1,000,000 packets are used daily. National programs have begun in more than 100 countries and in countries as

diverse as Egypt, the Philippines and Honduras, diarrheal disease mortality has decreased by 50%. Indeed, pediatricians, even in the U.S., are finding that effective oral rehydration, provided early, diminishes the need for hospitalization and intravenous therapy.

A third and more recent development, an intervention which has only begun to be exploited, is based on the discovery by Sommer and his colleagues at Johns Hopkins that the administration of vitamin A once every six months resulted in a dramatic decrease in childhood deaths in Indonesia, deaths due primarily to respiratory disease and diarrhea. Sommer's team administered vitamin A in standard UNICEF capsules to one to six-year-old children in one group of villages; a second group of villages served as a control. The capsules were given once every six months. The capsules cost less than ten cents each. Death rates among children in the control villages were 50% greater than those which received Vitamin A. Laboratory studies showed that vitamin A was vital for the maintenance of the integrity of intestinal and respiratory epithelium and to the immune process, effects which are compromised even among those who are marginally deficient. Vitamin A, previously given for the prevention of blindness, has now been accepted by WHO and UNICEF for widespread use throughout all developing countries.

Meanwhile, another community-based program, one for family planning, has made surprising progress in many parts of the world. I say "surprising: because most of the publicity is given to what yet needs to be done. It is important to recognize that much has already happened. Specifically, little more than 20 years ago, only a few countries had

government-supported family planning programs. Today, 95% have such programs. Total fertility rates have fallen by 33% during the last 25 years and world population growth has declined from 2.0% to 1.5%. However, we need to bear in mind that the female population in the developing countries will grow by 35% over the next 20 years and even if each of them has only two children, the population would continue to grow for 50 years, before stabilizing.

The development of these community-based programs represents a truly revolutionary conceptual change in the provision of health care. The potential of this change has only begun to be realized. Basically, it involves social mobilization. To realize the potential, we need to fully exploit science and technology in three important areas: (1) Biomedical science; (2) communications and computer technology and, (3) behavioral and management sciences. We have begun this task but we are only at the threshold.

Let me be specific. Vaccines which can confer protection for long periods with only one or two inoculations represent, by far, the most effective and inexpensive tools available to us in modern medicine. With the new techniques available to contemporary biomedical science and a rapidly improving knowledge of immune mechanisms, the potential for new vaccines has expanded by light years and the time required for vaccine development has been compressed several fold. Many antigens can now be combined into a single preparation, and some have been made sufficiently stable so as to be able to be kept for long periods at ambient temperatures under tropical conditions such as was the case with

smallpox vaccine. At a recent seminar, it was estimated that more than 50 new vaccines are at different stages of development, at least 6 to 10 of which could be in routine use within the decade. Included among them are vaccines, now actually under field study, which are effective in preventing pregnancy.

Diagnostic reagents, such as monoclonal probes, provide powerful new tools for determining the foci and extent of infection. Although sophisticated in concept, they can be simple indeed to use. These are already proving to be of inestimable value in polio eradication in the Americas and offer new vistas for epidemiological research. A major barrier is the conventional method for inoculating vaccines. The needle and syringe is an antique instrument. However, there is now a simplified jet injector, now moving toward the prototype stage, which could replace the cumbersome needle and syringe. The injector expresses vaccine in a jet under high pressure which passes through the skin. The model now under development would cost perhaps $25 and would be capable of providing thousands of vaccinations per day. I could describe other developments but the key words are simple, inexpensive and more fool-proof under field conditions.

The second generic area for development lies in the field of communication science. There is an urgent need to convey health messages to large, scattered populations speaking many different languages and dialects. Until recently, this has been a major stumbling block. Such communication is essential to gain the cooperation of the populace, indeed, to gain their <u>understanding</u> so that they demand

appropriate health services. Coupled with the problem of communication has been the deterrent of the stuffy, preachy, fuddy-duddy approaches so common among a past generation of health educators. This, too, has begun to change. Radios now are all but universal; television is increasingly widespread; and the use of cassettes and satellite transmission offers bright new vistas which have only begun to be exploited. Contemporary communications scientists are taking to heart the lessons of the commercial world and are beginning to use such as soap operas and popular songs.

Measurement of progress in the community-based health programs demands the creation of a network of reporting centers to measure numbers of cases of disease. For the traditional sickness care systems, such were unnecessary - the meaningful outcome was, quite simply, how the individual patient responded to treatment. A reporting system which uses current data to monitor programs is better known as a surveillance system - and this I must remind you was the key to smallpox eradication both here in India and elsewhere in the world.

Last but not least, there is a need, as never before, for those skilled in the behavioral sciences, cultural anthropology, operations research, economics and management to assess how best to interact with communities, how best to operate and manage programs and how to do this at a cost which is affordable.

The success of the community-based programs of which I speak have yet received comparatively little public attention although they are now

attracting previously unheard of resources from donor agencies. Major investments are now being made by the World Bank as well as the regional banks. Foundations and national agencies are increasing their support and, remarkably Rotary International has pledged to raise $120 million for polio eradication.

As I noted earlier, the Pan-American Health Organization, three years ago, established as a goal, the eradication of polio from the Western Hemisphere by the end of 1990 - only two years hence. How far have they come? During 1988, only 2% of all counties (districts) have reported a case. Data for 1988 indicate that so far, only ten wild polio viruses have been isolated in the whole of the Americas. Undoubtedly more will be isolated but the point has been reached where a substantial reward will now begin to be offered to those reporting and investigating cases of disease from which a wild polio virus is isolated.

Over the past decade, more particularly over the past five years, a revolution has begun to take form - a revolution which is concerned about the health of a whole population rather than about the sickness of individuals. Indeed, it is time for an effort greater than we have ever conceived if we are to deal effectively with the most important health problems, including AIDS.

Physicians will contribute to this effort <u>but</u> they must be part of a larger team which has skills and training which they do not. We need persons who understand a community and how to educate it; how to communicate with modern techniques; how to organize and to manage; how

to decide on the most cost-effective approaches at a time when resources are limited. Indeed the quality of life for us all lies in community-based programs which take into account the epidemiology of disease, which are skilled in quality-control and in mobilizing a host of resources. Hospital and physicians who care for the sick will continue to be needed but the frontiers of health now rest with those who are prepared to deal with issues of family planning, of AIDS, of preventable diseases, of environmental hazards of substance abuse and of sanitation.

You in Jaipur are uniquely blessed to have in your own community an institution specifically designed for the coming decades. The Indian Institute for Health Management Research embraces professionals with the skills I have described and its concerns are the concerns of greatest relevance to the future. Indeed, it is, as yet, one of very few institutions of its kind. However, it cannot do the job alone - it must serve as a catalyst - my advice to you all is to support it and to heed well its advice!