The progress of the Polio Eradication Initiative: what prospects for eradicating measles?

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Although various attempts have been made to eradicate infectious diseases, only smallpox has been eradicated to date. Polio is targeted for eradication in 2000 and already planning has begun for the eradication of measles. However, before we commit to a measles eradication effort, we must examine the lessons to be learned from polio eradication. Of particular importance is the debate over whether resources should be invested in ‘horizontal’ or ‘vertical’ programmes. The outcome of these debates will have a very deep and lasting impact on global health development in years to come. Collaboration between targeted programmes and the primary health care sector through polio and measles eradication efforts will help bring about the necessary balance between goal-oriented programmes, which are subject to quality control and can be evaluated by measurable outcomes, and broader efforts to build up sustainable health infrastructure.

Introduction

Eradication has been a catch-phrase in the international public health community for decades now because it is seen as a way of achieving the ultimate goal: sustainable global health improvement. Moreover, eradication programmes require only intensive, short-term commitment, which is more easily obtained than consistent, long-term commitment to a health initiative. It is very difficult to convince national governments to allocate large amounts of funding for disease control if these efforts must continue indefinitely and if there are other pressing health and social issues, as is always the case.

We find ourselves at an interesting crossroads: smallpox has already been eradicated from the world; polio and guinea worm disease are on the verge of eradication; and measles is being considered for eradication. The Polio Eradication Initiative (PEI) differs from the smallpox and guinea worm eradication programmes in that it has involved many more partners in its activities and has staged mass campaigns of unprecedented size. If the goal of eradicating measles is adopted, further evolution of the present strategies for both advocacy and field activities will be necessary.

The PEI offers lessons to those considering the eradication of measles, particularly in terms of advocacy. Advocates of measles eradication should look to the experiences with polio eradication in developing their strategies, and in doing so should also keep in mind the ongoing debates regarding vertical programmes and primary health care. Given these debates, one should also carefully analyze the feasibility of measles eradication. Measles is far more infectious than either polio or smallpox and will thus require a far greater degree of coordination around the world than has polio or smallpox.

Early eradication programmes

The idea of eradicating a disease emerged at the end of the 19th century with reference to animal diseases. The United States Congress established the Bureau of Animal Industry in 1884 to eradicate contagious bovine pleuropneumonia, which causes a highly fatal, chronic pneumonia in cattle.¹ The eradication of bovine pleuropneumonia in the United States in 1892 was achieved by slaughtering infected herds. Since then, other efforts to eradicate animal diseases have been waged, including equine glanders, foot-and-mouth disease, Texas fever in cattle, equine dourine, bovine tuberculosis, bovine brucellosis, scrapie in sheep and goats, and hog cholera.²

Hookworm was the first human disease to be targeted for eradication. In 1909, John D. Rockefeller, Sr. founded the Rockefeller Sanitary Commission, the
primary focus of which was to conduct hookworm eradication activities in the American South. In 1913, the Rockefeller Sanitary Commission became part of the Rockefeller Foundation, which extended hookworm eradication activities to over 50 countries in the following years. Regrettably, the Rockefeller Foundation did not make surveillance a priority, so the impact of its hookworm eradication activities could not be evaluated. When studies were finally conducted, they noted that the rates of hookworm infection did not greatly decrease, although the number of worms with which victims were infected was reduced so that the severity of the disease was mitigated. Controlling hookworm proved to be more complicated than originally realized, and the methods being used to attack hookworm were insufficient to achieve eradication.

The next human disease to be targeted for eradication was yellow fever. In 1901, W. C. Gorgas initiated the first anti-mosquito campaign in Havana, Cuba which resulted in the effective control of yellow fever. Gorgas repeated this success in Panama. In 1915, the Rockefeller Foundation established the Yellow Fever Commission under the leadership of Gorgas to undertake the eradication of yellow fever. When arboreal monkeys were found to be a reservoir for yellow fever, and thus a permanent source of reinfection for urban areas, the Foundation’s strategy shifted to eradicating Aedes aegypti, the mosquito that acts as a vector for yellow fever. When this strategy proved too costly, the Foundation withdrew its support for yellow fever eradication.

Following the yellow fever eradication and anti-mosquito campaigns, it was discovered that the Anopheles gambiae mosquito had found its way to Africa from Brazil. A. gambiae is a particularly efficient vector of malaria, and the threat of its expansion throughout the continent prompted efforts to eradicate it. F. L. Soper, the director of the yellow fever eradication programme in Brazil in the 1930s, led the effort to eradicate A. gambiae from Brazil, a goal which was achieved by 1940. Soper’s success with A. gambiae primed the public health community for taking on the eradication of anopheline mosquitoes, all of which are vectors of malaria.

The Malaria Eradication Program
The discovery of the insecticide DDT in the 1940s encouraged efforts to control and eradicate anophelines, which would lead to the eradication of malaria. In Venezuela, for example, the rate of mortality due to malaria dropped from 173 per 100,000, to two per 100,000 following extensive use of DDT. Similar successes were met elsewhere, including Greece, Italy, China, and the United States, which incited the 14th Pan American Sanitary Conference in 1954 to adopt the goal of eradicating anophelines in the Americas. In 1955, the World Health Assembly endorsed the goal of eradicating anophelines globally. The eradication of anophelines was not successful, however, because DDT-resistant anopheline mosquitoes emerged and the insecticide quickly lost its ability to control the malaria vector.

The Malaria Eradication Program (MEP) failed due to misconceptions regarding the eradicability of malaria. The observation that by the turn of the century Plasmodium falciparum (the malaria parasite) had already been selected for resistance to quinine should have been a clue that anophelines too could be selected for resistance. Mathematical models describing malaria transmission did not take into account the selection of resistant anophelines, and genetics was not far enough advanced at the time to model malaria transmission accurately.

While basic research would have provided an ‘insurance policy’ on which malaria control programmes could have relied following the failure of the MEP, environmental management approaches were also largely ignored. Once anophelines developed resistance to DDT and other insecticides, malaria control programmes perceived themselves as having few tools left with which to combat malaria. However, the World Health Organization (WHO) did not consider and properly evaluate environmental management approaches. Had environmental management strategies been tailored to each region, better long-term control of malaria might have been achieved. In China, for example, rice fields are a prime breeding ground for mosquitoes. By periodically flooding the fields, farmers can prevent mosquito larvae from developing thereby decreasing larval densities by 53–70%. In advocating the eradication of malaria, WHO officials claimed that the MEP’s strategies could be used by other public health programmes and encouraged international cooperation in future public health initiatives. Instead of improving primary health care services, the MEP developed its own infrastructure separately from the primary health care infrastructure. The MEP was financially and administratively
autonomous from other health services, which incited their jealousy. This caused problems later on when the cooperation of the entire health services was necessary to complete the eradication of malaria.\textsuperscript{13} The development of a separate infrastructure, which would be lost with the collapse of the MEP, incited many to clamour for integration of categorical programmes into primary health care services.

WHO also asserted that once malaria was eradicated, resources would no longer be spent on malaria control and could be diverted to other programmes. Such savings would have been difficult to assess since no good economic analysis of malaria's impact existed.

Moreover, the MEP had a poor foundation on which to build. Shabby malaria control programmes in many countries were simply renamed in order to become eligible for more funding from the international community. If a minimal level of health infrastructure and good malaria control programmes had been prerequisites for eradication efforts, the MEP would have had a more solid base from which to work. Such hastiness made for inadequate planning and a lack of intermediate targets.

Poor management, administrative, and planning skills also contributed to the failure of the MEP. Economists, sociologists, and public officials were left out of the planning process; as a result, the MEP neglected a number of important variables including population growth, migration patterns, cultural attitudes towards illness, and national health priorities. Other specialized agencies like the United Nations Children’s Fund (UNICEF) were not consulted. WHO only worked with national health ministries, without garnering the support of other sectors of government. Because of its poor management of the MEP, adequate and timely spraying was not accomplished, further contributing to the emergence of DDT-resistant anophelines.

By the end of the initiative, national governments had lost respect for WHO's technical expertise. The total cost of the MEP came to over a billion dollars.\textsuperscript{14} Disenchantment with vertical programmes ensued, and interest shifted to primary health care development. Malaria eradication was abandoned by the World Health Assembly (WHA) in 1969.\textsuperscript{15}

The eradication of smallpox

In 1959, the WHA agreed to undertake smallpox eradication at a time when the world’s faith in WHO's ability to carry out global eradication activities was failing.\textsuperscript{4} The Smallpox Eradication Program (SEP) eradicated smallpox globally in 1977 and recouped some of the international public health community’s belief in WHO’s ability to achieve large-scale, international health objectives. However by this time, the international public health community had also come to recognize the need for primary health care development. This was seen as being incompatible with the strategies of a single-disease eradication programme which tends to be vertically organized while primary health care programmes tend to be horizontally organized.

In 1959, the 12th WHA unanimously voted to undertake smallpox eradication.\textsuperscript{11} The 19th WHA allocated special funds for heightened eradication activities to begin in 1967, and set the goal that smallpox be eradicated within ten years.\textsuperscript{16} The last case of smallpox was detected on October 26, 1977 in Somalia.\textsuperscript{17} In 1980, the 33rd WHA certified the eradication of smallpox.\textsuperscript{18}

Smallpox could be eradicated because it has no non-human reservoir. Smallpox infections were apparent and easily diagnosed. The infectiousness and duration of infections were also limited. Those who survived smallpox infection had life-long immunity and were often permanently scarred, so they could be easily recognized. Finally, the smallpox vaccine was safe, inexpensive, heat-stable, easily administered, and effective even in young infants. The vaccine induced long-term immunity to smallpox, and vaccination also left a detectable scar.\textsuperscript{17} WHO has used smallpox as model in determining which other diseases may also be eradicable.

While the SEP may have called attention to underserved, rural areas, and provided an opportunity for other health services to penetrate them, the SEP did not establish sustainable health infrastructure. According to Ciro de Quadros (Director, Special Programs for Vaccines and Immunization, Pan American Health Organization):

‘In many countries where smallpox was eradicated, it was not done with the health services. You would go, employ vaccinators, and eradicate smallpox. Often the vaccinators were not from the health services, so they went back to doing whatever they did before. It was not building up infrastructure.’\textsuperscript{19}

The SEP did little to build up health infrastructure, particularly in areas where health infrastructure was
almost nonexistent. Temporary vaccination posts were set up to achieve the final goal of eradication, but these were not sustainable.\textsuperscript{20} Expatriates were largely responsible for the implementation of smallpox eradication activities, and this prevented local health officials from being trained to carry out such programmes.\textsuperscript{21}

However, the SEP established an appreciation for the value of surveillance, a tool to be applied by both primary health care (PHC) services and targeted programmes as a method for doing quality control and evaluating how effectively resources are being spent; noted by D. A. Henderson (former Director of the Smallpox Eradication Program):

‘Our first priority was to develop a surveillance system. Our second priority was to develop a surveillance system. And our third priority was to develop a surveillance system. Eventually it became necessary to proclaim “surveillance-containment” as the single most important component of the [Smallpox Eradication] Program’s strategy, knowing that whatever we said, vaccination would continue.’\textsuperscript{22}

Unfortunately, the SEP did more to reinforce negative ideas about targeted programmes than to demonstrate how such programmes could also contribute to sustainable development of health infrastructure. It did not build up health infrastructure in a tangible way, as proponents of the SEP claimed it would.

**Eradication of guinea worm disease**

The International Drinking Water Supply and Sanitation Decade (1981-1990) spurred efforts to eradicate guinea worm disease. In 1981, the Decade’s Steering Committee adopted the eradication of guinea worm disease as part of their goal to bring safe drinking water to under-served populations. In 1986, the 39th World Health Assembly resolved to target guinea worm disease for elimination.\textsuperscript{23} Two years later, the African region set the goal of eradicating the disease in Africa by 1995. In 1991, the 44th World Health Assembly resolved to eradicate the disease worldwide by 1995.\textsuperscript{24} By the end of 1995, the Guinea Worm Eradication Program (GWEP) had achieved a 97\% reduction in guinea worm disease since it was targeted for eradication.\textsuperscript{25} However, in 1996, the total number of cases reported worldwide increased by 18\%, largely due to an increase in the Sudan. The Sudan accounted for 78\% of the world’s cases in 1996, and represents the last barrier to the eradication of guinea worm disease.\textsuperscript{26,27}

Guinea worm disease is transmitted through drinking water from ponds which contain infected water fleas, and while it kills few people, it causes incapacitating pain and reduces economic productivity. Infected individuals are disabled for several weeks by secondary infections associated with the emergence of the worm.\textsuperscript{28}

Humans are the only animal reservoir for guinea worm disease, thus the parasite is an ideal candidate for eradication. The worm does not persist beyond its one-year transmission cycle, so there are no long-term carriers of the disease. The disease is easily diagnosed, and further transmission once diagnosed can be prevented. Moreover, water fleas do not travel long distances, and as a result cannot spread guinea worm disease over wide geographic areas.\textsuperscript{29}

Guinea worm disease can be prevented through health education and by ensuring a safe water supply, distributing cloth filters, preventing those infected from contaminating ponds with the parasite, and treating ponds with temephos, which kills water fleas (the intermediate host).\textsuperscript{29} The diagnosis of guinea worm disease, which is conducted by village health workers, does not require a complex laboratory surveillance system. Other simple interventions, such as health education and the monitoring of children’s immunization status, are easily incorporated into surveillance for guinea worm, thus integrating guinea worm surveillance into the primary health care system.\textsuperscript{30} This makes the surveillance system sustainable – since village health workers will still have a motive for continuing their activities even after guinea worm disease is eradicated – and builds on the health care infrastructure.

In addition to the non-governmental and bilateral agencies that traditionally give funding for such programmes, E. I. DuPont de Nemours Company, in collaboration with Precision Fabrics Group, donated nylon filter material worth millions of dollars. The American Cyanamid Company also agreed to donate all the temephos necessary for guinea worm eradication efforts in Africa until the end of 1995.\textsuperscript{31} Such donations indicate effective collaboration between the public and private sectors for an international public health initiative.

The GWEP acts within the spirit of primary health care as defined by Alma Ata. Village health workers
conduct surveillance activities and are exemplary of the ideal of self-help and community involvement. Where they already exist, PHC workers implement GWEP strategies. Through the incorporation of PHC workers, the GWEP strengthens the primary health care services by providing them with technical and managerial training.

Unfortunately, the GWEP fails to contribute to PHC development as effectively as it could. For example, in Pakistan the village health workers trained and recruited by the GWEP were not afterwards used by other PHC agencies, but the GWEP is not solely responsible for the ill-utilization of these village health workers. The GWEP and PHC agencies should have better coordinated and planned for the absorption of the village workers into PHC agencies before eradication activities ended. PHC services should have capitalized on the trained village health workers available to it and recruited them more fervently. Furthermore, the GWEP and PHC agencies should have ensured that funding no longer needed for the GWEP could be redirected towards maintaining the force of village health workers trained and developed by the GWEP. The PHC agencies did not have the foresight to take advantage of the village health workers trained by the GWEP, and thus the improvements that could have been effected through these workers represent a lost opportunity.

In Nigeria, by contrast, GWEP activities were organized within the framework of existing primary health care quadrants, thus facilitating the integration of GWEP activities into existing PHC structures. The Expanded Program on Immunization’s (EPI) staff accompanied GWEP teams and carried out immunization activities in villages they had not reached before. The GWEP also helped bring oral rehydration, family planning, and other PHC services to isolated parts of the country.

The GWEP has also succeeded in carrying out eradication activities during cease-fires in countries ridden with civil unrest. In the Sudan for example, a two month cease-fire was announced to permit acceleration of efforts to eradicate guinea worm disease and polio, as well as to implement other health initiatives. PHC services are very much national programmes, and may not get the attention of the international community when a country suffers political unrest. But an international, targeted programme will call attention to the breakdown of health infrastructure and can help reinstitute PHC services.

The Polio Eradication Initiative

Efforts to eradicate polio and guinea worm disease are proceeding concurrently; however, polio eradication is a very different goal because polio is prevalent in many parts of the world, even today, while guinea worm disease is far more localized. For this reason, advocacy of polio eradication has been directed at a much larger audience, and many more partner organizations have taken part in polio eradication activities.

Intra-organizational commitment

The political commitment for the eradication of polio was first generated within WHO, UNICEF, and the Centers for Disease Control and Prevention (CDC). Beginning in the 1970s, enthusiasts for polio eradication within the EPI began establishing a sustainable system of routine immunization with a primary emphasis on high coverage. Surveillance was also a priority, but was difficult to improve at the time without specific targets.

In 1985, de Quadros (Director, Special Program for Vaccines and Immunization, Pan American Health Organization, WHO) spurred other governments and agencies to look seriously at polio eradication in light of the Pan American Health Organization’s success with polio eradication activities in the Americas. Many at WHO questioned why polio eradication was being given such priority, while neonatal tetanus and measles were among the leading causes of vaccine preventable deaths. In particular, advocates of PHC development questioned the priority being given to a vertical immunization programme over PHC services. UNICEF resisted the focus on a single disease target, and even today, continues to press for multi-antigen campaigns. Moreover, UNICEF’s administration is decentralized, requiring that each national programme be convinced individually of the importance of polio eradication. Initially, many CDC leaders were not very supportive of the PEI. Even now says Robert Keagan (Public Health Advisor, Polio Eradication Activity, National Immunization Program, CDC), there is tension within the CDC regarding earmarks for polio eradication:

‘CDC folks were unanimous in wishing that the earmarks would have come with additional funds for CDC rather than being funds redirected from
within NIP [National Immunization Program]. Obviously, there were folks within NIP who were quite upset that funds were redirected from their programs.¹³

In 1966, for example, grant money normally administered to the states by the Domestic Program was redirected to Polio Eradication Activity. According to Joel Kuritsky (Director, Domestic Program, National Immunization Program, CDC), however, ‘in the context of the entire budget, this was a small amount of money’ that was being redirected towards polio eradication efforts, and he was ‘very much in favor because it will save domestically on polio vaccines’.¹⁴

The success of de Quadros’ polio eradication strategies in the Americas overrode many of the arguments against pursuing polio eradication globally, and helped to solidify intra-organizational commitment to the goal.

Agreement on technical issues

Once the key partners committed themselves to polio eradication, they were able to address disagreements over the strategies to be implemented. There was disagreement over the type of vaccine that should be used, and whether polio eradication could be achieved by improving routine immunization or would necessitate mass immunization campaigns. Administration of oral polio vaccine (OPV) during mass campaigns has been found to be highly effective in supplementing routine immunization activities. OPV is simpler and cheaper to administer than inactivated polio vaccine (IPV), and it induces local intestinal immunity which IPV does not, thereby preventing continued transmission of polio virus. Efforts to develop a more thermostable OPV were abandoned because polio eradication activities were successful in the Americas without a thermostable vaccine, and because vaccine vial monitors seemed more likely to insure the administration of potent OPV than a marginally more thermostable deuterium-stabilized OPV.

Obtaining global political commitment

Polio eradication activities began earlier in the Americas than in the rest of the world, demonstrating that polio eradication is feasible, and providing a model for initiatives in other regions. The American region is among the wealthiest of the six WHO regions, and routine immunization is above average in this region. At the same time, in parts of the Americas, such as in Colombia and El Salvador, it is just as difficult to carry out polio eradication activities as in any other part of the world. Thus, while the Americas did have a head start in some areas, the success of polio eradication activities throughout the region indicated that the global eradication of polio was possible.

For example, the eradication of polio from Africa may appear to be an insurmountable task, yet the same strategies that were used in the Americas are succeeding. Between January 1996 and March 1997, more than half of all children under five were targeted by polio eradication activities. Twenty-six countries organized national immunization days (NIDs), and four held sub-national immunization days (SNIDS), with about 80% coverage of the target group. During the remainder of 1997, ten countries conducted polio eradication activities for the first time, and three of the four which previously conducted SNIDS, organized NIDs. One of the greatest challenges now will be to reach children in countries like Nigeria and the Democratic Republic of Congo that account for almost a quarter of Africa’s under-five-year-old population.

In the Americas, de Quadros recognized the importance of coordination, mass campaigns and surveillance – strategies that he championed to eradicate polio from the Americas, and that are now being used in the rest of the world. His advocacy for polio eradication set a precedent for the broader efforts that would follow.

De Quadros’ success helped spur the rest of the world to join the effort to eradicate polio. In March 1988, the Taskforce for Child Survival and Development endorsed global eradication of polio in the Declaration of Taal툴로. In May 1988, the World Health Assembly approved the goal of eradicating polio by 2000.³⁶ In 1990, polio eradication was also endorsed by the World Summit for Children.³⁷ However, an international commitment made by the World Health Assembly cannot be used to dictate health policy to national governments. According to Nick Ward (former Chief, Expanded Program on Immunization, WHO):

‘The importance of getting this political commitment cannot be overemphasized, but you cannot quote that sort of commitment to countries. They will all come back to you and say, ‘Well, why
should we do this rather than malaria or diarrhea?" which are infinitely bigger problems from their point of view.\textsuperscript{40}

An international commitment sets the stage for advocacy at the regional and national levels.

The role of Inter-agency Coordinating Committees in catalyzing regional and national coordination

Among the most effective tools for fostering political commitment at the regional and national levels are the Inter-agency Coordinating Committee (ICC) meetings. The purpose of regional ICCs is to serve as a forum for enhancing the collaboration and coordination among all international partner organizations and the national EPI programmes. They also ensure that sufficient political will, technical support, funding, and vaccines are available to achieve polio eradication, as well as other EPI disease control targets. ICCs also serve as an advocacy tool – demonstrating that there is the financial and technical support available to assist the country in carrying out eradication activities – so as to convince governments to take on polio eradication.

ICCs are an innovation of the Polio Eradication Initiative. Such large-scale coordination was not required during smallpox eradication because, according to de Quadros:

‘When we worked for the eradication of smallpox, there were not too many agencies involved in this – non-governmental organizations or international agencies – there were very few groups, so it was easy to coordinate them. When we started the eradication of polio in the Americas, we faced a different world that had many more international groups participating in development. Another characteristic is that there was a process of decentralization in the public sector, so you have many local governments which play a very important role. With so many actors, it would have been really impossible to cooperate with so many governments if there was not a coordinating mechanism.’\textsuperscript{19}

ICCs prevent the duplication of contributions to polio eradication efforts and competition between donors to fund particular aspects of a project. They are a forum in which the partner agencies can work together to establish the priorities, strategies, and needs of polio eradication activities. ICCs also involve donors in technical discussions thereby empowering them and making them feel like true partners.

The regional ICCs are important for coordinating international organizations whose contributions are most effectively made at the regional level, such as to a region-wide surveillance network. According to Stephen Cochi (Chief, Polio Eradication Activity, National Immunization Program, CDC):

‘Polio is a disease that does not respect borders. The regional ICC is the manifestation of that fact: that there needs to be not only coordination of partners at the country level, but an understanding of needs and contribution to meeting those needs through regional cooperation.’\textsuperscript{41}

The effectiveness of the regional ICCs varies. In the Americas where ICCs have been very effective, all countries are asked to submit five-year plans to the regional ICC including: their priorities, activities that need to be done, who is responsible for implementing them, and the cost of these activities, both recurrent and capital costs. According to F. M. LaForce et al.:

‘The coordinating role played by regional offices within donor organizations and the perception of how representative they are of regional interests have played an important role. The clearest example of this is PAHO and poliomyelitis eradication efforts. PAHO, as a regional officer for WHO, coordinates nations in a participatory process of multi-donor, multi-year planning for programs, procuring vaccines and disease surveillance. Regional coordinating committees exist. The active participation and facilitation of PAHO has created a supranational effort. It might be argued that many functions necessary to programs are more efficiently and effectively carried out at regional level. For example, there has been considerable success with the revolving fund for procurement of vaccines as well as the coordination of surveillance and outbreak control, which supersedes national borders.’\textsuperscript{42}

More timely, detailed plans of action and funding proposals are needed in some of the other regions, in particular in the African and Eastern Mediterranean Regions. The quality of leadership in the different regions varies, and is strongest in the Western Pacific Region and in the Americas where the ICCs have also been most effective. Some of the WHO regional offices lack the respect and trust of the countries in
their region, which hinders successful organization of ICCs in these regions.\textsuperscript{22}

The national ICCs are most critical because it is there that the bulk of inter-agency planning takes place. It is essential that national governments be active participants in ICCs, as Dr. Robin Biellik (EPI Advisor, Southern Africa) has explained:

‘Effective ICCs require high-level political commitment. They don’t work when they are constituted as a sort of EPI technical committee under MOH leadership and without inter-sectoral support.’\textsuperscript{43}

Some national governments and ministries of health have shown little interest in participating in ICCs because by doing so, they lose the ability to pit the donors against one another. According to Jean-Marc Olivé (Medical Officer, Expanded Program on Immunization, WHO):

‘When governments want to purchase something, they give a shopping list to each agency, hoping that something on the list will be provided by one of the agencies. If different agencies provide the same thing, that’s no problem for them. They feel that, but it’s not true because if you coordinate the agencies, the country will get much more.’\textsuperscript{44}

In addition to uncooperative national governments, the lack of local technical capabilities as well as a poor perception of donor organizations can render ICCs ineffective says Peter Ndumbe (University of Yaoundé, Cameroon):

‘One reason why they may not be as effective as they could be is related to the haughty attitude of the donors, coupled with lack of competent local staff.’\textsuperscript{45}

Where there has been weaker government leadership, efforts to coordinate donors have been less successful, says LaForce et al.:

‘At the national level, coordination among donors and governments influences how EPI programs are funded, designed, and implemented. Donor coordination was reported to be poor, resulting in inefficiency in many instances. In those countries where governments have taken strong leadership roles in coordinating committees and resource prioritization, immunization has been more likely to be sustained or improved. The weakest and poorest countries are those in which donors have the greatest influence and yet the countries’ ability to coordinate donors is often the least developed. Coordination itself requires strong leadership and adequate resources of time, personnel and finance.’\textsuperscript{46}

Efforts to develop local technical capabilities must be one of the first priorities of the ICCs, before polio eradication activities can be initiated on any large scale. If donors perceive the presence of a large body of local expertise, they will be less likely to behave in a paternalistic manner and more fruitful consultations will ensue.

National political commitment

The strategies for obtaining national political commitment to the PEI have been very much dependent on a country’s level of development and political structure. For example, in an industrialized country like the United States, where immunization coverage is already very high and sanitation is quite good, the goal of advocacy is primarily to raise money for conducting eradication activities in other parts of the world. Mass campaigns have never been conducted in the United States as part of the PEI. Advocates of polio eradication in the United States gained substantial support from Congress by forming a coalition of organizations which included Rotary and by realizing that lobbying was an effective way to promote political support for polio eradication.\textsuperscript{47} Rotary, a bipartisan organization, has an entrée into Republican Congress. Rotary is seen as fostering a true private-public partnership – an attractive point for Republican legislators – because it contributes US$400 million of its own money towards polio eradication.

Getting political commitment from developing countries has been a more contentious issue. Some argue that these nations are being bullied by the industrialized world to undertake a goal that is not truly in the best interest of the developing world. According to Biellik:

‘South Africa, like most other South African countries, gave a commitment to polio eradication as part of its international obligation to participate in this global goal, not because polio disease was considered widespread.’\textsuperscript{43}

There is no question that pressure from the industrialized world, as well as availability of funding from donors like Rotary, has played a role in getting the developing world to sign on to the goal of eradicating polio; however, this pressure alone was
Table 1. Global costs for polio eradication (millions US$), 1996–2005^{50}

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not enough. Other approaches and activities are being undertaken to demonstrate the feasibility and value of eradicating polio.

In India, for example, the focus of advocacy is on organizing mass campaigns and surveillance. In 1989, Rotary sponsored special vaccination days, ‘Baby Protection Days’, in India. These vaccination days represented a first step in raising coverage levels and awareness. In 1994, Rotary worked with the Ministry of Health and Family Welfare in Uttar Pradesh to conduct SNIDs around New Delhi. The campaigns in New Delhi helped to jump-start nationwide commitment to polio eradication in India. Having been conducted in the nation’s capital, the SNIDs in New Delhi had very high visibility. Rotarians met with other Ministers of Health, political leaders of the various parties, and Prime Minister P. V. Narasimha Rao. In 1955, WHO, UNICEF, and Rotary presented the strategies for polio eradication at a meeting of health and state ministers, who voted unanimously in favour of undertaking polio eradication activities. India immunized more than 93 million children during its first NIDs in December 1995 and January 1996. 117 million children were vaccinated in December 1996, and in January 1997, 115 million children were vaccinated.^{48} 130 million children were immunized in December 1997 and again in January 1998.^{49}

By conducting a showcase initiative in a small, highly visible part of the country, the partner organizations initiated nationwide commitment to polio eradication, resulting in the organization of NIDs. This proved to be a good strategy for convincing a large country with a decentralized government to organize mass campaigns because it capitalized on disunity among member states.

Funding

Total resource needs for the PEI (1996–2005) are projected at US$2.5 billion (see Table 1); this funding will come from both the industrialized and developing nations.

The role of WHO in fund-raising is to solicit resources from the whole array of participants in polio eradication: industrialized countries, developing countries, and non-governmental organizations (NGOs). Because WHO is the keystone of the PEI, there have been problems in the drive to get funding. WHO has languished and lost credibility under the poor leadership of the past decade. Furthermore, the hierarchical structure of WHO makes it difficult to get funding directly for polio eradication.

Perhaps the most important participant along with WHO in fund-raising for polio eradication is Rotary. Rotary has used its funds not only directly, but also catalytically to encourage the participation of more donor organizations which can multiply Rotary’s financial contributions to the PEI.

Among the most effective tools for fund-raising are the ICCs, which coordinate donor contributions to the PEI in each country. ICCs ensure better allocation and distribution of funding for PEI activities.

Social mobilization

Advocacy is also focused on social mobilization: recruiting transportation and human resources to carry out activities in the field, and convincing parents to have their children immunized.

The commitment of the national leadership provides a venue for raising public awareness about the PEI.
The participation of national leaders in immunization efforts during NIDs conspicuously illustrates a national commitment to polio eradication, and leads to newspaper and television coverage, further amplifying the message to the public and making polio eradication a national priority.

It is equally important to secure commitment from the local leadership for polio eradication, because it is community leaders who actually implement polio eradication strategies in the field. In many countries, vaccination committees composed of local residents (not limited to professionals) coordinate PEI activities and spread awareness. Community education supplements these activities. In aggregate, these activities emphasize strong contacts with all those involved in immunization programmes, from national officials down the line to community health workers.

The other important component of social mobilization is to ensure the participation of the public – that parents bring their children to be immunized. One way that has been very successful in the Americas is to schedule NIDs at the same time every year. The involvement of the private sector to ensure the public’s participation is also important. Rotary led this effort, but others in the private sector have also contributed. Coca-Cola has collaborated in placing posters announcing upcoming vaccination campaigns in all places where their products are sold. In Panama, McDonald’s restaurants have been used as vaccination posts. Immunization efforts have also received support from baby food manufacturers, pharmaceutical companies, travel agencies, and others. These companies assist primarily with social communication and the mobilization of volunteers.

The ‘Kick Polio Out of Africa’ campaign promises to be the most comprehensive social mobilization enterprise yet to be undertaken by the PEI, capitalizing on enthusiasm for soccer, especially among the youth.

The PEI and the debate between horizontal and targeted initiatives

The spotty record of eradication programmes – beginning with localized yellow fever and hookworm eradication programmes at the turn of the century, as well as the international eradication programmes discussed here – caused public health leaders to re-evaluate their usefulness and favour more comprehensive primary health care programmes over the targeted eradication programmes. So where does polio eradication fit in with this shift to building primary health care infrastructure? The PEI succeeds in combining the goals of targeted programmes while achieving some of the sustainable improvements mandated by proponents of primary health care. PEI activities have increased the demand for immunization services; built up health infrastructure, particularly surveillance networks; and set a precedent for cooperation within communities and among agencies, institutions, and sectors of government on a health programme.

Targeted programmes like the PEI and primary health care programmes complement one another. While some might argue that a strong primary health care system is a prerequisite for pursuing more targeted goals, one could also take this argument one step further and claim that it is impossible to develop a strong primary health care system without substantial economic development. But, the impact of infectious diseases, like polio, on economic development has been well documented. Thus all of these developmental activities are intertwined and complementary. According to Rudi Eggers (National EPI Manager, South Africa):

‘I regard this problem as being one of balance – we cannot spend all resources and time only on polio eradication, nor should we be fixed in the “upliftment of PHC services” without any focused attention to the individual problems.’

The problems of the developing world are far too complex and urgent to be attacked using only one approach. Primary health care development is not a cure-all, but neither are targeted programmes.

Culture of prevention

One critique of eradication programmes is that although they bring about one-time behaviour, they do not instil an understanding of preventive medicine or create demand for immunization, which would make immunization programmes more sustainable. According to anthropologist Mark Nichter:

‘The imposition of a vaccination campaign complete with targets, plans for community surveillance, and the possibility of coercion are questioned, as are campaigns rendering the community dependent and powerless to decide upon its own health care priorities. It is only when vaccinations are recognized as a perceived need and demanded by the “community” that they become
community development resources in a "comprehensive health care" sense.  

Others argue that eradication programmes like the PEI, along with the EPI, raise people's awareness about immunization and have thus increased demand for immunization in general. In the Americas, according to de Quadros:

'... starting in 1980 with campaigns in Brazil, immediately after mass campaigns, there was an increase in the demand for other vaccines and more health centers. It empowers the population to have access to health and prevention.'  

Roland Sutter (Deputy Chief for Technical Affairs, Polio Eradication Activity, National Immunization Program, CDC) agrees that the PEI helps generate a demand for immunization, and the belief that one is entitled to health care:

'Communities in the past saw immunization as a kind of hand-out from the government or a privilege. Occasionally immunization services reached areas where there is no infrastructure, but now, this high publicity campaign generates the feeling by everybody that this is an entitlement to every child in the country. Communities are much more aware of immunization, and they are much more willing to demand immunization.'  

According to Cochi, the PEI has elicited a demand for immunization in Africa, where sustainable improvements in health care are most critically needed:

'There are more children who are brought by their parents to seek immunization. The preliminary information from many of the NIDs in Africa indicates that in most countries, there was an effective creation of demand for immunization. . . . One of the legacies of polio eradication is an improvement in the awareness and understanding of the value of immunization.'  

The PEI imparts a 'culture of prevention'. Through the PEI, target populations gain health awareness and a preventive, rather than curative, view of medicine.

Polio surveillance has sensitized local health officials to the importance of carrying out surveillance and incorporating surveillance data in decision-making. Surveillance cannot be taught abstractly, but must be demonstrated on a specific, well-defined disease problem like polio. Because surveillance is being conducted globally, the PEI has helped to standardize data collection. The quality of surveillance data has improved, allowing for better comparisons to be made between regions and facilitating cross-border disease control activities. The standardization of surveillance has also streamlined data collection and reduced the amount of data to be collected so that only the critical variables are studied.

Acute flaccid paralysis (AFP) is now conducted in most countries, with the exception of non-endemic countries in the Americas and Western Europe, as well as a few countries in Africa. The global laboratory network is equipped with virologists trained to follow standardized methods for poliovirus isolation. According to Rehan Hafiz (National EPI Program Manager, Pakistan), AFP surveillance improved local managerial skills:

'Polio eradication efforts have made major advances. We now have in place an AFP surveillance system that covers the entire country. . . . Through our extensive polio surveillance efforts we are getting a better hold on general EPI and are playing an effective role in developing management skills.'  

The development of managerial skills is particularly important in the context of rapidly progressing health sector reform. As health services become decentralized, communities are increasingly responsible for health delivery without having the necessary managerial skills. PEI surveillance activities serve to train local health workers in doing surveillance and
to base their strategies on the information they gather. Such quality control is transferable to other health programmes. According to Eggers:

‘In South Africa, we have just gone through a restructuring of the entire public service, including the health sector. . . . We have found that our polio campaigns which started in 1995 were instrumental and very helpful to bring together previous different administrations. Being given this fairly straightforward task and allowing the different sections to do their own planning, these new structures were tested for the first time and many health workers appreciated the campaigns as being the opportunity to make the new system work.’

In general, local management skills have been sharpened through participation in polio eradication activities says Eggers:

‘In regards to management skills, especially the provincial coordinators have had to get together their teams and keep them functioning throughout these three years, which would not have happened without the push of the campaigns.’

Thus the impact on the PHC services has been the recognition of the need for surveillance, the effective incorporation of surveillance data in planning, and improved programme management. However, the goal-oriented nature of the PEI can put great pressure on local health services and may lead to the falsification of data. Clearly, this does not promote improved surveillance and managerial skills. Therefore, improved surveillance and managerial skills should be a prerequisite and top priority before programmes may aspire to achieving decreased disease incidence and ultimately eradication.

As part of its surveillance activities, the PEI has developed a global laboratory network. The PEI’s laboratory network can also be used to monitor other infectious disease, including measles, cholera, meningitis, yellow fever, and emerging infections. According to an EPI staff member from Brazil:

‘. . . working in polio, we strengthened the entire epidemiological surveillance system for other reportable diseases. So, in the case of measles, we used the occasion to improve . . . the entire surveillance service and to establish an epidemiological surveillance network in all municipalities throughout the state.’

De Quadros explains:

‘There is no question that the use of categorical programs, if they are well and intentionally turned to favor the strengthening of health infrastructure, will do it. In the Americas, when we started polio eradication, we intentionally reinforced one, the immunization program in general, and two, the health infrastructure, particularly in relation to surveillance, program planning, and program management.’

The PEI’s laboratory network will be an important component of the global surveillance network that is being developed to monitor infectious diseases.

However, the PEI does not have a wholly beneficial impact on PHC services. Local health officials in other health programmes have sometimes objected to NIDs because they feel that they lose physical, economic, and human resources to the PEI. During a NID, other activities may be interrupted says F. J. C. Millard:

‘During the polio campaign nurses and transport were withdrawn from the TB services with no warning. It was only for a short time, we were told, and of course a few days without drugs will do no harm, but it is precisely this attitude that is so damaging to the TB program. The message is clear to patients, supervisors and nursing staff – TB is not important. If a mass campaign is considered necessary, personnel and transport should be provided and not withdrawn from other services.’

The criticism that personnel and transportation not be withdrawn from other essential health services is valid. For example, tuberculosis control programmes, which Millard explains were interrupted for NIDs, require consistent contact with patients to ensure that drugs are taken during the full course of treatment. When patients take drugs erratically, drug-resistance can emerge, resulting in difficult-to-treat and highly costly cases of tuberculosis. By interrupting tuberculosis treatment, polio eradication activities send conflicting messages to health providers and patients. It is important that such issues be taken into account in planning for NIDs, and that they be avoided by providing separate personnel and transport when the interruption in other services constitutes more than a temporary inconvenience.

**Precedents for cooperation and collaboration**

Among the most positive achievements of the PEI is the cooperation and collaboration that it cultivates, a finding of the Taylor Commission:*
Of special interest is the finding that the most positive impact of Polio/EPI was on social mobilization, especially the use of information, education and communication to reach all the people, both through mass media and in their homes, and also to promote community organization and the involvement of leaders to strengthen all preventive activities.  59

According to Ndumbe, 'Indeed the mere fact that it [polio eradication] got intra-sectoral and multi-sectoral collaboration going is a great plus. 45 The PEI promotes cooperation within communities, as well as cooperation among agencies, institutions, and different sectors of government.

The PEI creates new links between NGOs, the private sector, and different governmental agencies, particularly through the Inter-agency Coordinating Committees (ICCs). Prior to the PEI, health initiatives were executed almost solely by the Ministries of Health (MOHs) and WHO. Different sectors of government are included in PEI planning and activities, such as the Ministries of Finance (MOFs), the military, policemen, and teachers. Strengthening links between the MOHs and MOFs is particularly important because this leads to better national planning, especially in the budgeting process.

The PEI also involves volunteer organizations like Rotary, which has contributed both as a donor and through the efforts of its volunteers. Rotary has members in many countries who assist in the planning and implementation of PEI activities. Local foundations and NGOs, professional and religious organizations, neighbourhood councils, and women's clubs are also active participants in organizing PEI activities at the local level. 32,61-64 Local vaccination committees have been established to assist in this organization. For example, says Sobhan Sarkar (Assistant Commissioner of Immunization, Department of Family Welfare, India):

'In India over 120 million children were to be given OPV on two days for which 650 000 immunization booths are being organized on each of the NIDs. In each of the posts apart from one health personnel, there were three volunteers from the community. . . . All social sector departments under the Government of India have fully cooperated in this program. NGOs at the national level (Rotary) or at the grass root level have fully cooperated in this program, and many of the professional bodies have provided immense support in not only the social mobilization sector but also setting up posts for polio vaccination on NIDs. It would not be just not to include the polio surveillance activities by the community and the voluntary sectors to complete the activities supported by them. The Indian Academy of Pediatricians, (Association of Pediatrics), Indian Medical Association have already set up their own surveillance networking system so that all medical practitioners are aware of where to send the information in case of AFP so as to enable the district officials to investigate and send stool samples to the laboratories. 65

In areas where community involvement has been encouraged, the benefits to the PEI have been tremendous, but not all national programmes have benefited from community involvement. This has partly been dependent on the local political culture. It is not surprising that formerly communist nations, for example, have not seen such community involvement in polio eradication activities. According to Alenka Kraigher (Director, Communicable Disease Center, Institute of Public Health, Republic of Slovenia), 'In the polio eradication program, community involvement was not expected [in Slovenia]. No volunteer non-governmental organization has been involved. 66 Community involvement and civic participation is not part of their political culture, and so does not arise in the context of polio eradication activities. In addition, the degree of community involvement is also dependent on the need for community input in planning for activities. While the PEI strategies do not vary much from country to country, the manner in which they are implemented often requires the advice of local leaders and health officials, explains Eggers:

'[In South Africa] Community involvement was evident in almost all polio campaign visiting points, and we would not have reached our target without them. . . . many rural and tribal authorities also supported the effort by calling their people together on campaign dates. 54

Communities can sometimes better address practical issues - where to put immunization posts, how to immunize hard-to-reach populations, and how to distribute the vaccine - than can PEI staff.

Community involvement and cooperation is not only instrumental for the PEI, but also has a positive effect on other health programmes. Such community organizations extend their efforts into other health
programmes. For example, in Mexico local vaccination committees help coordinate the national vaccination programme and spread awareness about immunization. According to Brad Hersh (Medical Officer, Special Program on Vaccines and Immunization, Pan American Health Organization):

‘In many countries, there are committees made up of local residents (not limited to professionals) who assist the vaccination program in making plans for vaccination activities, including mass-campaigns. These committees have been instrumental in targeting high-risk areas for mop-up vaccination activities for both polio and measles eradication. These local committees are organized and administered locally and remain independent of the national vaccine program and the MOH [Ministry of Health].’

By bringing community members together to collaborate in planning and reaching a common goal, the PEI enhances the potential for such cooperation on other health or social and political issues, and fosters the growth of a more ‘civic community’. According to Robert D. Putnam (Director, Center for International Affairs, Harvard University):

‘Civil associations contribute to the effectiveness and stability of democratic government, it is argued, both because of their “internal” effects on individual members and because of their “external” effects on the wider polity . . . associations instil in their members habits of cooperation, solidarity, and public-spiritedness.’

Through their involvement in PEI activities, the community members become empowered and learn to cooperate better. The impact of such cooperation extends not only to health development, but to development in all sectors. Enhanced cooperation reinforces itself and helps to ensure the sustainability of the health development achieved by the PEI. According to an EPI staff member from Mexico:

‘. . . at the community level, people are responding rather well to all the programs and to the polio program in particular. There is already a community organization in place which is supporting these intensive campaigns. There are rural communities or municipalities with extremely small populations which have their own systems of work for national health campaigns.’

The new relationships created by the PEI will bring to fruition other health projects, explains Mark Pallansch (Chief, Enterovirus Section, Division of Viral and Rickettsial Disease, CDC):

‘There are many linkages that are now being established in the context of polio that will spill over in other cooperation. . . . In Africa, there will be other major partners who are actively involved in work in that continent who will probably be more involved in measles than in polio, but that had their first exposure to these types of activities during polio.’

Already in the Americas, many of these same relationships are supporting measles elimination efforts. The PEI has established a paradigm of inter-sectoral collaboration that mirrors the interdisciplinary approaches required for solving global public health problems.

**Allocation of resources**

In a recent critique of the PEI, Carl Taylor, Felicity Cutts, and Mary Taylor maintain that it is:

‘. . . shortsighted for donors to use their considerable influence to promote polio eradication if this delays or diverts long-term investment by poor countries in sustainable health systems.’

This assertion implies that polio eradication activities do not promote sustainable health systems; however, whether the PEI does promote sustainable health development depends on how activities are carried out – the process – as has already been argued.

The PEI relies not only on national funding, but also on new sources of money. The US$400 million raised by Rotary for polio eradication would not have been available for other health programmes, affirms Alan Hinman (Senior Consultant for Public Health Programs, Taskforce for Child Survival and Development):

‘I see no way in the world that Rotary International would have raised $400 million [by 2005] for general primary care development, but they did raise $400 million to support polio eradication. People who make it a one versus the other argument are saying that there is this fixed pot of resources with a health label on it, and it’s the only money that’s going to be spent on health, and all of it has to be spent on health . . . There is no such pot.’

The CDC also put money into the PEI that would not otherwise have been available for health programmes.
in developing countries. However, not all the funding for the PEI has come from new sources like Rotary. National governments contribute a good portion of the resources says Bruce Aylward (Medical Officer, Expanded Program on Immunization, WHO):

'The industrialized countries pay for, depending on the particular country, 10–25% of the in-country costs, while these guys [developing countries] pay for 75–90% of costs. In some very difficult countries and some special situations, they [industrialized countries] will pay for a lot more, but usually that’s not the case.'\textsuperscript{70}

By investing in polio eradication, developing countries strengthen their ownership of and commitment to immunization programmes, raise immunization coverage generally, and create a larger budget for health programmes at the national level. In the Philippines, for example, following the successful 1993 NIDs, the government tripled the budget for vaccine purchases from the 1992–1993 fiscal year.\textsuperscript{56} Allocations for immunizations become a permanent part of national budgets, thereby ensuring sustainability of increased immunization coverage.

While the goal of developing PHC services is an important one, definitions of PHC are very vague. Because resources are scarce, it is very important that the little that is invested in health care be invested in such a way that the return on that investment is measurable. According to de Quadros:

'The issue of the diversion of resources is very relative because resources are scarce, and if they are not well utilized, they don’t achieve any objective. So if you start setting several objectives that are measurable, you can really see the impact of your moneys.'\textsuperscript{19}

The development of PHC infrastructure lacks specific goals, so it is difficult to demonstrate that a goal has been met with the resources allocated. In addition, government officials are more likely to invest in polio eradication activities because they perceive them as being more exciting and spectacular. Henderson remarks:

'Decisions about allocations of resources are frequently not made based on the facts and cost-benefit analyses. A lot of emotional judgments are made. This is where the basic health services approach to getting money often gets you a yawn.'\textsuperscript{22}

Goal-oriented programmes like the PEI can be used as political motivation tools to bring more resources to health services generally. The PEI does for health services what sending a man to the moon did for the US’s National Aeronautic and Space Administration: to raise programme visibility and resources available across the board.

One must also be pragmatic and realize that bilateral agencies – among the largest funders of health development efforts after the World Bank – act out of a sense of benevolent self-interest. Funding for health development is coming more and more in the form of earmarked moneys, which cannot be transferred between programmes. Foreign aid budgets are shrinking in many industrialized nations in an era of fiscal conservatism. Infectious disease programmes are attractive to bilateral agencies because there is a recognition that these diseases ‘have not borders’ and that outbreaks in other countries can be a threat to public health in donor countries. Instead of denying political realities, health policy-makers should promote the targeted activities, like the PEI, that will channel resources into the different sectors of the PHC infrastructure, in this case immunization services.

There is no question that the development of PHC services should be a priority. The question is whether this should be done through direct investment in PHC services only, indirect improvements effected by targeted programmes, or a combination of the two. Unfortunately the debate has become so polarized that many fail to recognize the necessity of both. Targeted programmes accomplish specific, measurable goals: garner the enthusiasm of government officials, transforming them into advocates of health issues generally; bring new sources of money to health care; and funnel resources into the development of health infrastructure. PHC development programmes sustain improvements made by targeted programmes and expand on their scope.

Integration of polio eradication with PHC services

There are instances when the integration of polio eradication activities and PHC services is appropriate, as in the integration of polio eradication and EPI activities says Hafiz:

'Neither activity is meant to replace the other but need to work together and in theory complement one another... Polio eradication activities must form an integral part of the primary health care
system. We are aiming to include in our EPI activities, primary health care programs such as the lady health worker of the Prime Minister’s health package which is a successful World Bank supported activity that presently has around 40,000 lady health workers at the provincial level responsible for a specific number of children. We target difficult to reach populations through these workers and have used them extensively during polio outbreak responses that we have had this year.\textsuperscript{71}

Another example is the integration of polio eradication and neonatal tetanus elimination initiatives in Egypt. In this case, surveillance for polio and neonatal tetanus were integrated, thereby facilitating identification of areas with a high risk of neonatal tetanus. However, health officials did not integrate mass immunization activities for the two programs because the target populations and operational aspects of the two differ greatly.\textsuperscript{72} According to Codi:

‘One cannot integrate carte blanche without risking ending up with a homogenized blob, and lose sight of objectives. You have to have some priorities. Integration in the extreme removes any sense of what are the highest priorities. If you can’t measure the progress toward decreasing the burden of disease, what have you achieved by integration? Both of those camps have the potential to get closer to their objectives if they can find a common ground and share resources when appropriate.’\textsuperscript{74}

By integrating programmes to the extent that this is appropriate – for example, in the sharing of vehicles or development of joint surveillance systems – jealousies between health programmes that might otherwise grow, can be avoided. In addition says Biellik, programmes should only be integrated:

‘To the extent that they can be through planning, training, social mobilization, evaluation, etc. After all, at the local level, horizontal integration is inevitable because there are few health workers on whose shoulders all activities rest.’\textsuperscript{43}

Furthermore, explains Eggers:

‘While polio campaigns will have as their starting point and focus the existing health facilities, the intention of a campaign is to reach out. Thus, as far as campaigns are concerned, integration is possible only for a short period. However, the other aspects of polio eradication, namely AFP surveillance and routine immunization support are imminently integrated in PHC. The training done through the polio eradication activity on routine immunization and on the surveillance integrates very well with other PHC support.’\textsuperscript{54}

Full integration can dilute the goals of individual health programmes, and prevent any from being effectively achieved.

**Next target: measles?**

Measles is a highly infectious disease that has a major impact on child survival, particularly in developing countries. Before measles vaccine became available, almost all children contracted measles, resulting in approximately 130 million measles cases and 16 million measles-related deaths in the world each year. Today, a number of countries in the Americas, including the United States, have successfully interrupted indigenous measles transmission through the implementation of the Pan American Organization’s (PAHO) measles elimination strategies. The United Kingdom and the Nordic countries have also made substantial progress towards eliminating measles. Several African and Asian countries are now conducting mass campaigns to immunize against measles, similar to those held in the Americas. In July 1996, experts from the CDC, PAHO, and WHO decided that measles eradication is a feasible goal, and that planning should begin now for a resolution for the 1999 or 2000 World Health Assembly to eradicate measles by 2010.\textsuperscript{73}

The absence of a non-human reservoir for measles favours its eradication. Furthermore, all measles infections are apparent, one single serological type exists, and both measles infection and immunization induce lifelong immunity to the virus. However, the extremely infectious nature of measles virus will represent a tremendous barrier to eradication efforts. Measles is far more infectious than either smallpox or polio. Moreover, measles vaccination has been shown to decouple the timing of measles epidemics between cities.\textsuperscript{74} Unless measles immunization activities are organized concurrently throughout the world, this decorrelation of epidemics could inhibit attempts to eradicate measles. The decorrelation of measles epidemics between cities favours the survival of measles virus in pockets, which in turn represent sources of reinfection to regions from which measles has been eliminated.\textsuperscript{74} Thus the first requirement of
any measles eradication programme will be international cooperation on planning measles immunization programmes concurrently world-wide.

Previous attempts to eliminate or eradicate measles

There have been several attempts to eradicate or eliminate measles since measles vaccines were introduced in the 1960s: in 1966, the United States set the goal of eradicating measles in the country by 1967; beginning in 1967, the Gambia conducted national measles immunization campaigns to interrupt measles transmission, initiated as part of the West African Smallpox Eradication Program; and in 1978, the United States set the goal of eliminating measles in the country by 1982. These initiatives failed because: public health officials did not realize how high the level of population immunity must be in order to eliminate measles transmission; there was too much reliance on routine immunization services; the health infrastructure was not equipped to identify and immunize new susceptibles; government priorities changed; funding and management skills were in deficit; and there was vaccine failure and short supply of vaccine.

Strategies for measles elimination and eradication

One major difference between the strategies used for polio eradication and those that would be used for measles eradication, if this target is pursued, is that the goal of the PEI is merely to stop transmission in a particular region (because polio is less infectious). The goal of a measles eradication programme would be to achieve almost 100% population immunity in order to prevent epidemics when the highly infectious measles virus is reintroduced into populations from which it has been eliminated. The PEI could progress region by region in its efforts to eradicate polio, but in the case of measles eradication, immunization activities will have to be coordinated between regions, not just between countries. Because measles eradication efforts would have to be so comprehensive and intensive, this would also be an opportunity to build up routine services, which would assist in maintaining the high vaccination coverage necessary for measles eradication.

Surveillance for measles is less well developed than it is for polio. All measles cases are readily apparent, unlike the many subclinical cases of polio; however, measles surveillance is problematic because a number of other diseases cause similar rashes and fevers, such as rubella and dengue. Because measles is considered to be a normal childhood illness, many children who come down with measles are not brought to health centres in search of medical care. Better field diagnostics would allow more accurate detection of measles cases, and better methods for isolating measles virus would aid molecular epidemiologists in determining the pathways of measles transmission.

The strategies to be employed in a future measles eradication programme would be based on PAHO’s elimination strategies, and would resemble those of the PEI in many respects. The likelihood of success for a measles eradication programme would be dramatically improved if much of its efforts were done through PHC services so as to achieve a base level of vaccination coverage. Delivery of measles vaccine through PHC services would act as a safety net to the programme, and would also contribute to the development of the PHC services. NIDs will also be needed to supplement routine immunization and to immunize hard-to-reach populations. Furthermore, if a measles eradication programme can contribute to primary health care development, it is more likely that developing countries would make it a top priority for funding than if it were an isolated effort.

Beginning advocacy for measles eradication

Advocacy for measles eradication will take place in a somewhat different atmosphere than for polio eradication. In the case of polio eradication, developing countries were comparatively more difficult to convince that they should support the programme financially and politically, while with measles eradication, industrialized countries will be more challenging to persuade. Polio was a highly visible and terrifying disease in Western nations during the earlier part of this century. Most of those who are governmental officials today witnessed the impact of polio during their childhoods. The impact of polio in developing nations has been much less evident because polio has been endemic in these nations and fewer of the more severe cases associated with infection at a later age are observed. The few paralytic cases that do result because of polio infection represent a small disease burden compared with the burden of other diseases.

In contrast, measles has been viewed as a mild childhood illness, much like chickenpox, in many industrialized nations. The ravages of measles are most
apparent in developing nations where lack of good health care, crowding, and malnutrition aggravate the course of the illness. According to Bjorn Melgaard (Chief, Expanded Program on Immunization, WHO):

'I think the sheer nature of the disease would give rise to a different approach. There is an Arab saying that you don't count your children until the measles are past. So, there's a public awareness that measles is a killer disease in the Third World. The main message is that you will reduce mortality among children.'\textsuperscript{75}

Developing countries are aware of the disease burden due to measles and the benefits to be had from eradication.

In the industrialized world, measles does not appear to cause many deaths because those children who do get measles have access to good health care, and are comparatively well nourished. Measles is seen as a normal childhood illness. Some doctors advise that it is better to be infected with measles than to receive vaccination because they believe that natural infection induces better immunity, despite the myriad complications that can result due to a measles infection. According to Olivé:

'In Europe, we have a major problem because in some countries, there are no more deaths due to measles. The medical professionals and mothers don't perceive measles as a burden or as a problem. . . . But, in countries where you have very high coverage, because the vaccine is not efficacious, every five, six, seven years, you have big outbreaks. . . . This is mainly because they feel that measles is not a problem.'\textsuperscript{76}

In order to convince industrialized countries of the importance of measles eradication, it is necessary to study its disease burden in the industrialized nations. The first goal should be to improve measles surveillance, which can be integrated with ongoing polio surveillance as well as the global infectious disease surveillance network that is also being established. Improving measles surveillance could be a challenge even in developed nations such as France, Germany, and Japan, where measles is not a notifiable disease.\textsuperscript{77} Public health officials should also document the number of complications and hospitalizations due to measles in the industrialized countries.

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**Lessons from the Polio Eradication Initiative**

Lessons that can be learned from polio eradication include the importance of forming a partnership with a large, international, NGO like Rotary, and the need to resolve intra-organizational issues before proceeding with advocacy.

Not everyone agrees on the goal of measles eradication. UNICEF, in particular, is reticent about supporting eradication programmes without further efforts being made to improve primary health care. According to Keegan:

'It is a global priority to deal with measles, but I don't think the global community is ready yet to embrace measles eradication because the polio campaign is still going on, and because the whole disagreement over more vertical or targeted programs versus primary health care or horizontal programs has not been resolved. Measles will exacerbate the argument even more . . . there are major organizations that don't want to talk about measles eradication at all, and they include UNICEF.'\textsuperscript{78}

Before measles eradication activities could begin in earnest, all international agencies would have to agree upon this goal. The World Health Assembly, for example, has yet to pass a resolution declaring measles eradication to be a goal.

Rotary's membership in the PEI coalition has been a model for future efforts. Rotary, a neutral NGO with an immense international membership, provides an avenue to lobby governments, such as the United States, for funds. According to Keegan:

' . . . one of the major strategies is to find an organization or major donor who will take the lead, as Rotary has done for polio. It's not so much Rotary's contribution in the dollar sense that would be regarded. As important is the fact that they are influencing a lot of others. So they are an advocacy group.'\textsuperscript{78}

A neutral, non-governmental organization is in a prime situation to advocate effectively for a health programme without seeming self-interested, says Ward:

'The business of advocacy is always extremely difficult for people in government and international organizations because there are limits on what we can do. Bob Keegan and myself cannot go and
testify directly before Congress on our own, whereas a neutral organization like Rotary can do something.  

Rotarians brought with them pre-established political ties, and they used these connections to persuade politicians to support the PEI. While another NGO like Rotary may not be essential for measles eradication, it would facilitate the initiative if an NGO like Rotary, or a group of NGOs, could be convinced to join the effort.

A possible candidate is the International Association of Lions Clubs – the largest NGO associated with the United Nations. Lions works with the WHO to raise funds for blindness prevention. Representatives of the Global Program for Vaccines and Immunization (GPV) and the EPI have argued to Lions that measles prevention would be tantamount to blindness prevention, since measles is a major cause of blindness in the developing world. In Asian countries, vitamin A deficiency is responsible for approximately 25% of cases, with measles being the precipitating factor in 10–12% of cases. In African countries, measles is also a major cause of blindness in children. For example, 55% of children in Malawi have a history of measles prior to becoming blind from corneal scarring. According to James Cheyne (Program Officer, Global Program for Vaccines and Immunization, WHO):

‘I have argued that measles causes blindness, and therefore preventing measles will prevent blindness. And they said ‘Yes, that is true. But measles prevention is not one of the five activities that Lions will support to prevent blindness.’ . . . And I said, ‘Well, how do we get measles on the list?’ . . . The reaction was so negative that it was rather surprising. It was almost like they had made up their minds before they came to the meeting.’

Related to the problem of convincing Lions to support measles eradication is a problem of intra-organizational commitment within WHO. Lions is advised by a small technical group headed by B.-I. Thylefors (Director, Program for the Prevention of Blindness and Deafness, WHO). Thylefors’ first priority is to ensure that there is enough funding for the prevention of blindness, as prescribed by his programme. According to Cheyne:

‘Thylefors . . . sits on the Lions committee for assessing money for projects. He, I think, is not convinced about measles. So we have an internal problem, to convince somebody internally.’

Thylefors has advised Lions on how to invest in blindness prevention; this does not include measles vaccination. It is plausible that he is afraid of losing Lions funding to the EPI. Thylefors would not comment on this issue himself. Michael Pajonk (Manager, Sight First Department, Lions Club International Foundation) would only say:

‘Sight First does not support measles eradication as part of our program priorities for blindness prevention. This has never been a priority for Sight First funding nor do we expect it to be in the future.’

However, there is grass-roots support within Lions for measles immunization and eradication. According to Cheyne:

‘Lions in India produced a project called Measles Minus. They caught this idea, and said, “We will do measles in India.” And they spent a huge amount of money in India, all the Lions of India collected money . . . And as far as I remember, it was largely because of them that measles immunization started in India . . . I then tried to build on that idea. If Lions could do it in India, why didn’t we get Lions International to do it for the whole world?’

In Guyana, Lions and other local NGOs participated in the planning phases of the measles programme and also participated in service delivery. During ‘measles month’, Lions members provided transportation to deliver vaccines to hard-to-reach children. As part of a coordinated action, other NGOs worked with Lions, EPI managers, and government officers to ensure the success of the measles campaign. Lions members in Italy are also very anxious to join a measles eradication effort.

More recently, GPV has encouraged other Lions members to advocate measles eradication: the honorary chairman, Lic. Oec. Peter Wiesli, and the chairman and chief executive officer, Dr. P. Legler, of Swiss Serum (one of the largest manufacturers of measles vaccine). To make such a partnership with Lions successful, however, the EPI should work with the Program for the Prevention of Blindness and Deafness (PBD) to come to a consensus on the role of measles immunization in blindness prevention.

Before global measles eradication efforts can begin, the WHO must convince all industrialized and developing countries that measles eradication is feasible and beneficial. Participating organizations must
resolve their internal disagreements and make a clear commitment to the goal of measles eradication. Furthermore, members of the coalition to eradicate measles should recruit NGOs – large and small – and the private sector to join their efforts.

Conclusions
Measles eradication would be a precarious endeavour, and should not be attempted until the eradication of polio is assured. If the PEI does not achieve its goal of eradicating polio, a backlash against eradication programmes and targeted programmes in general will result. Initiating any new eradication programmes following such a failure would be impossible. Thus, advocacy of measles eradication should include support for ongoing PEI activities. The strategies used by the Americas to eliminate measles bode very well for the success of strategies to be implemented in eradicating measles using the current vaccine, but the highly infectious nature of measles represents a very serious barrier to achieving its eradication. Garnering strong support from all countries following the intensity of the polio campaigns will be the greatest challenge to measles eradication and efforts to do so must begin now.

Endnotes
* The Taylor Commission was convened by the Pan American Health Organization to determine what impact the EPI and PEI had on national health systems in the Americas. The members of the Commission include: Hesio Cordeiro (Federal University of Rio de Janeiro, Brazil), Felicity Cutts (London School of Hygiene and Tropical Medicine, UK), Julio Frenk (National Institute of Public Health of Mexico), Dean Jamison (University of California at Los Angeles, USA), Efraín Otero (Fundación Santa Fé de Bogotá, Colombia), Carl Taylor, Chairman (Johns Hopkins University School of Hygiene and Public Health, USA), and Julia Walsh (Harvard School of Public Health, USA). Research teams collected and analyzed data from Bolivia, Brazil, Colombia, Guatemala, Mexico, and Paraguay.

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37. Interview with Joel Kuritsky, telephone, 7 April 1997.


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Eradication programmes for polio and measles

Biography

Celine Gounder graduated from Princeton University in 1997 with a degree in molecular biology and a certificate in engineering biology. For the past year, she has been the Project Manager of the Princeton Project 55 Tuberculosis Initiative – a tuberculosis advocacy group founded by Princeton’s Class of 1955. She is now an ScM candidate studying epidemiology at the Johns Hopkins School of Hygiene and Public Health.

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