Fighting Polio Block by Block, House by Shack

**GHAZIABAD AND DELHI**—Ghaziabad is one of the last strongholds for poliovirus. This impoverished corner of the northern Indian state of Uttar Pradesh offers an almost perfect environment for the virus to survive—even thrive. In urban shantytowns so new they don't even have names, families live in dirt-floored huts, cobbled together out of brick or cardboard secured by grass or plastic; lucky families have a piece of wood instead of burlap for a door. There are no toilets, no running water except for a single standpipe, no electricity. Bare-bottomed kids sit quietly in the mud. Human and animal feces commingle in drainage ditches.

In a rural village nearby, open sewers run on either side of a thin dirt path that winds around the brick houses. Flies and dust are everywhere.

Sixteen years after the World Health Organization (WHO) and its partners set out to eradicate polio, the virus is hanging on here and in just four other redoubts around the world: the equally poor Indian state of Bihar, two impoverished regions of Pakistan, and northern Nigeria. India poses some of the toughest challenges confronting the polio eradication campaign anywhere.

The chains of transmission have never been broken in Uttar Pradesh, and there is no guarantee that they can be. Devastating poverty, rapid population growth, overcrowding, dismal baseline health, and a lack of sanitation are ideal incubators for a virus spread by fecal-oral contact, says Bruce Aylward, who coordinates the polio eradication effort from WHO headquarters in Geneva: "If I were a virus being pushed to extinction, I would hide out there."

Yet, the global polio eradication effort is about to launch what leaders hope will be its final push to wipe out the virus in India. Drawing on hard-learned lessons from a devastating outbreak in 2002, the Indian government has just adopted a bold new plan to stop transmission in 2004—and coughed up $100 million extra to do it.

With the number of inadequately immunized kids still perilously high and the disease popping up in parts of the country that had been polio-free, no one is underestimating the difficulty of the task—or the amount of luck needed to pull it off.

This all-out operation is part of the world's biggest biological and social experiment in disease eradication. After nearly 10 years of charting the virus's every move in India, epidemiologists are increasingly adept at anticipating where the virus will resurface, what weak link in the social fabric it can exploit. Far more rudimentary is their understanding of what it takes socially and politically to eradicate a disease that is so thoroughly entrenched in a country overwhelmed with more urgent health problems.

Still, if India can do it, says Chris Maher, coordinator for country support in Geneva, it will show that global eradication is actually feasible. "When we take out one global reservoir, we've won. And India is the best one to go for," he adds.

** Millions of vials **

The scale of the project is nearly unfathomable. Although figures vary slightly from year to year, volunteers typically deliver two drops of oral polio vaccine (OPV) to some 165 million children two times a year; up to 100 million receive an extra three or four doses. For the National Immunization Days in February 2004, for instance, the government set up 640,000 booths and sent 2.3 million mobile vaccination teams to visit 191 million houses. Watching over the 1.1 million mobile vaccination teams to visit some 165 million children two times a year, volunteers typically deliver two drops of oral polio vaccine (OPV) to some 165 million children two times a year; up to 100 million receive an extra three or four doses. For the National Immunization Days in February 2004, for instance, the government set up 640,000 booths and sent 2.3 million mobile vaccination teams to visit 191 million houses. Watching over the 2.3 million vaccinators were 137,000 supervisors. In all, they used some 10 million vials of OPV to vaccine 169 million children.

Theoretically at least, the mobile teams, instituted in 1999, visit every single house in the 2 to 5 days following the initial “booth day” to reach the 50% or so of children who don’t make it to the site. Each two-person team, composed of health workers, midwives, teachers, truckers—whomever the government can enlist—typically visits 100 to 150 houses, often on foot, carrying insulated shoulder bags full of vaccine and ice packs. The team marks each house with chalk in a code that denotes success or failure: F if all the kids under 5 were home and vaccinated, and X if no one was home, the parents refused, or for any other reason some children were not immunized. X houses are revisited either by the original team or by local health or community leaders.

Unlike Nigeria and other parts of Africa, where 80% coverage might suffice to wipe out the virus, in Uttar Pradesh the target is 90% or 95%. With half a million babies born each month in that state alone, and fewer than half of them receiving polio protection as part of routine birth immunization, the susceptible cohort accumulates quickly, explains Jay Wenger, project manager of the National Polio Surveillance Project, based in Delhi. That has necessitated years of seemingly endless rounds of vaccination and engendered abundant fatigue among vaccinators and communities alike.

By year-end 2001, the effort seemed to be paying off: The figures were down to just 268 cases, and the disease was eliminated in the southern part of the country. The polio partners jubilantly predicted that they would stop polio transmission in 2002. "It looked like we were at the end of the road," says Wenger. "We just needed to mop up, and that would be the end of the story."

Then, in 2002, polio came roaring back, with a staggering 1600 cases, 83% of the worldwide total. Eighty percent of the Indian cases were concentrated in Uttar Pradesh, but transmission was also intense in Bihar, and the virus spread to 11 states that had been polio-free. And in January 2003, a boy in Lebanon was paralyzed, the first case in that country in more than 10 years—with a virus that originated in Uttar Pradesh.

In retrospect, it was clear what happened,
In the trenches

Over the course of a few days last November, when WHO staff monitoring the rounds toured urban and rural Ghaziabad, it was clear that the battle would be won—or lost—district by district, block by block, alley by alley.

In an informal settlement that sprung up almost overnight near a construction site, Umang Kochar, a physician and one of WHO’s two surveillance officers for Ghaziabad, leads his team through the makeshift huts, checking kids for the telltale purple mark on the fingernail, a sign that they have been vaccinated. The team doesn’t encounter any resistance; the problem is simply finding all the children. The settlement does not officially exist, and there are no house numbers.

In another part of Ghaziabad, a slum area known as Shipra Sun City, Anju Puri, the other surveillance officer and also a physician, routinely quizzes the vaccination teams she encounters, asking whether they understand what the color coding on the vial means. (The label turns dark when the vaccine has become too warm.) They do.

Many of the children don’t have finger markings, even though their parents insist they were vaccinated. One young woman’s pen is already dry, and no one has a spare. Another is out of ice, and the vials of vaccine she carries are in danger of getting too warm.

In one of the Muslim villages in rural Ghaziabad, the village leader greets the polio team. Over tea and almonds in his courtyard, he explains that he doesn’t want his village to be part of the problem. Despite his efforts, several families have refused this round. One man, for instance, let his daughter receive the drops but not his son, fearing it would cause impotence. As the polio team tried to persuade him, several village women gathered and began scolding the father, but he held fast.

Final push

On 17 November 2003, the India Expert Advisory Group for Polio Eradication, including Aylward and Maher of WHO and Stephen Cochi of CDC, met with representatives of the Indian government to review progress and chart a course for the coming year. Either because the quality of rounds had improved so much or because they were reaping the benefit of a natural downturn in transmission following an epidemic—or both—epidemiology was on their side. Although polio had reappeared in the relatively prosperous state of Karnataka, for instance, the government response was reasonably prompt. Overall, coming out of the high season, transmission was at its lowest ever, just 225 confirmed cases in 2003.

The group’s recommendations, presented the next morning, stunned even the core partners for their boldness. Instead of the usual two big national rounds, the advisers were calling for five, with an additional subnational round to cover 110 million youngsters in the highest-risk areas.

”India just bit the bullet and agreed to eradicate polio in 2004,” said a visibly elated Maher. “We didn’t expect this to happen. But the data are saying that this is our best chance.”

“If we can deliver four really high-quality rounds in the first 6 months, we will be cooking with gas. If we muck up, then the two rounds at the end are no longer insurance but a last-ditch effort to finish in 2004.”

There are no guarantees. “We have been here before and didn’t finish,” cautions Maher. To pull it off, responses to any new outbreaks will have to be bigger and faster than in 2003, he adds.

Wenger has a firm response: “There are a whole bunch of infections we could spend much time and money on just one disease, much money on, but they will be with us for the foreseeable future. Polio can be done—it can be eradicated—and right now, we have the infrastructure and capacity to do it. It will be permanent and durable, and it will benefit the poor more than anyone else. We don’t have that opportunity for any other disease.”

—Leslie Roberts