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A Report on Poliomyelitis Eradication and the
Expanded Program on Immunization

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Thank you very much, Dr. Macedo. It is a special pleasure for me to be back among colleagues from PAHO/WHO and to have the opportunity to talk with you this morning about the Expanded Program on Immunization (EPI) and especially about poliomyelitis eradication. I do not know how I can be more eloquent than Dr. Macedo on this subject. As he noted, I have had the privilege for almost four years of serving as Chairman of the Technical Advisory Group (TAG) on EPI, working with Dr. Ciro de Quadros in this effort. For me, this is and has been an extremely exciting and most rewarding experience. We have been meeting every six months with PAHO and national staff from the different countries. Each meeting has been more remarkable and more exciting than the previous one, as we have watched the program progress.

My message to you this morning, is a very straightforward one. It is, quite simply, that we believe the interruption of polio transmission in the whole of the Western Hemisphere is now within our grasp. This could be achieved within the next two to three years. The task will not be an easy one, however. We cannot underestimate its difficulty but we now see clearly that it can be accomplished. Your help and your support are

absolutely vital to this achievement. These conclusions stem from the meeting held in Buenos Aires in early November, a meeting at which most countries reported such exceptional progress that it surprised us all.

Before talking with you about some of the observations made at the Buenos Aires meeting - what they mean and what we see as the task before us - I would like to take just a moment to relate the immunization effort to the broader context of our efforts to promote better health throughout the world. It is important that we understand the reasons as to why the countries decided on an Expanded Program in Immunization, how it developed, how we came to decide that polio eradication was a very feasible proposition and what all of this means to the much broader efforts that we are all making. This is important because there are those who ask: "Why do we have a special immunization program? Why do we have a polio eradication campaign? Is not our principal objective to develop primary health care?" The answer I will offer is that immunization and primary health care programs are not at all incompatible. Indeed, I believe that in conducting the immunization program, in executing the polio eradication campaign, we are exploring new approaches for the delivery of health care which is most appropriate to the 1980s and 1990s, approaches which are very different from those which we have employed since the 1950s and which are far more relevant to the health of the public.

As you are aware, I worked in WHO for 11 years from 1966 to 1977. I traveled widely observing in the field, primary health care activities throughout the world. The observations were first-hand and some a

little more first-hand than I really cared for, particularly during the civil wars in Pakistan, Nigeria and Ethiopia. There were many surprising observations for all of us during this period, some of which pertain today. What we discovered first of all was that few health systems anywhere had more than the slightest vestige of management. Primary health staff were seldom visited by supervisors, supplies and equipment were scarce and reporting of either cases of disease or activities was unusual. If reports were submitted, they were usually filed and forgotten. When our smallpox supervisory teams became operational, they were frequently the only teams in the field - the only teams which came to talk with health staff who were trying to work in the field, to talk with them about what needed to be done and could be done, to talk with them about their needs and problems. It was surprising to all of us to discover that when given vaccine, encouragement and training, how many really dedicated people there were who were prepared to work. Their help aided the smallpox program enormously.

The second observation was that vaccines, if they were available at all, were seldom administered. I recall well being in West Azerbaijan (Iran), which was then WHO's principal demonstration and training center for primary health care, during a major epidemic of smallpox. I visited numerous primary health centers to inquire whether they were vaccinating all who visited the center or those who did not have a vaccination scar or perhaps only those who asked to be vaccinated. The replies, without exception, were "Oh, Doctor we don't have time to vaccinate because we have so many sick people to take care of." Thus, in WHO's premier

primary health care demonstration program no vaccine was being offered at all. To control the epidemic, vaccination was performed by special teams.

The third observation, strange as it may seem, was that at that time very few children in any country were being immunized against any disease except smallpox and tuberculosis. Yet, of all the medical procedures that we have, the very simplest and most cost-effective is vaccination. One has to ask the question: if a health system does not perform immunizations, the simplest and most cost-effective medical procedure, what is it capable of doing?

We talked with health authorities in many countries and what we found was that most countries were not even buying vaccines. They had no immunization programs and indeed, throughout the developing countries, less than 5% of all children were receiving any immunizations at all except for smallpox and tuberculosis for which there were special programs. What were the health services doing? They were primarily providing costly and often ineffective curative care and that is all they were doing.

The fourth observation was that even when primary health center staff were motivated and a good health education program was conducted in the area, it was difficult to get more than 50 to 60% of the children vaccinated in health centers, even within a two-mile radius surrounding the center. Only a portion of the mothers who were asked to bring their children to the health center would come. On the other hand, when we

took the vaccine into the community and enlisted community support, we invariably achieved at least 80% vaccination coverage.

In other words, physicians and health staff, sitting in health centers, stethoscopes in pockets and waiting for people to present themselves, were far less effective than when they took the product to the people. It was all too apparent that community-based programs were needed, that they were uncommon and that we needed to know an awfully lot more about how best to plan and execute them, not only for immunization but for family planning and for many other activities as well.

Finally, there was another serious problem in the 1960s and 70s. International resources being made available for health were few indeed. It was exceedingly difficult to obtain contributions of funds for programs. Few appreciate just how difficult it was. Let me illustrate by pointing out that during the first five years of the smallpox eradication campaign, we received a substantial quantity of vaccine but, in cash, only US \$100,000 from all sources put together. Agencies were then little interested in investing in health programs. During the last five years of smallpox eradication, substantially greater sums of money were received as countries and agencies appreciated that the goal was achievable but even then, activities had to be constrained because of deficient funds.

During the early 70s, it was decided to begin talking with countries about an Expanded Program on Immunization in order to provide to children throughout the world the most cost-effective health

intervention available. It was believed that at the same time, the program could serve as a vehicle to help improve health systems more generally: in management, in organization, in the development of community-based interventions. And indeed this was agreed. The definition of a specific program with stated targets proved attractive to donors and contributions increased rapidly. This should be a lesson to all of us. Many of us forget that in public health, planning and executing programs is only half the task. The other half is that of selling the virtues of the program so as to obtain the needed resources. We often forget this. I remember well when I was at the Centers for Disease Control in Atlanta, we regularly asked for more money for the training of epidemiologists because they were in such short supply. The requests were regularly denied although all agreed that it would be most useful to have many more trained epidemiologists. However, when we asked for more epidemiologists for poliomyelitis or measles control, the only question was that of how many we needed. Today, a similarly disinterested response is common when one asks for funds to strengthen primary health care services, however much they may be needed. But if one asks for funds to accomplish specific goals within the framework of primary health care, the funds are usually more readily provided. If one then uses these funds wisely, there is no reason why the result cannot be strengthened for primary health care services. With the EPI and polio eradication campaigns, I would note that substantial additional funds in the Western Hemisphere are now being received from the Inter-American Development Bank, from Rotary International, from USAID, from UNICEF, PAHO and others. Some of these agencies are supporting health programs for the first time. Without these special

programs, however, I can assure you that available resources would be substantially less.

Worldwide immunization coverage, as you know, has increased to more than ten times what it was a decade ago, more than 50% overall. In the Americas, overall coverage is even better than this. Clearly, PAHO has led the way in this program. There is no question but that this is the best program in any of WHO's regions. Indeed, the European Region is becoming a bit anxious because programs here are progressing better than many in Europe.

These programs, in effect, pay for themselves. Studies in Brazil indicate that the total cost of the polio program is less than the cost of the rehabilitation services which are provided to poliomyelitis patients. Similar studies of costs and benefits have been conducted in other parts of the world which show similar results with respect to tetanus and measles as well as poliomyelitis. In brief, it is less expensive to conduct immunization programs than it is to treat patients.

As the immunization program progressed, a number of scientists raised the possibility of eradicating polio and measles. From the beginning, I was very much a skeptic; I failed to see how this could be done. I remain doubtful with respect to measles until such time as we have a vaccine which can be administered successfully at or near birth. Polio posed a different problem. The oral polio vaccine, in a number of studies in tropical areas, produced less satisfactory antibody responses and poorer levels of protection than in the temperate climates. The

reasons for this are still not clear but, given this problem, eradication seemed most unlikely. Brazil, however, clearly demonstrated that when oral polio vaccine was widely administered, polio incidence declined dramatically - almost to zero - even in the tropical areas of that country. Thus, when Dr. Macedo in 1985, asked an expert group to examine the question of whether poliomyelitis eradication could be achieved in the Americas, all of us agreed that it could be and this was recommended as the target for 1990.

The question is often asked as to why we would want to eradicate poliomyelitis. What difference is this going to make? Will not polio be reintroduced from Asia, from Africa or from Europe? Based on the experience of the United States and Canada, it appears to us that importations of poliomyelitis from other continents are unlikely to occur. There are also epidemiological reasons for believing this. The primary excretors of wild polio viruses are young children. By and large, young children do not travel very much. Those that do travel tend to be from middle and upper socioeconomic groups who are more likely to have been vaccinated in their own countries. When they arrive in another country, they usually are more apt to stay in middle- or upper-income neighborhoods where the children are most likely to have been vaccinated. This is very much like the situation with smallpox and during the course of that program, we saw very few importations of infection from one continent to another. In the Western Hemisphere, in fact, the last importation of smallpox from another continent occurred in 1946. For nearly 30 years, during which smallpox was endemic around

the world, there was not a single importation into the Western Hemisphere.

Thus, it is our belief that if polio transmission is stopped in the Western Hemisphere, it is unlikely to be imported from other continents and if it is, it is very unlikely to spread. However, if the polio virus continues to circulate within the hemisphere, we will continue to have both large and small outbreaks especially in areas where vaccination is most difficult - the lower socioeconomic slum areas in and around cities and rural areas where access is difficult. A concentrated effort over a short period should stop such transmission and with good cooperation, this should be able to be achieved everywhere. Then, there would be no polio at all. The Technical Advisory Group thus believes that this is very much worth doing.

In the course of the last 3-4 years of the program, we have learned a great deal. National and PAHO epidemiologists in the field as well as clinicians and virologists have all contributed to our better understanding of the disease. Our primary objective is to discover all cases of polio. Thus, we are endeavoring to assure that all cases of flaccid paralysis in children under the age of 15 are reported. Can adults get polio? Yes they can, but it is very uncommon. Do all children with flaccid paralysis have polio? No, they do not; there are other causes for flaccid paralysis. However, to assure that we don't miss cases, we begin by asking that all cases of flaccid paralysis be reported. Each is then investigated by a trained epidemiologist and a stool specimen is obtained in order to isolate the virus. A further

evaluation of each case is made 60 days after onset of illness. Tremendous progress has been made in developing this reporting system in most countries of the Americas, although there is more to be done. If this reporting system is developed effectively, then we can begin to collect reports of other diseases of importance and, by this mechanism, begin to monitor what is being done in the improvement of health and begin to develop strategies which best address these problems.

A second problem has been to develop laboratories of assured quality which can isolate and identify the virus from specimens which are submitted. A lot of work has gone into developing such a network. Resources and training have been provided and the laboratories are now being certified by PAHO. Thus, in the course of developing the polio eradication campaign, expanded resources for laboratory diagnosis are becoming available.

In the course of the immunization campaign, we are learning a lot about the conduct of community-based programs. As I mentioned earlier, if one simply waits for children to come to health centers or hospitals to be vaccinated, coverage is poor. This is the experience in all countries and no less in the United States which even today succeeds in vaccinating only 60-70% of children by the age of two years. To obtain the type of coverage which is necessary, we must conduct community-based programs and we need to know better how to do them. We are now learning a lot about this strategy.

What happened at the Buenos Aires meeting? What we learned was a tremendous surprise to us all. Enormous progress had been made in the period of just six months since the preceding meeting. The number of confirmed cases thus far this year numbered only 307 for the whole of the hemisphere, compared to more than 500 during the same period last year. This occurred during the period when the reporting system in most countries was being greatly strengthened. Thus, despite improved reporting, the number of cases declined sharply. Even so, it became apparent that because of the way we have asked that cases be categorized, the actual number of cases is overstated.

The illness most likely to be confused with poliomyelitis is what is called the Guillain-Barré Syndrome, a disease without a known cause that is found in young children as well as adults. It also causes an acute illness with flaccid paralysis but in most cases, it can be clinically differentiated from poliomyelitis. However, expertise is necessary to do this with accuracy. Until the Buenos Aires meeting, we had decided that such cases would be counted as cases of poliomyelitis but it became apparent at that meeting that perhaps half of the recorded cases of poliomyelitis are in fact due to this syndrome. We had a number of excellent neurologists from a number of different countries at the meeting and so a program was worked out to study all cases of flaccid paralysis by a joint team comprised of neurologists and epidemiologists who would review the case and the laboratory information in reaching a diagnosis.

Last year some 453 countries or "municipios," reported cases of polio; this year, less than 200 had done so. This represents less than 2% of all the countries/municipios in the whole of the Americas. Very surprising!

Where are the cases occurring? What we are finding is that most of the cases are occurring in lower socioeconomic areas of urban and periurban areas, primarily the poorest areas. The cases are not back in the mountains or in the jungles. And that perhaps is not surprising. Epidemiologically, polio seems to resemble smallpox. It was in the urban areas where smallpox continued to circulate, only periodically spreading to rural areas, and then dying out. I would note that in Brazil, few smallpox vaccinations were performed in the whole of the Amazon basin until the end of the program. When the teams systematically searched the Amazon, there was no smallpox. It had died out.

Polio, we believe, behaves like smallpox. From the data we have, it now appears that there is no poliomyelitis in the Caribbean and none in the whole of the Southern Cone - Southern Brazil, Argentina, Uruguay, Paraguay, Bolivia and Chile. Intensified surveillance is necessary to confirm this but this is an enormous area which appears to be polio-free.

At the meeting in Buenos Aires, new studies were reported to us by Dr. Olen Kew from the Centers for Disease Control, which were surprising of themselves and have important implications for the program. He

showed by genetic mapping that when he examined polio strains isolated over the past 8-10 years in Mexico and compared these to strains from Brazil, that the strains in each country closely resembled each other but were very different from the strains in the other country.

Likewise, strains from Central America and strains from the Andean Region were uniquely different. What does this mean? What it implies is that polio virus strains do not move readily from place to place even within Latin America. It suggests that when a large area becomes free of polio, it is likely to remain free. Certainly, we must sustain immunization throughout Latin America until eradication can be certified but it would appear that by concentrating resources and efforts for highly intensive vaccination campaigns wherever the wild polio virus is present, we should be able to accelerate our timetable in achieving the interruption of transmission.

Most surprising was the fact that from the 170 lab specimens so far collected this year, only 10 wild polio viruses have so far been isolated. When all the specimens have been processed, how many might we expect? Perhaps 50, maybe 75 or even 100 but doubtfully more. This is a very small number. Indeed, the number is so small that we discussed the possibility of offering a substantial reward to the individual reporting a case of poliomyelitis from which wild polio virus is isolated and to the health worker who investigates it. The consensus of the Technical Advisory Group was that this should be done and that the reward should probably be on the order of US \$100. This would result in a great many more specimens being submitted and would increase the laboratories' work but it would help greatly in pinpointing infected

areas. At this time, polio appears to be so limited in scope that one can offer such a reward for cases of polio, much as we did with smallpox, and so accelerate activity.

A lot of good work has been done in the brief few years of the program and especially during the last six months. What now do we need to do? We believe that in the next year we need to intensify the effort. As Dr. Macedo has suggested, a "mopping-up" operation is indicated. Immunization protection must be sustained; national immunization days need to be continued. We need prompt reporting of all cases of flaccid paralysis in children and prompt investigation of such cases with careful collection of specimens. In urban and periurban slum areas where cases are occurring, intensive house-to-house vaccination campaigns should be considered. Is such an intensive effort justified? Compared to the overall expenditures for health services, it is a very small investment indeed. By concentrating intelligently on the areas with special problems, major changes can occur in a short time.

Where are our principal problems at the moment? They appear to be the Andean countries, Haiti, Guatemala and Mexico. All countries are making progress but we are concerned that these countries in particular are not doing enough. We need the best efforts of everyone to assure that all countries move together in concert. Your help is going to be especially valuable in encouraging this necessary effort.

If we succeed in eradicating polio, what further implications might it have? Following smallpox eradication, we saw around the world a renewed

interest and confidence in public health as a whole. This echoed in many different ways, in many different forms. To be able to say that we had found the last poliomyelitis case in the whole of the Western Hemisphere - a disease of major concern to countries around the world - would provide renewed confidence in public health as a whole. This would translate, I am sure, into more resources and support for other initiatives that we need to take but which perhaps have somewhat less political appeal. It would provide to the health services an impetus to begin to look at other health goals, to identify numbers of cases and deaths due to various causes and to determine whether our health programs are having an impact on their occurrence. And, if they are not, to change them. This generic approach, I believe, represents the future thrust of public health - to establish measurable health goals, to create a surveillance system to measure progress and to constantly question and adopt programs to best achieve the goals. Polio eradication can play a key role in fostering this process.

Let me conclude by saying that it has been a great pleasure for me to have been able to meet with you. It is a special pleasure being able to work on this program. It is a most exciting time and I am optimistic that with a concerted effort polio will be stopped - and in a very short period of time. Indeed, it is entirely possible for the Americas to achieve this goal before Europe does! With your support, I am sure it will.

DAH/gz