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Cover photo: A house-to-house polio vaccination team member gives a child polio vaccine drops in a home in the slum of Kamla Nehru Nagar. Urban slums such as this one are intensively targeted during the polio campaigns (Bihar, India, 2010); photo by Gates Foundation, <http://www.flickr.com/photos/gatesfoundation/5466262329/in/photostream/>.

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# POLIO ERADICATION IN INDIA GETTING TO THE VERGE OF VICTORY— AND BEYOND

*Teresita C. Schaffer*<sup>1</sup>

India's struggle against major health challenges in the past few decades has been a white-knuckle ride, with India illustrating some of the best, as well as the worst, of the health problems of the developing world.

But now—even though those closest to the effort are unwilling to declare victory prematurely—there is a good chance that India's polio eradication campaign will tell a more inspiring story. In 1988, when the World Health Assembly formally adopted polio eradication as a global goal, WHO data recorded 23,800 cases of polio in India.<sup>2</sup> At this writing, it has been a year since the last case was identified, in West Bengal on January 13, 2011.

If this milestone endures, it will be the result of a persistent and focused effort and unprecedented collaboration among Indian scientists, administrators, and their international counterparts. The campaign has combined cutting-edge research on vaccines, old-fashioned door-to-door follow-up, public and private outreach, political drive, and relentless surveillance. It has had to overcome what the program's Indian and international leaders regard as a unique combination of biologic and epidemiologic challenges, as well as classic speed bumps in navigating India's bureaucracy. The effort's ultimate legacy—beyond the unquestioned benefit of reducing or eliminating paralytic polio—will depend on how India's health leaders consolidate their victory, and how they embed the institutional sources of their apparent success into the country's remarkably diverse health system.

## Origins of the Campaign

India had extensive experience with single-disease campaigns before the polio campaign got under way. HIV/AIDS, tuberculosis, and malaria had all been targets of single-disease programs, and they illustrated both the sharper focus such programs can provide and the dangers of walling off disease programs from the overall health system. India was also one of the last countries to eliminate smallpox. The campaign was ultimately successful, but its relatively inflexible organization nearly

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<sup>2</sup> World Health Organization (WHO), "India Reported Cases" (time series of incidence of reportable diseases, for India), [http://apps.who.int/immunization\\_monitoring/en/globalsummary/timeseries/TSincidenceByCountry.cfm?C=IND](http://apps.who.int/immunization_monitoring/en/globalsummary/timeseries/TSincidenceByCountry.cfm?C=IND).

led it to fail. It was also largely a foreign-staffed effort and left no institutional infrastructure behind. This history shaped the polio campaign in important ways.<sup>3</sup>

India was relatively slow to adopt eradication as its operational goal for polio. Many professionals at the Ministry of Family Welfare were deeply skeptical that eradication would be possible. Within some Indian medical circles, and among the staff of the New Delhi–based Southeast Asia Regional Office (SEARO) of the World Health Organization (WHO), some officials argued that polio eradication would benefit primarily the rich countries; that there were other, more pressing health priorities in India; and that the cost of the eradication campaign would limit resources and organization for providing health services to India’s general population.<sup>4</sup>

Two of the key personalities in overturning such skepticism were Dr. Jon Andrus, an American from the U.S. Public Health Service who arrived in India in 1993 as regional adviser for polio on the WHO/SEARO staff, and Dr. Kaushik Banerjee, a director of India’s national immunization program in the Ministry of Family Welfare, who had written a dissertation on polio during his medical studies and maintained a strong interest in the subject.

Polio programs were beginning to move forward in a couple of Indian states and elsewhere in the region. In 1993, the Indian state of Kerala conducted a statewide polio immunization campaign, and the state of Tamil Nadu followed. In the next two years, Thailand conducted a National Immunization Day. So did Bangladesh, reaching an estimated 95 percent of children under five years of age. The data from these events illustrated the campaigns’ impressive reach, as well as their impact—as evinced by a rapid drop in new polio cases.

Andrus’s regional polio responsibilities included Bangladesh. After one of his visits to that country, he made a presentation to the Indian Health Ministry, offering his first-hand account of Bangladesh’s aggressive initiative. In a pattern that was to recur many times over the next 15 years, he and Banerjee peppered the ministry’s leadership with data-rich presentations showing the decisive factors in successful anti-polio work across the globe. The big breakthrough came in 1994, at the state level, when Harsh Vardhan, health minister of the Union Territory of Delhi, decided to embrace the issue and elevated the campaign against polio by scheduling an immunization day for October 2, Mahatma Gandhi’s birthday.<sup>5</sup>

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<sup>3</sup> See Teresita C. Schaffer, *U.S. Engagement in Indian Health Care: What Is the Impact?* (Washington, D.C.: CSIS, November 2010), pp. 11–12, [http://csis.org/files/publication/101115\\_Schaffer\\_USEngageIndianHealth\\_Web.pdf](http://csis.org/files/publication/101115_Schaffer_USEngageIndianHealth_Web.pdf).

<sup>4</sup> See, for example, Debabar Banerji, “Global Programme of Polio Eradication in India,” *International Association of Health Policy*, April 2004, <http://www.healthp.org/node/17>.

<sup>5</sup> There is a political dimension here that goes beyond the scope of this paper. At the time, the Bharatiya Janata Party (BJP), a Hindu nationalist party to which Vardhan belongs, was in power at the state level in Delhi, but not at the national level. The BJP is the heir to a political tradition that sharply opposed Gandhi during his lifetime. The choice of Gandhi’s birthday represented both a recognition of the value of the

National policy started to shift toward eradication as Indian leaders became conscious of the success of other programs—especially in Bangladesh, a country many Indians look on as less advanced than their own. At the same time, India’s own health officials began to publicize the issue, fortified by data provided by advocates for polio eradication.

In December 1995 and January 1996, India scheduled two National Immunization Days. There was only enough vaccine on hand to cover children up to the age of three, but the eradication team mounted a remarkable effort, mobilizing the health machinery from states and districts all over the country, 2 million volunteers, and the Indian chapters of Rotary International. They reached 87 million children. A year later, with a more generous supply of oral polio vaccine, another round of National Immunization Days took place, targeting children up to the age of five and reaching some 125 million. These initiatives proved that immunization on a grand scale had become part of the landscape in India.

Setting up a surveillance system—the other critical arm of the polio eradication campaign—turned out to be more complicated. In 1997, the Danish aid agency, DANIDA, made an \$11.5-million grant to support surveillance. DANIDA, however, wanted to create an institutional legacy, rather than be swept up into a wider eradication campaign whose ability to leave lasting infrastructure the Danes questioned.

Andrus saw an opportunity to build Indian human resource capacity and avoid the smallpox program’s excessive reliance on expatriates and its failure to create local institutions. He argued that putting together a top-flight network of laboratories specialized in polio surveillance and deploying surveillance medical officers (SMOs) around the country would create an Indian surveillance institution the Danes could be proud of. This system was also, not incidentally, the kind of structure that India’s polio eradication effort needed.

At the outset, at DANIDA’s insistence, the surveillance machinery focused entirely on surveillance of acute flaccid paralysis (AFP), the classic definitive symptom of polio. It had no mandate for comprehensive support for the polio eradication program. This program soon became institutionalized as the National Polio Surveillance Program (NPSP), described in greater detail below.

In time, however, SMOs stationed in each district of India became more deeply and comprehensively involved in micro-planning for the eradication campaign. The surveillance that was so critical to India’s effort, in other words, was set up as an initiative to increase capacity in that skill alone; it only overtly embraced comprehensive eradication once the program grew strong enough to overcome the donor’s skepticism.

Regular immunization days and improved surveillance caused the number of new cases of polio to plummet. By 2000, the original target date for eradication, WHO data showed newly transmitted

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Mahatma’s name as a mobilizing and unifying force in India and a gesture in the BJP’s reconciliation with the Gandhian tradition.

cases down to 265. More dramatically, the state of Orissa—one of the poorest states, with a government whose name was then considered to be a byword for ineffectiveness—had gone from 45 cases of wild poliovirus infection to zero transmission within one year, a record polio eradication that veterans had not seen anywhere else. Eradication seemed close at hand.

But the virus bounced back: by 2002, cases were up to 1,600. The managers of the program had decided to reduce the number of immunization rounds in the polio campaign. Veterans of the program attributed this decision to complacency and believe that it contributed to the program’s “losing its edge.” The program managers stopped treating each small indicator of renewed transmission as an emergency. The next three years saw a toned-up effort, which brought renewed progress—down to 66 cases nationwide in 2005. This was followed by another bounce-back in 2006–2009, with new polio cases numbering 550–874 in each of those years. In 2010, however, the campaign was back in fighting trim, with 43 cases. The last recorded case of wild poliovirus infection in India, as previously noted, was in January 2011.<sup>6</sup>

Year	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Number	4,791	3,263	1,005	2,275	4,322	2,817	265	268	1,600	225	134	66	676	874	558	756	43

## Structure of India’s Campaign

The heart of India’s polio eradication effort is the NPSP, founded in 1997 as described above. From the start, it was a joint venture between WHO and the government of India, with strong participation by the U.S. Centers for Disease Control and Prevention (CDC). Its current director is Dr. Hamid Jafari, a U.S. citizen seconded by CDC. Except for a handful of foreign medical officers, NPSP is staffed entirely by Indians. Its leadership considers its international ties critical in validating NPSP’s data and results, but they also recognize that the Indian character and “ownership” of the organization is a tremendous asset when it comes to mobilizing the country and the organization for a sustained effort.

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<sup>6</sup> Except as otherwise noted, the account of the history of the eradication program was based on Jon Kim Andrus, foreword to “Special Supplement: Poliomyelitis in India—Past, Present and Future,” *Indian Journal of Pediatrics* 65, no. 1 (January–February 1998); and on the author’s conversations with Dr. John Andrus, chief, Immunization Unit, Pan American Health Organization (PAHO), and Dr. Steven Cochi, senior adviser, Global Immunization Division, CDC, Atlanta, Georgia.

<sup>7</sup> WHO, “India Reported Cases” (time series of incidence of reportable diseases, for India), [http://apps.who.int/immunization\\_monitoring/en/globalsummary/timeseries/TsincidenceByCountry.cfm?C=IND](http://apps.who.int/immunization_monitoring/en/globalsummary/timeseries/TsincidenceByCountry.cfm?C=IND).

As NPSP's name and history suggest, surveillance is its core strength and function. This too is noteworthy. India's surveillance capacity has steadily increased over the past two or three decades, the result of work by a dedicated corps of Indian professionals, assisted by sustained support from CDC and the U.S. Agency for International Development (USAID) for India's collection and use of health statistics.<sup>8</sup> The organization's leadership takes justifiable pride in having run a data-driven and transparent operation. The quantity and quality of data on their website is far more extensive, more current, and easier to use than other health data currently available through the Indian government.

NPSP is directly responsible for finding cases of AFP and promptly analyzing patients' stool samples to determine whether they contain polio virus and, if so, what type. It carries out this task through a network of nearly 300 SMOs located all over the country. These officers, the backbone of NPSP, were rigorously selected, with a national search followed by in-depth interviews with a panel of experts. Technical knowledge and experience, dedication to hard work, and compassion for serving the underserved were critical selection criteria. Once assigned to their posts, it was extremely rare that anyone abused his or her authority, even in such a huge country. In the few cases when unprofessional behavior occurred, it was NPSP's policy to act swiftly and fairly. People familiar with disease eradication efforts around the world commented that this team development and oversight contributed to an esprit de corps rarely found in global work.

The analysis of stool samples is carried out by the laboratories in the India Poliovirus Laboratory Network, which in turn are part of the laboratory network of the Indian Council of Medical Research. The eight National Laboratories are part of a global network of 145 labs that is annually certified by WHO. One of them, the Enterovirus Research Centre in Mumbai, is one of seven Global Specialized Laboratories designated by WHO.<sup>9</sup>

In describing the start of the national laboratories network, Dr. Andrus said India had opted, with its donors' support, for "a Cadillac model," in an effort to avoid the surveillance gaps that had led to recurrence of infections in several Latin American countries. The decision to go for excellence and for multiple institutions around the country, however, also showcased Indian scientific capacity and made polio surveillance a demonstration of national pride.

NPSP has also become the principal planning agency for polio eradication. In planning immunization days, it works with the government's immunization program—the tiny staff in the Ministry of Health, whose primary function is vaccine procurement, and the operational staffs of state governments all over India, who hire and maintain vaccinators and other staff. NPSP has participated in training vaccinators; it has also organized massive immunization days in some of the most difficult areas of the country, working with state governments that many people had more

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<sup>8</sup> See, for example, discussion of USAID support for the National Family Health Survey and CDC support for laboratory capacity in Schaffer, *U.S. Engagement in Indian Health Care*.

<sup>9</sup> National Polio Surveillance Project (NPSP), "Lab Network," <http://www.npspindia.org/Lab%20Network.asp>; and author's conversations with Dr. Andrus and Dr. Cochi.

or less written off. NPSP has apparently been able to calibrate the level of its involvement to the needs of particular locations.

NPSP has also brought the Indian players in the polio eradication campaign together with the spearheading partners in the Global Polio Eradication Initiative (GPEI): WHO, CDC, UNICEF, and Rotary International, as well as other bilateral and private donors. A major vehicle for doing this is the India Expert Advisory Group, which meets once or twice a year. Participants in these meetings have commented on their productiveness. Even after more than a decade of regular meetings, participants in this group continue to attend in person rather than sending subordinates. This personal commitment of time has certainly contributed to the strength of the Indian eradication effort and to the vibrancy of the professional relationships that are driving it.<sup>10</sup>

India accounts for 32 percent of the financial requirements of GPEI—a large share, reflecting India’s size and importance as one of the last endemic countries. The surprise, however, is the government of India’s relatively large share of the funding for the polio eradication campaign. Figures released on the GPEI website show that the Indian government financed a cumulative total of \$1 billion for polio eradication between 2003 and 2010, and this is projected to finance 79 percent of the campaign’s costs between 2011 and 2013. This is in sharp contrast to the way India has financed some of its other high-profile campaigns, such as the one on HIV/AIDS.<sup>11</sup> It suggests that the Indian government has taken ownership of this effort in a way that it had not done with earlier disease prevention and control campaigns and that success has become a matter of national pride.

Indian government funding for polio eradication, currently on the order of \$225 million per year, is more or less evenly divided between vaccine procurement and operational costs, in keeping with the global pattern. Participants in the program report few of the bureaucratic holdups that plagued some other programs. International funding has supported social mobilization, with the Gates Foundation as the largest donor. International donors have also supported surveillance and technical assistance, with most of the funding coming from WHO and UNICEF, but with a key startup contribution, as already noted, from DANIDA, and significant contributions from bilateral donors, including the United States, as well as the Gates Foundation and Rotary International.<sup>12</sup>

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<sup>10</sup> Information on NPSP comes from its website, <http://www.npspindia.org/link.asp>, and from the author’s conversations with Hamid Jafari, NPSP director; Stephen Cochi, senior adviser, Global Immunization Division, CDC; and Bruce Aylward, assistant director-general for polio, emergencies and country collaboration, WHO.

<sup>11</sup> There is no comparable source of comprehensive figures on the AIDS campaign. Based on figures in the Finance Ministry’s “India Economic Survey, 2011–2012,” spending by the National AIDS Control Organization accounts for about 2.2 percent of 2010 government spending on health. Indian and international AIDS experts have consistently reported that the majority of India’s expenditures on the AIDS campaign were internationally financed.

<sup>12</sup> Global Polio Eradication Initiative (GPEI), “India: GPEI External Financial Requirements, 2011–2013,” [http://www.polioeradication.org/Portals/0/Document/Financing/FinancialRequirements/India\\_OnePager.pdf](http://www.polioeradication.org/Portals/0/Document/Financing/FinancialRequirements/India_OnePager.pdf).

## Constantly Adapting Strategy and Tactics

The broad outlines of a global strategy were released promptly by WHO when the campaign was launched and adopted by the other members of GPEI and participating countries:

1. Maintenance of high vaccination coverage levels among children with at least three doses of oral poliovirus vaccine (OPV);
2. Development of sensitive systems of epidemiologic and laboratory surveillance, including use of the standard WHO case definition;
3. Administration of supplementary doses of OPV to all young children (usually those aged less than five years) during National Immunization Days to rapidly interrupt poliovirus transmission; and
4. “Mopping-up” vaccination campaigns—localized campaigns targeted at high-risk areas where wild poliovirus transmission is most likely to persist at low levels.<sup>13</sup>

The key elements of the strategy, validated in the experience of the Pan American Health Organization (PAHO) during the late 1980s and early 1990s, were vaccinating vulnerable populations, especially children, and intense surveillance. But the key to success, it turned out, lay in adapting these basic concepts to local needs, not just in different countries but in different micro-communities, once these needs became better understood.

In the early years, revisions to the strategy appeared in the form of multiyear planning documents. By 2009, annual planning documents had become the norm, with more frequent ones developed as needed. These dealt with local differences in the biology and epidemiology of the campaign. Some of these proved critical to India’s effort. For example, experience in India demonstrated that oral polio vaccines produce less effective immunity in populations where childhood diarrhea is prevalent. This led the Indian program to dramatically step up the number of national and other supplementary immunization days. Similarly, some of the most polio-affected parts of northern India had significant migrant populations. As a result, immunization days were timed near festival days that would naturally lead large numbers of people to gather at their respective family seats. This pace of work required a herculean effort of training and mobilization, working in some Indian states long considered the least capable in the country.

NPSP took pride in subjecting its operational results to constant scrutiny. This type of operational research indicated that children in higher-prevalence areas might need as many as 10 to 12 doses of vaccine, more than the standard set forth by the WHO guidelines. The Indian program was able to deliver 10 to 11 polio vaccination campaign days a year in critical places, including in areas like Uttar Pradesh and Bihar, where the epidemiologic and governance challenges are most severe.

That said, as recently as 2009, despite a significant increase in vaccination, routine vaccination received less attention than the special eradication-related campaigns. The overall rate of routine

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<sup>13</sup> Quoted in CDC, “Progress toward Global Poliomyelitis Eradication, 1985–1994,” *Morbidity and Mortality Weekly Report* 44, no. 14 (April 14, 1995): 273-6, 281.

vaccination coverage in the areas most vulnerable to polio infection—the three doses of trivalent oral vaccine stipulated in the original WHO strategy—fell well short of the numbers required for good population immunity. Estimated routine coverage in Bihar came to 62 percent in 2009, up from 51 percent in 2006. In Uttar Pradesh the figure was 54 percent in 2009, up from 50 percent in 2006. And in West Bengal, site of the lone case discovered in 2011, coverage was 74 percent. In other words, the scale of vaccination was a remarkable achievement, but there remain significant gaps in routine immunization.<sup>14</sup>

Along with the evolution of how vaccines were used came changes in the vaccine itself. The immunization campaigns started by using trivalent oral polio vaccine, which included inactivated viruses from all three strains of polio virus. As research began to indicate that other formulations could deliver a better immune response, the Indian campaign introduced monovalent vaccine and, in 2010, bivalent vaccine aimed at the two types of polio virus that continued to be found in the country.<sup>15</sup>

The surveillance effort that supported the campaign changed less. The emphasis in the periodic strategic reviews was on speed and accuracy, both in obtaining and analyzing stool samples from the patients and in applying the findings in the campaign. In the early part of the last decade, environmental surveillance was added to the mix as an “insurance policy,” with the Enterovirus Research Centre in Mumbai taking the lead in sampling sewage in Mumbai and Delhi for polio virus.

As the number of new cases fell, India focused more tightly on the areas that were most seriously affected, as it had in other single-disease campaigns such as smallpox and HIV/AIDS. It identified problem states, problem districts, and finally 107 “high-risk blocks,” moving into ever smaller micro-communities to isolate the problem.

As the campaign’s geographic strategy narrowed its focus, so too did its communications and social mobilization effort. These efforts have comprised a critical dimension of each of India’s major disease elimination campaigns. A crucial component has been grass-roots level understanding of the communities in which the campaign is working. For instance, a major polio outbreak in 2002 in Uttar Pradesh and Bihar, in which Muslims in particular refused vaccination, brought things to a head. NPSP reexamined how it had staffed for vaccination days and decided to ensure that each vaccination team must include the maximum number of local people and at least one woman.

The teams were carefully trained in how to answer questions (why so many vaccinations? why not use the money to build roads?). One of the trickiest questions, hotly debated within the eradication team, was why the polio vaccination teams did not bring other medications. Distribution of vitamin A, for example, was considered but ultimately not added to the polio teams’ responsibilities because

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<sup>14</sup> WHO, “Progress towards eradicating poliomyelitis: India, January 2010–September 2011,” *Weekly Epidemiological Record* 86, no. 45 (November 4, 2011), <http://www.who.int/wer/2011/wer8645.pdf>.

<sup>15</sup> *Ibid.*

it was controversial within the Indian medical community. The polio program decided that it had to stay with its core job.

In communities where government services were scarce—most of the high-risk blocks fit this description—particular effort was made to work with locally influential people. By 2008, the disparity in vaccination rates with the surrounding communities had been largely eliminated, and in the process routine immunization rates for other diseases had also increased.<sup>16</sup>

A celebrity campaign started early in the program, including televised launches in the prime minister's garden, attended by all the partners in the program. Some of the GPEI partners, notably UNICEF and Rotary, played a role in putting this celebrity campaign together, adding to the visibility of polio eradication, and probably contributing as well to high-level political commitment. Film clips made by Bollywood's biggest star, Amitabh Bachchan, and by Fernando Alonso, two-time world champion Formula 1 Ferrari driver, attracted particular popular attention.

As India neared what it hoped would be the finish line, an additional objective was added to the strategy: guarding against imported infection. The major focus was on neighboring countries. Pakistan, another one of the four still-endemic countries, suffered an increase in polio infections in late 2011, and India responded with a decision that all children under five coming across the India-Pakistan land border would be vaccinated at the border.<sup>17</sup> This border has relatively little traffic. The largely unguarded and frequently crossed India-Nepal border is much more difficult to control, even if the rules are in place.

## The Final Inch and Beyond

India's polio eradication campaign has mobilized the work and enthusiasm of millions of people, who are now watching with bated breath as India marks a full year with no wild poliovirus transmission. A film nominated for an Emmy Award for documentaries, "The Final Inch," captured the long campaign's drama and the tension surrounding its very last stages.

But India's real challenge lies beyond the coveted one-year mark. Thus far, smallpox is the only disease to have been eradicated worldwide. India came close to wiping out malaria in the 1960s, only to see it return in force a decade later. And, as we have seen, the polio campaign has had at least two bounce-backs. Several countries that had interrupted transmission have seen it reappear. How can India avoid a reprise of this disheartening experience?

Those closest to India's campaign cite two principal vulnerabilities. The biggest and most fundamental is the danger of complacency, and with it the risk of missing some new transmission or an imported case. The second comes from the gaps in routine immunization coverage. The 95

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<sup>16</sup> Author's conversation with Dr. Hamid Jafari, Director, NPSP, December 7, 2011.

<sup>17</sup> Pakistan Press International (PPI), "Indian govt sets up polio booths at Wagah," *Express Tribune* (Karachi), September 20, 2011, <http://tribune.com.pk/story/256345/indian-govt-sets-up-polio-booths-at-wagah/>.

percent standard advocated by WHO could still leave gaps, and in some of the highest-risk states, coverage falls well below this standard.

These vulnerabilities will be tested as India moves toward what the GPEI calls the “post-eradication” phase. The polio virus can live, albeit briefly, outside a primate host. The oral vaccine that is the backbone of the immunization campaign is made from attenuated live viruses. It causes a small number of cases of disease each year, and some of these are capable of further transmission. Completing the job of eradication is thus critical. The key elements in global thinking about post-eradication work are sustaining a very strong program of routine immunization, shifting from live to inactivated virus vaccine, and maintaining surveillance. Most critically, the program needs to maintain its intensity, funding, and focus for several years beyond the time India is declared free of transmission—perhaps the hardest goal of all when a country perceives it has already “succeeded.”

There has been some discussion of post-eradication strategy in India, but so far little evidence of hard planning or budgeting for that phase. The leaders of India’s program are aware of the debate in the international scientific community about the timing and tactics of shifting vaccines. The inactivated polio vaccine (IPV), which eliminates the risk of vaccine-derived polio, is about five times as expensive as the live virus; moreover, it must be delivered by injection, whereas the live vaccine is delivered orally. A strong research effort is under way, covering vaccine formulations, administration protocols, and dosages. Preliminary results suggest that this may well result in an inactivated vaccine strategy that is comparable in cost to the oral vaccine currently in use, making it possible to eliminate the risk of vaccine-derived polio earlier than the three to four years that have been the norm thus far.

Those who are thinking ahead to post-eradication are also considering delivering other vaccines in a single injection, together with IPV. One issue being explored is whether India can manufacture a combined vaccine. The drive to innovate and incorporate data from research, in other words, will have yet another manifestation in the last stages of India’s eradication campaign.<sup>18</sup>

## Closing Reflections

With this final struggle still ahead, it is fitting to look back at the biggest challenges and biggest successes of India’s polio eradication program so far.

Any national campaign in India faces the problem of scale. India’s health sector is full of creative and dynamic initiatives. Few of them operate at a state-wide level, let alone nationally. India’s federal structure complicates action on a national scale. The states have major responsibilities for

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<sup>18</sup> Author’s conversations and correspondence with Dr. Hamid Jafari, Dr. Bruce Aylward, Dr. Jon Andrus, T. Jacob John, Department of Clinical Microbiology and Department of Virology, Christian Medical College, Vellore, and Dr. Robert Bollinger, Johns Hopkins Center for Clinical Global Health Education (CCGHE) and Johns Hopkins Center for Global Health.

health, but as in the United States, they are not subordinate to national-level ministries, nor are they required to take orders from federal officials.

Add to this the fact that in some of India's most densely populated states, both environmental and biological factors make for a very high level of "routine" disease among India's children, the key population for polio eradication. Water pollution and uneven or poor hygiene practices facilitate transmission of a water-borne virus. Diarrhea is extraordinarily widespread among children. In India's diverse population, suspicion of outsiders frequently extends not just to foreigners but to people from other parts of India or other social backgrounds.

But some of these challenges carried the seeds of India's apparent success. India's size and scale meant that, if the right policies were put in place, bureaucratic and institutional inertia would keep them going. There was no single national champion of polio eradication; instead, there was a wide range of institutional champions. This network made for bureaucratic rivalry, as one would expect, but also, at least by the latter part of the campaign, widespread commitment on the part of each participating institution. A special place of honor goes to NPSP, which operated with savvy and skill to bridge not just India's internal divides, but also those between Indian and international scientists.

The epidemiologic challenges pushed India's scientists and the program managers to intensify the research and innovation that would overcome these obstacles. All observers have commented that this campaign has been an unusually open and transparent, research- and data-driven process. The strategic innovation noted above was the result and was clearly critical to India's success.

But research is not just a laboratory activity. One of the hardest things to do in an institution is to create a culture that encourages participants to question conventional wisdom and constantly ask "why." NPSP insiders and close outside observers agree that those who created NPSP have done this to a remarkable extent. This achievement, combined with a strong commitment to integrity, proved to be critical when it came to handling information and setting standards for staff behavior. The high quality of data and of surveillance and monitoring gave the program's leaders good information to start with—and credibility when they reached difficult stages in the program.

Research quickly became a national asset and a legitimate point of national pride. India's national labs are a case in point. In recent years, a growing number of Indian experts have gone on to key positions in WHO and other international institutions. More recently, there has been an effort to recruit Indian veterans of the polio eradication campaign to share their experience around the world, notably in Africa.

Moving beyond government institutions, India's effort has also benefited from an extraordinary volunteer push. The Indian chapters of Rotary International, consisting mainly of successful business people, were able to get a hearing for the polio eradication campaign in political circles where technocrats would normally not have access. This high-level access—even more than the funding Rotary provided—helped make polio eradication a national cause, which in turn protected NPSP and the polio campaign from the vicissitudes that all government agencies go through at one time or another. It also facilitated the VIP advocacy that supported the campaign.

The last and perhaps most indispensable ingredient of India's achievement has been the dedication and resilience shown by the team that saw this effort through. Many key players remained involved for seven years and more, providing a strong core around which other participants could orient and organize themselves.

Those who led the polio eradication campaign clearly had absorbed experience from earlier Indian health efforts, including lessons about how international experts and their Indian counterparts can most effectively relate to one another. Besides the critical importance of team building and the enduring value of professional relationships founded on deep mutual respect, three key lessons emerge from this experience.

First, a disease eradication campaign—and arguably any major health campaign—is not just a medical affair. It involves human behavior; it involves government and nongovernment players; it involves government and nongovernment doctors. Outreach and a cross-sectoral approach are critical, and both need to be built in from the start.

Second, routine and “special” efforts reinforce each other. The example here is polio vaccination. India has brought polio vaccine to its children on an unprecedented scale—but gaps persist. If it is able to fill these gaps and apply the techniques that worked for a high-profile polio campaign to routine vaccination, the benefits will be huge for all vaccine-preventable diseases. As we saw in the discussion of both vaccination and surveillance, these basic skills are building blocks for a healthier population.

Third, institutions matter. NPSP's future remains to be decided, but it has become a national asset and is already supporting surveillance for other diseases, like measles and Japanese encephalitis. This institution, with its record of teamwork and capacity to reach out to India's states and to international experts, is well positioned to help transform public health in India.







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