

10/19/2009

Independent Evaluation of Major Barriers to Interrupting Poliovirus Transmission in India.

REPORT

Preamble:

At the request of Dr. Margaret Chan, the Director-General of the World Health Organization, a team¹ was assembled to assess the current polio program in India and to enumerate constraints in achieving sufficient population immunity to interrupt poliovirus transmission. Members of the team visited India between August 10th and 20th, 2009 and had extensive discussions with National Polio Surveillance Program (NPSP) staff and relevant groups from the Government of India, UN agencies, Rotary, and others in the donor community. The itinerary for the evaluation team is appended (Attachment 1).

The evaluation team focused on Uttar Pradesh (UP) and Bihar, two states in north central India where poliomyelitis cases continue to be reported. The population of these areas illustrates the immensity of the task. UP has a population of 187 million with 38 million children under five. Bihar has a population of 101 million with 21 million children under 5. Each vaccination round in UP engages 200,000 vaccinators and 22,000 supervisors to reach 33 million households. There are 110,000 booths (fixed sites) and 64,000 house to house teams. In Bihar there are 37,000 house-to-house teams plus 10,000 transit, mobile, special event teams with 95,000 vaccinators and 14,000 supervisors. In 2008 UP conducted nine rounds and there have been five rounds in 2009 (through August). In Bihar there were 12 rounds in 2008 and 6 in 2009 (through August).

Populations residing within the Kosi river embankment in Bihar have been targeted for a special effort since wild poliovirus is found most persistently there; it may well be the last lair of polio in India. The area is particularly difficult because of annual floods that leave much of the area under water for four months each year. The average population density of 1,000 per square kilometer in Kosi becomes much greater as populations crowd into elevated island villages during the floods. The conditions are such that Fine and coworkers have suggested that the reproductive (R) number for wild poliovirus secondary infections may be as high as 21 in this area (Dr Fine's April 2009 assessment was shared with the evaluation team **after** the team's recommendations had been formulated. The congruence of many of the observations is striking and strengthens the recommendations.

Wild type poliovirus was eliminated from much of India with relative ease. Transmission of indigenous wild polio virus (WPV) in 26 Indian States and seven union territories was successfully interrupted following supplementary immunization activities with trivalent oral poliomyelitis vaccine during 2000-2002. The characteristics of this successful elimination strategy included twice yearly mass immunization campaigns that were

¹ The team consisted of Dr. Nicholas Grassly, Dr. Marc LaForce, Dr. John Modlin, Dr. Nirmala Murthy, Dr. Jon Rohde, Dr. Niruparma Sarma, and Dr. Peter Wright. See attachment 1 for biographic details.

largely based in fixed posts with “mop up” activities in high risk areas. Since 2004 all wild poliomyelitis cases reported from other Indian states and union territories have been caused by importation of wild poliovirus from UP and Bihar. These persistent foci have not only caused reintroductions to the rest of India but also as far away as Angola. Specific poliomyelitis clusters in Bihar often have been temporally associated with recovery of the same virus in Mumbai sewage indicating the migratory nature of this population. UP and Bihar being among the poorest and most densely populated states in India and were also among the last Indian states to eliminate smallpox

The continued circulation of type 1 and 3 polio virus in western UP and Bihar is documented in table 1.

Table 1: Wild type poliovirus isolates in AFP cases in India

Strain and state	2006	2007	2008	2009(to August)
Polio type 1 UP	520	22	62	14
Polio type 3 UP	28	340	243	125
Polio type 1 Bihar	61	46	3	13
Polio type 3 Bihar	459	459	230	27

The current situation in India has often been viewed purely as a failure of OPV rather than a failure to immunize a sufficient proportion of the population. While the current live oral polio vaccines have less than ideal immunogenicity the team concluded that the situation is more complicated and can only be understood by considering the ecology of poliovirus in the unusual environments of western UP and Bihar.

The challenges in India and the individual interests of the evaluation team members have generated a report with sections on program and operations, vaccine performance, epidemiology and environment, and perception of the program (communications). The team appreciates that there have been extensive efforts to understand the epidemiology of polio in India and in implementing a complex eradication strategy. The team was unanimous in their recommendations and hope they will be of help to the Director-General in her continued support of the polio program and to the dedicated workers at every level in this immense final leap to a polio-free world.

I) Programmatic Evaluation: (a more detailed description of program evaluation found in attachment 2)

I.A Introduction -

The team received comprehensive background documents, both from WHO/HQ and Delhi that were reviewed before arrival. Further briefings in Delhi from NPSP, Unicef, the India WR and SEARO RD clarified operational and technical issues and provided insights that were explored in depth during field visits. Five days were spent in visits to western UP (2 days in Ghaziabad district during a polio vaccination round) and Bihar (3 days in Patna and the Kosi River basin during post polio round activities). We examined detailed records, acute flaccid paralysis (AFP) reports, microplans, maps and the intensified field strategies to reach marginal groups, reluctant families and especially children in transit who constitute fully 12% of all Bihari children during each round.

Evaluation team members joined vaccination teams, observed follow up activities, visited marginalized/nomadic communities and saw transit site vaccination efforts. In each case we verified coverage of both households and children. In the Kosi river areas the evaluation team conducted a coverage survey in over 12 villages examining 561 children for the finger nail markings applied when vaccinated and found four that were unimmunized (all four were in transit during the previous week's campaign and did not pass any transit site stations). This level of 99.2% coverage is consistent with reported 99% found on area-wide post round surveys.

It is important to note that even if OPV performance in Bihar and UP is similar to that noted elsewhere in the developing world the implications of a type 1 seroconversion rate of for example 75% after three doses of trivalent OPV, means that even a very high coverage rate of 98% translates to 74% seroconversion after the initial three doses. In addition, even missing only 1% of a large population plus the large number of newborns can quickly lead to a substantial unvaccinated pool.

I.B Recommendations –(* most important to * less urgent)**

- Most recent innovations to reach high risk groups may not have had time to yield full results. *These strategies need to continue to be refined and intensified in these high risk groups.* ***
- In spite of recent improvements, routine immunization in UP and Bihar are still weak and some workers feel, threatened by the polio program. Current routine poliomyelitis immunization recommendations in UP and Bihar include a dose of tOPV at birth and single doses of tOPV at 6, 10 and 14 weeks with a supplementary dose at 16-24 months. **Estimated routine coverage of tOPV is still only 53% in Bihar and 40% in Uttar Pradesh.** While we are not certain of the extent to which poor routine programs contribute to difficulties in polio eradication there is an inverse correlation between a strong routine program and ease of eradication. We are also certain that when elimination of wild type virus circulation is achieved a strong routine immunization program will need to be in place. Even now a strong routine program would reach a critical age group for polio control. Though the polio program puts a strain on personnel shared with routine immunization this did not appear to be an adequate excuse for the present low coverage. *The routine immunization and child health programs must be strengthened in the immediate future. This will aid in polio eradication and provide necessary antigens to India's poor.* **
- Although no vaccine vial monitors were seen that indicated loss of vaccine potency **the cold chain, especially at District and block levels, is vulnerable as old equipment is breaking down with no adequate back-up, repair or replacement for electronic parts.** *Cold chain integrity will progressively worsen and needs attention now.* **
- The NPSP has established a superbly trained vaccination group and developed novel approaches to reach marginalized groups and identify newborns in the community. *We believe there are major lessons from the very active NPSP outreach program for routine immunization. The NPSP is an ambitious and time limited programme but has defined how outreach can immunize virtually all*

*children under very difficult conditions. The polio program must remain a focused program; however, transition planning with lessons learned from the NPSP needs to be begun in the near future.**

- The India Expert Advisory Group (IEAG) provides an excellent forum for decisions about vaccine strategy. We are however concerned with the recrudescence of type 3 virus and would *recommend for program perception and the health of the children being vaccinated that attention continue to be paid to type 3 eradication.***
- Intensified supplementary immunization activities (SIAs) mark the programs in UP and Bihar. In Bihar, the Kosi River Basin is one of the last remaining strongholds of type 1 transmission in the country. Enhanced management and administrative support has been provided to support the planning, implementation and monitoring of SIAs. Monitoring surveys conducted to assess coverage at the end of SIA activity in 2009 have shown that 2-3% of children in UP were missed at the SIAs and less than 1% were missed in Bihar. Inflation in the number of annual rounds has been an instinctive response to the program difficulties and efforts to reach the youngest children without a critical assessment of their benefit and necessity. The team *recommends for sustainability of the program a critical review of the timing, vaccine content, coverage areas and frequency of vaccine rounds be carried out.***
- One approach is to focus the efforts more on the children under 1 year to avoid accumulation of susceptible children. *The youngest age (birth – 2 years) is critical and operations should be most focused on this age group.***
- **The introduction of bivalent type 1 and 3 vaccine should offer a significant operational advantage.** The data from southern India suggest that its immunogenicity is close to equivalent to individual monovalent vaccines. *Bivalent OPV needs to be introduced in the program with validation of effectiveness as soon as possible.****
- Surveillance of acute flaccid paralysis (AFP) is a key component of the program. Global standards are that AFP cases be detected at a rate of 2/100,000. The national non-polio AFP rate was 6.6/100,000 for children under 15 years in 2009 compared to 1.39 in 1999, while AFP rates in Bihar and UP were 18/100,000 and 30/100,000, respectively and within the Kosi river embankment exceed 100/100,000. *The broadening of the case definition has important programmatic implications: 1) although AFP reporting provides a critical tool for detection of polio circulation a strict case definition of poliomyelitis needs to be adopted (as has been the case with vaccine-associated poliomyelitis (VAP)) and 2) a differentiation should be made between detection of wild type poliovirus in the stool and a case of poliomyelitis* We believe that the disillusionment of seeing cases described as “polio” after multiple (10-20) vaccine doses is a major deterrent to maintaining the morale of the program and may in many cases reflect incomplete mucosal protection and resultant wild type polio gut infection without implying failure of vaccine protection against poliomyelitis. ***
- In polio case records there is information that needs to be analyzed of injection history, nutritional status (arm circumference) as well as clinical reports with 60 day follow-up. *An important question is whether the patterns of illness differ in*

*those with detection of wild type polio, vaccine polio, non-polioenterovirus and no virus? The medical officers on the NPSP team are well trained and could readily be trained to conduct field research on this important issue. **

- *VAP now occurs with a frequency approaching wild type poliomyelitis. The occurrence of VAP must be acknowledged. There is an opportunity to look for immunodeficiency in this group (approximately 1/4 of US VAP cases were associated with B-cell deficiencies that have potential for long term shedding - iVDPV). **

I.C Conclusions -

The evaluation team concluded: Indian Expert Advisory Group (IEAG) suggestions have been largely implemented and technical recommendations followed. There was a high level of cooperation between collaborating partners. Remarkable cross checking and thorough managerial oversight assure adherence to all norms and procedures. From the evaluation team's perspective there was no evidence of declining quality in program implementation. In fact the team concluded that the high coverage observed reflected the most thorough well managed field work that team members had ever seen. In short, program implementation was not viewed as a constraint to elimination of polio.

The NPSP, Government of India and their partners are capable of sustained high coverage OPV for the immediate future, though a less intense schedule will ultimately be important to avoid worker fatigue. A decline in cases and WPV isolates will be an important motivating factor as complete elimination comes closer though many cautioned against presenting too "rosy" a picture or giving time lines that could not be met. More attention must be paid to the post eradication strategy and the ultimate integration of NPSP into a strengthened routine immunization program.

II) Vaccine Performance:

II.A Introduction

The response to trivalent oral polio vaccine (tOPV) has long been recognized as compromised in developing countries with the dominant response after the first dose being to type 2 and gradual immunity developing to types 1 and 3 with subsequent doses. Studies in the late 1980's showed responses after 3 doses in northeast Brazil and The Gambia to be 84% to type 1, 95% to type 2 and 68% to type 3 after doses at 0, 6, 10, and 14 weeks. (Collaborative Study Group on Oral Poliovirus Vaccine. Factors affecting the immunogenicity of oral poliovirus vaccine: a prospective evaluation in Brazil and the Gambia. J Infect Dis, 171, 1097-106, 1995) Studies in Cuba have pointed to the very gradual acquisition (up to 8 doses to reach over 80%) of type 3 antibody (Bull World Health Organ. 1994; 72: 221-). In contrast, virtually complete immunity to all three types is seen after routine immunization in Bangkok and Jogjakarta. The reasons for limited immunogenicity in certain tropical settings are not clear; nevertheless, polio has been eradicated from the great majority of the world's countries using tOPV.

Various immunogenicity studies of tOPV in India carried out over the last 40 years have also confirmed the lower immunogenicity of tOPV, indicating seroconversion of 66%, 83% and 66% to serotypes 1,2 and 3 respectively after 3 doses of trivalent OPV (Sutter RW, Kew OM and Cochi SL. Poliovirus vaccine - live. In: Plotkin SA, Orenstein WA, eds. Vaccines. fifth edition. Philadelphia, USA.: Saunders, 2008). Case-control studies based on the AFP database indicate variable vaccine effectiveness across India, but, in particular, poorer performance in the north of India where wild poliovirus transmission persists (Grassly NC, et al. New strategies for the elimination of polio from India. Science 2006;314:1150 – 1153).

The reasons for limited immunogenicity in certain tropical settings are not clear, nevertheless polio has been eradicated from the great majority of the world's countries using tOPV. **Even, in UP and Bihar it is important to note that of 9 lineages of type 1 found several years ago only 1 persists and for a period of 1 year in UP no type 1 wild type virus was found before reintroduction (from Bihar) in 2008.** As is the case throughout the rest of the world wild type 2 has not circulated in India for a number of years.

A central question is whether vaccine performance (as judged by infectivity and extent of subsequent immunogenicity) is different in UP and Bihar than that experienced in other tropical countries with comparable environmental conditions. An additional key question is whether OPV induces sterilizing gut immunity against acquisition of wild type polio in settings with a very high force of infection. The team spent a considerable time dissecting these issues; however, many of the recommendations must remain tentative and are often structured in the form of questions and opportunities for research. Some critical portions of this research are underway with results promised in the near future. The background, rationale and some additional recommendations appear in more detail in attachment 4

II.B *Recommendations -*

- *Continued mathematical modeling of vaccine performance in preventing poliomyelitis and limiting gut infection and possible transmission of wild type polio is strongly encouraged with strict attention to a definition of poliomyelitis and the actual number of doses received.***
- *The virology laboratories are an asset and legacy of the polio eradication initiative. Greater attention should be paid to the virology laboratory AFP data as per examples in attachment 3. **
- *An alternative effect of Sabin strains, as suggested by the effectiveness of mass campaigns in quickly suppressing wild type polio in the environment, is that Sabin strains can interfere with the initial infection or replication of wild type virus. Experts have noted that in tissue culture and with equal amounts and simultaneously administered the wild type will outgrow the Sabin strains. It is not clear how to establish an epidemiologic field model for this. This mass interference effect would provide a rationale for the frequent campaigns *and suggest that that they be focused on the low transmission season. ****
- *However, we are not sure that there is an immunologic justification for the frequency of campaigns. Further exploration of seroprevalence is encouraged*

*with individual responses to sequential campaigns after known number of doses.****

- There is a curious paucity of reports of circulating vaccine derived polio – a major threat to the eradication effort in other countries, e.g. Nigeria. Thus, *three recent reports of circulating vaccine derived polio need to be analyzed completely*. Is it possible that the very factors that may limit the effectiveness of Sabin strains on administration may limit persistent circulation?*
- Continued circulation of wild poliovirus despite many OPV doses is unsettling, suggesting that in the Indian setting, either gut immunity after multiple doses of OPV is incomplete or in the presence of gut immunity the density of wild poliovirus in the Indian environment is sufficient to allow for continued excretion and transmission. The public health implications of these observations are daunting. More complete information on gut immunity in the Indian setting is urgently needed. *We encourage the conduct of studies on gut immunity (challenge studies with Sabin vaccine after OPV and inactivated polio vaccine IPV) in UP and/or Bihar. Virtually all studies to date have been done within a year of last receipt of OPV and varying challenge doses would give additional information.****
- Use of inactivated polio vaccine (IPV) was a question that arose wherever the review team engaged with senior medical and non-medical governmental staff. As previously noted there is the perception that OPV has not been as immunogenic as had been anticipated and that the introduction of IPV will serve as a useful adjunct. Introduction of IPV is no small matter because of the cost and the logistic demands. **It seemed to the team unlikely that IPV can be given in house to house visits and a fixed center approach that immunizes a large fraction of children under one would have to be developed.** DTP3 coverage is about currently 50% and an effective supplemental IPV based strategy will require much higher routine coverage. Translation of this strategy to public health scale will be a major challenge. *Nevertheless, IPV must be examined in the northern India context.****
- Of particular interest is the demonstration that the combined use of OPV and IPV has induced uniformly high antibody response to all three polio types in a range of countries (WHO Collaborative Study Group on Oral and Inactivated Poliovirus Vaccines. Combined immunization of infants with oral and inactivated poliovirus vaccines: results of a randomized trial in The Gambia, Oman, and Thailand. Bull World Health Organ. 1996; 74(3): 253–268). *Planned studies of IPV should include a combined OPV/IPV arm. **
- IPV is likely to engender better **individual** protection against poliomyelitis with fewer doses than the current OPV strategy in UP and Bihar (Simoes EAF, Padmini B, Steinhoff MC, Jadhav M and John TJ. Antibody-response of infants to 2 doses of inactivated poliovirus vaccine of enhanced potency. American Journal of Diseases of Children 1985;139:977-980; Krishnan R, Jadhav M and John TJ. Efficacy of inactivated poliovirus vaccine in India. Bull WHO 1983;61:689-692). In addition to improving individual protection use of IPV could perhaps improve mucosal immunity as well. This is a complicated area and although the team reviewed the available literature, nicely summarized in the polio chapters in

*Vaccines 5th edition (editors Plotkin S, Orenstein W and Offit P) we did not feel full attention could be paid to this during our visit. A thorough review of the mucosal immunogenicity of IPV and its induction of serum antibody in the absence of circulating OPV should be done either in a meeting format or commissioned review.***

- *A prudent approach may well be to introduce IPV and IPV/OPV as a “pilot” program in a district in UP or Bihar with good DTP coverage. The introduction should be accompanied by a serologic assessment of antibody responses. This is an important step since the Government of India will need such information to inform the “India post-eradication strategy”. ***

II.C Conclusions -

Pending and future studies on vaccine infectivity and immunogenicity, seroprevalence, and wild-type carriage in the face of serum antibody in a broad age spectrum and the contribution of IPV and combined OPV/IPV are needed. Bivalent types 1 and 3 OPV represents the most immediate promise for increasing immunity and eliminating the last lineages of polio.

III) Environmental Issues:

III.A Introduction -

The environmental conditions in all the areas we visited are ideal for polio transmission, with indiscriminate defecation, contaminated water supplies, and extreme crowding of population (rural populations of 1000/km² in Kosi are crowded into dry land one tenth that area during the flooding monsoon season²). Add to this an extremely high prevalence of malnutrition, unclean supplementary food and extremely high birth rate with interbirth intervals as close as one year, and the vulnerability of the very young to enterovirus infection becomes very apparent.

III.B Recommendations -

- **While substantial overall improvement in sanitation seems very unlikely in the foreseeable future, attention to clean water and hygienic practices, especially for the under 2s offers an intervention worth exploring.** Specifically, all tube wells in Kosi were unprotected with plinth or platform and many were surrounded with filthy stagnant water. We were told that studies of wells in this area showed 80% contained E coli indicating fecal contamination. *Further studies may indeed be indicated to define indicators of the worst affected wells. Simple affordable technologies to protect rural wells should be explored.****
- Personal hygiene is extremely poor and infants were often seen with severe impetigo, scalp sores, and boils. Particular attention is needed to protect the very young. *Promotion of the use of soap and exclusive use of clean well or purified water for the very young is needed.***

² Stepping onto one of these islands one had the impression of entering a biblical Ark

- We did not review in detail breast feeding practices, nor the introduction of inappropriately early supplements and feeding bottles, but in the periurban areas, bottles are frequent and a dangerous source of contamination. *Exclusive breastfeeding should be encouraged by teams, even at the time of vaccine administration. Questions about the harm of breast milk immediately after polio drops should be clarified, but in no way should the value of continued exclusive breastfeeding be compromised.**
- The high prevalence of unlicensed healers giving injections is a great worry. We encountered several polio cases with residual paralysis in the legs that had a clear history of buttock injections just prior to onset of paralysis. *Informing the public and practitioners of the dangers of injections to ANY child in these areas of polio endemicity are to be encouraged.***
- Environmental studies may shed light on the tremendous burden of enteric infections and safety of ubiquitous tube wells that appear poorly protected (no plinth or platform). *Studies of water quality protection with particular attention to the very young could suggest practical measures to reduce risk of enteric infection. Several Indian institutions have extensive experience in such work (AIPHH – Calcutta)-***
- Are the severe environmental issues – floods, filth, sanitation, poor water quality, high density of population, especially in periurban and squatter areas and in tiny isolated river bed islands sufficient to maintain wild poliovirus circulation despite extremely high OPV coverage rates? *There is a need for more comprehensive environmental sampling to better understand persistence of wild poliovirus in these unusual environments.****
- Nutrition of children is poor – *how does this effect vaccine efficacy? NIN Hyderabad has studied this for years and suggests micronutrient supplements may be of significant value. The ongoing studies of zinc supplementation are noted and encouraged and such interventions should be implemented if proven efficacious. ***
- Diarrhea is almost a uniform finding and may interfere with OPV “takes” *Would zinc administration or introduction of rotavirus vaccine help with this? ***

III.C Conclusions -

Unique settings in parts of northern India are contributing to poor effectiveness of Sabin OPV vaccination strategies. Attention must be paid to the role environmental issues may play in generating a force of infection that may be difficult to overcome with tOPV. We are very conscious of the need to keep NPSP as a vertical and focused initiative but believe that some of the proposed work will bring people with different skill sets into collaboration with the program that will increase the likelihood of success of polio eradication and improve the lives of the people in UP and Bihar.

IV) Perception of Program:

IV.A Introduction -

The efforts to eradicate polio in India form a highly visible and recognised programme with robust community mobilisation and programme communication components especially in the endemic states of Bihar and Uttar Pradesh. Basic awareness relating to polio symptoms, benefits of OPV, and the target group (children under 5 years) is high, with earlier resistance in minority communities having decreased substantially in recent years, due to the active mobilization of community leaders/ influencers. Additional background information is in attachment 4

IV.B Recommendations -

- Sharpening the focus of the communication strategy, with greater emphasis on *mobile populations, transit points, community-based messaging* for collective responsibility (to complement the existing individual focus) and *complementary use of mid-media channels* rather than a dependence on interpersonal communication alone.*
- Introducing communication focus on mobile populations and *messaging on the link between mobility and polio* (greater chances of missing a round and therefore reduced immunity). A message of “make sure your child gets polio drops, especially if you’re traveling/away from home” could establish this important link, and encourage service-seeking behavior by mobile populations at source, destination and transit sites. In minority communities with residual resistance to OPV, messages emphasizing the Haj/Mecca requirement that all pilgrims are vaccinated for can strike even greater resonance. *
- Strengthening *mobilization and programme communication at transit points* such as train and bus stations. These are busy, congested sites where identification, vaccination and interpersonal communication (in case of resistant caregivers) can be very challenging. The addition of mobilization teams to identify and refer caregivers to vaccination teams, establishment of attractive booths and outdoor media/communication activities (that emphasize the link between mobility and risk of missing an immunization round) could trigger service-seeking behavior by caregivers at these sites, while also reducing the pressure on vaccination teams. Attention should also be paid to those using private transportation for long distance travel who might otherwise be missed.**
- *Intensive and high-level advocacy efforts* must be initiated that respond to the growing frustration with delayed eradication objectives, parliamentary questions on vaccine efficacy, and cases of Adverse Events Following Immunisation (AEFI). These efforts must be proactive and pre-emptive, and involve key program partners, policy makers, high-level government officials, and most notably, the media. Through highly visible fora and media formats (talk shows,

debates, editorials, a monthly “polio watch”³) these efforts must highlight the considerable achievements of the program (in reducing caseload, developing sophisticated monitoring systems that can benefit other public health programs) and the criticality of staying the course. ***

- Partners such as Rotary International have been in dialogue with large corporate houses and the Ministry of Defense for example, to mobilize hovercrafts for immunization coverage in geographically difficult areas. *The forging of such partnerships could set examples for others to follow and need to be highlighted.**
- The two existing national Working Groups (for advocacy and social mobilization) need to be strengthened to bring greater visibility to, and advocate for, the program. **

IV.C Conclusions -

Challenges to the program today pertain to some confusion in ownership, with government and key program partners each attributing it to the other. There is a growing frustration among donors and senior government officials with constantly shifting timelines, and not knowing the “missing link” that hampers eradication objectives despite a highly evolved program. Further, reaching high numbers of mobile populations and geographically inaccessible areas, and sustaining the morale and intensity of the program are further key program challenges. If eradication of polio is shown to depend on improvement in the environment of these young children the message will have to be broadened to include safe water, breastfeeding and hygienic measures.

³ A successful example is that of the respected TV news channel NDTV, which had a long running “pollution watch” campaign with daily sound bytes on pollution levels in major cities.

Attachment 1 Itinerary of trip and biosketches of team members (pending)
Itinerary for the independent GPEI review: India

Date	Topic	Who to meet	Where
9 Aug	Arrival in Delhi (late night 9 th / early AM 10 th) for Peter Wright, Marc LaForce, Nick Grassly, Nirmala Murthy, Nirupama Sarma (lives in Delhi)		
10 Aug	AM: Internal discussion for review team 12.30: Meeting with WR over lunch 14.30: Overview of polio epidemiology and NPSP and UNICEF activities	WHO Representative, India (WR) Hamid Jafari, Sunil Bahl, Virginia Swezy (NPSP), Lieven Desomer (UNICEF), Arun Thapa, Patrick O'Connor, Nalini Ramamurthy (SEARO), Rotary	Nirman Bhavan NPSU
11 Aug	Technical review of evidence for sub-optimal vaccine efficacy and possible solutions 18:30 Security Briefing Evening: Internal team dinner (Note: Reviewer Jon Rohde arrives 14.50 in Delhi on flight EK516,; Nick Grassly departs late evening)	Lalit Kant (ICMR), Arun Thapa, Patrick O'Connor, Nalini Ramamurthy (SEARO), Hamid Jafari, Sunil Bahl, Virginia Swezy (NPSP), Lieven Desomer (UNICEF) Sushil Sharma, WHO Country Security	NPSU
12 Aug	Observation of field activities in West UP for 2	Block Medical Officers,	Ghaziabad (Country-Inn)

	<p>days in Ghaziabad. The review team splits into groups with each group seeing various aspects of the program (H-H, brick kiln, nomadic immunization, transit team at train station, social mobilization, reconversions, block meetings) over the 2 days.</p> <p>AM: travel from Delhi to Ghaziabad, split into teams, observe field activities</p> <p>PM: Meeting with NPSP / UNICEF state level staff for overview of NPSP state activities</p>	<p>Supervisors, Vaccinators, SMOs, Field Volunteers, CMCs, etc.</p> <p>NPSP State Team Leader, NPSP state routine immunization officer, UNICEF State team</p>	<p><u>Drivers :</u> <i>Mr Raju</i> <i>Mr Vincent</i></p> <p><i>Hotel at Ghaziabad : Country-Inn</i></p>
13 Aug	<p>AM: Observe field activities in Western UP</p> <p>1400 hrs: Meeting with Chief Medical Officer followed by district review meeting during the round</p> <p>1500 hrs: Meeting with District Magistrate</p> <p>PM : Delhi-Patna 9W 727 1925 hrs 2055 hrs</p>	<p>UP district officials and NPSP / UNICEF district staff</p> <p>Airport transfers by Patna unit office</p>	<p><i>Ghaziabad</i></p> <p><i>Over night at: Hotel Maurya Patna</i></p>
14 Aug	<p>AM: Meet State officials and NPSP/UNICEF state teams</p> <p>PM: travel to Begusarai (road)</p>	<p>Bihar State Health Secretary, UNICEF state Rep, NPSP state team leader</p>	<p><i>Airport transfers : NPSP Patna, unit</i></p> <p><i>Begusarai (overnight at Mile 0)</i> <i>Hotel : Yuvraj</i></p>

15 Aug	Teams split again and go to different areas of Kosi in Khagaria to observe activities AM: Drive to Khagaria and visit Kosi river areas PM: Village surveys and interviews Night at KOSI	Khagaria District officials	2-3 different areas of Khagaria Begusarai (overnight at mile 0) <i>Hotel : Yuvraj</i>
16 Aug	AM: continue field surveys in Kosi rural areas PM – return to vehicles and drive to Patna for local debriefing <i>PM: 9W 727 2130 hrs 2300 hrs Patna-Delhi</i>		<i>Airport transfers and room reservations : India International Centre</i>
17 Aug	11 AM: Meeting with NPSP – clarifications 11:30 – 1:00 Meeting with the Donors 2 – 3 PM: Meeting with WHO - SEARO 4:30 PM: Meet with Rotary	USAID, DFID, Rotary, KFW, World Bank, CORE, JICA, Gates Regional Director (RD), Deputy Regional Director (DRD) and Director of Program Management (DPM) Deepak Kapur, Chairman	NPSU NPSU WHO Regional Office, Delhi Rotary Office
18 Aug	Internal Team work as needed 12:00 – 2:00 pm Joint Secretary Health, GOI	Mr. Amit Mohan Prasad, Joint Secretary, MOHFW Dr. Khaparde, Deputy	NPSU : Government offices, Nirman Bhawan, Delhi

	Meeting with GOI Routine Immunization Team PM: Internal team meeting	Commissioner, Immunization GOI	
19 Aug	9:00 – 10:00 AM: Meet with UNICEF Deputy Rep and Chief, Polio Unit Internal team work or other meetings as needed	Kunihiko Chris Hirabayashi and Lieven Desomer	UNICEF Office NPSU

Attachment 2 Details of Program Evaluation - Field Observations:

India's polio program has expanded as each type of missed child has come under new program for transients, migrant workers, marginal groups, remote non permanent huts (Bassa's) and efforts to find absent children with repeat daily visits for 5 days. Our field visits consisted of 2 days in Gaziabad, UP and 3 days in Bihar in the Kosi River basin (covering Kagaria, Darbhanga and Saharsa Districts). State level NPSP and Unicef staff accompanied us. During the evaluation we:

- Observed vaccination teams, CMC workers in HRAs, house revisits, mobile teams at construction sites and brick kilns, field huts, mosque and madrassa immunization sessions, supervisor visits. We attended supervisors' meetings at 4.p.m with the Block Medical Officer (BMO); then District Magistrate's meetings with all BMOs (convened each night at 8 PM during the campaign). We also met with State level officials including Sec Health, District Chief Medical Officers and District Magistrate in both the states.
- We explored the functioning of the NPSP information system in the field. The system tracks status of each household (defined as a separate kitchen in a house); marks on the house wall shows date of the visit, number of children found and immunized; and absent children revisited until found. It was an impressive flawless system; each item of that data was being used for monitoring and for taking immediate corrective actions. Data are processed promptly at the end of each immunization day, discussed immediately with supervisors and officers in meetings convened to discuss deficiencies and find solutions. Followed 5 days of field visits including overnight in rural areas of Kosi river meeting community leaders, quacks, opinion formers, religious leaders teachers and others. Met with WHO NPSP and Unicef staff in regional and local offices and they accompanied us to field.
- Noted a remarkable information system with each visited household marked on outside with date of visit and number of children found and immunized – where children absent revisits made until found - clearly defined tally sheets, revisit codes, and each and every item of data used in calculating indicators with operational significance, all collated at end of each working session and discussed immediately in managerial meetings to identify performance and to remedy deficiencies and identified problems.
- Noted that finger marking with an indelible polio pen is effective though occasionally hard to read.
- As mentioned 561 children were examined by external team members in direct HH visits in Kosi area – we visited tiny islands and the most remote huts - found 4 unimmunised – all in transit and not near any transit points (out of state, travelling on boats between rounds) and one no finger mark but insisted vaccinated (and another child in same HH immunized) - thus 0.7% non-coverage found by us correlates with 0.5% as reported for all Bihar
- HH marking complete and amazing cross checking – daily mgt review at cluster/grid level, block with supervisors at district and state levels.
- Virtually universal cellular phone coverage, even in most remote areas, makes voice communication immediate. No apparent use of GPS to mark or find

- isolated houses or clusters but mapping very thorough with verification by satellite
- Our field visits confirm both planned procedures being followed from HH to district and state level and validity of reports
 - A review of the clinical case reports of polio cases for 2008 and 2009 in Bihar suggested to the review team members that much of the clinical data was inconsistent with a diagnosis of poliomyelitis. In fact, the principal determinant of whether a case was labeled as poliomyelitis was the isolation of wild virus irrespective of the clinical presentation. The comment was made in the field by a senior member of the team in Bihar that “polio was getting a lot less severe” Review members thought that there was a reasonable likelihood that a significant fraction of poliomyelitis cases that were reported were more likely to represent examples of coincidental carriage that although key for defining the presence of wild type polio may not have been vaccine failures in the sense of not preventing clinical disease.
 - Our team examined the program related operational issues and the local capacity to overcome, when they occur. We also tried to assess the quality of direct oversight by the program leaders, both in Bihar and UP, through discussions with the program staff and field observations.
 - Our team studied individual block micro-plans prepared before each round with latest changes in HHs, vaccinators, precise route of each team, missed HH from last rounds, and other critical operational data.
 - We visited most recent polio and non-polio AFP cases during the field visits.
 - We observed HH visits and revisits, Team B verification visits, transit point team activities on train stations, busses, and boats.
 - We visited the High Risk Areas (HRA) in UP where migrants and transient people reside in densely populated settlements and also to BASA (temporary field shelters) in Bihar where some 160,000 (in July 2009) people live in temporary hutments away from villages (as of 1 year ago only 10,000 of these were known)– as examples of what is meant by “access compromised areas”.
 - Our field visits confirmed that the campaign protocol was being followed to near perfection in both UP and Bihar.
 - We observed team spirit, high motivation and pride – at all levels and high degree of commitment to achieving the final goal. If there is any fatigue, as we repeatedly heard in Delhi, it was not in the field, for sure.

Brief description of activities in UP and Bihar: similarities and differences

Activities before the SIA, in both Bihar and UP, include detailed micro-plan, training of vaccinators, preparing the monitoring plan and enlisting/updating migrating sites. During the round, vaccinators visit all houses and temporary residences to vaccinate children. Houses where resident children are not found, sick, or refuse vaccination are (marked as X) visited by influencers and medical personnel to convert them in to “P” houses, which is the major emphasis in each round. Detailed feedback is reviewed at the block and district levels on daily basis and corrective actions are taken promptly. Issues brought up at district level review, attended by DM and CMO include any cold chain

issues, SMO /supervisor being absent, teams not proactive, children found unimmunized at specific sites. On day 7, street survey is carried to assess immunization completeness, based on the finger marking of the children found.

The effort to vaccinate each type of missed child has come under new program for transients, migrant workers, marginal groups, remote non permanent huts with repeat daily visits continued for 5 days. Initially absent children are coded on the houses as X and if found during the subsequent 5 days, remarked as P. This conversion from X to P runs in to some 1.6 million children in Bihar and *** million in UP during the June 2009 round. The overall missing children as estimated from the street survey on the 7th day of the SIA round, of children not having the finger mark, was 0.5% in Bihar and 2.5% in UP.

The major differences between Bihar and UP SID are: Bihar exclusively uses health personnel like ASHA (community health volunteers) and AWW (Anganwadi workers), while UP also uses teachers, NGO staff, and volunteers, in addition to the health personnel. In Bihar, members of Team-A (vaccinators on day 1) and Team-B (vaccinators doing the follow-up on the 5th day) are the same. In UP, the two teams are different. Bihar uses House-to-House immunization strategy without fixed booths; UP uses booth strategy on the first day of the campaign to cover 40-50% children then undertakes house-to-house visit to cover the missing children.

Critical challenges compromising OPV coverage

On the program management side we found no critical gaps that would compromise OPV coverage. Adequate numbers of vaccinator teams, supervisors, vehicles are being deployed to cover the areas. Vaccinators and supervisors are well trained and closely supervise to ensure that they systematically follow the protocol.

On the program beneficiary side, we found a few challenges compromising OPV coverage. Of the challenges listed below, some have been adequately addressed, others need attention:

(1) Populations living in Access-compromised areas: large numbers of mobile and in-transit population; people living in dispersed temporary housing, and resistance from minority communities living in the high risk (HR) blocks have been systematically covered using effective strategies to reach them.

For example, at each campaign temporary shelters are enlisted. Transit teams are deployed to reach families travelling by railway and roadways. People from Bihar and UP travelling to destinations such as Mumbai, Delhi, Punjab, Haryana, Gujarat are covered at those destinations. Mobile teams are used to reach families living in temporary housing in urban slums; at construction sites, socially marginalised people residing in field huts inside Kosi river embankments.

Social mobilization efforts are mounted to address concerns of resistant communities by creating awareness among their religious/community leaders. These strategies are being implemented since the end of 2008. In absolute numbers, children now covered through these strategies are large (1.6 million) resulting in near universal OPV coverage in the HR blocks.

(2) Perception of poor quality vaccine persists because people see some children getting polio after taking 10-12 doses of OPV. People cannot be expected to appreciate

the fact that 80% of those cases are of P3 type against which vaccine is not being given. Some people occasionally refuse the vaccine on quality ground, though this practice is not widely prevalent, certainly not among the rural poor. This issue needs to be handled urgently using Polio bivalent vaccine to cover both 1 and 3 since cases of polio 3 are on the rise.

(3) Instances of community resistance: Resistance around development issues (such as non-availability of roads, water, health care) were also reported. Some communities, we understand, use resistance to SIA as a way to draw authority's attention to their other neglected problems but not to the point of being detrimental to the program. This form of resistance shows the political clout the polio program enjoys.

(4) Many opportunities for corruption: In SIA, funds are made available to PHC for contracting vehicles, local purchases, remuneration to volunteers, which could be misused without the strong external oversight by the NPSP staff and the extensive internal mgt checks they use. The financial implication of this external funded supervisory structure though seems daunting to many, the team felt it was fully justified; without this structure the current OPV coverage could not be reached.

Challenges compromising OPV efficacy

(1) Environmental issues – persistent flooding, ubiquitous filth, totally absent sanitation with indiscriminate defecation, water pumps (with no plinth or platform) surrounded with stagnant contaminated water and high density of population- were the other challenges we noted likely to be compromising OPV efficacy. Though these conditions can be observed at many locations in India, rarely do they all converge in one place like in the Kosi river embankment.

(2) The nutritional status of most children is obviously low, as is the case in many instances with their mothers who are both extremely short and low weight (<145cms, <40 kgs as estimated by experienced observers). Low birth weight is reported in excess of 35% and may be over 50% in some communities. Diets are of simple grains with little else making both micronutrient as well as protein energy deficiency common. Frequent enteric and respiratory infections exacerbate the under-nutrition and likely lead to reduced immune functions in these children.

(3) Vulnerable Cold chain -- at district and block level we observed old cold-chain equipment, some broken down and no adequate facility for repair or replacement. The infrastructure seemed barely sufficient to meet the needs of the program. Some medical officers reported acquiring cold storage facility from private sources. Since electricity outage is a problem, PHCs get funds to buy diesel for generators and hire vehicles for timely delivery of vaccine. It was evident that the cold- chain is being managed well against all odds; vaccine bio-meters were in good shape, vaccine was not exposed to excess heat (we inspected vial monitors wherever we went, in the field and facilities and never found a single vial monitor turning color).

(4) Weak Routine Immunization (RI) Program -- In HR areas where polio is persisting, routine immunization is particularly weak. Low RI coverage means fewer infants are getting 3 doses of tOPV by age 6 months. It also implies low demand for immunization services. In these areas the RI coverage is further compromised, we were told, by monthly SIA rounds that took away considerable time and energy of health workers from RI.(though many would question whether RI would receive the effort if SIAs were reduced)

(5) Seasonality of Campaigns: NID are held in low transmission period (Dec-Jan). In UP and Bihar the monthly SNID are also organized during high transmission period (monsoon). During this period, especially in Kosi embankment areas, campaign logistics is difficult and some children and young pregnant mothers move out of the area (20%) for safety reason and return after the rainy season is over. Avoiding high transmission seasons for SNID might also reduce the number of missing cases in the HR regions.

(6) Excesses in under-5 coverage: Bihar with population of 101m and UP with 187 million, are expected to have with 16.7 and 29.2 million under-5 populations. The enumerated under-5 population in the polio program was 25-30 percent excess over the expected numbers since the polio program immunizes some even 6 and 7 year olds just so any real under 5s are not missed. This also means excessive efforts are being made to reach the “not so important” target population when the real target group should be the under 2 population. The team believes that the “new born tracking” strategy initiated in the polio program, which would help achieve near complete under 2 coverage, is the step in right direction to improve OPV efficacy.

Conclusions and Recommended actions

Is there staff or community fatigue? None seems apparent yet, though both GOI with its huge allocation of >\$250m/year voiced reservations about how long this kind of expenditure could be sustained and donors are voicing similar concerns. It appears to us that fatigue is likely to become a significant problem within the next year or two unless very measured progress is seen in terms of elimination of wild virus and polio cases.

If the polio eradication program is failing, it is not because of implementation weakness! All IAEG suggestions have been largely implemented. All identified coverage gaps have been progressively plugged and verified by our team in the field. Remarkable cross checking and thorough managerial oversight assure adherence to all norms and procedures. To date there is no evidence of declining quality in program implementation.

Since cold chain is such a critical component of these campaigns, the team felt that some redundancy in cold chain equipment might be needed for its smooth functioning. Private sector could be involved for timely maintenance of equipment. State-level repair facility with spare freezers and ILRs would greatly help both polio and routine immunization activities.

Attachment 3 More detailed picture of vaccine performance and its failure

At the end of 2005 under 5s in UP and Bihar had received on average 15 doses of tOPV, compared with 10 in the rest of India. Even under conditions highly favorable for the fecal-oral transmission of wild poliovirus, this level of vaccine coverage might have been expected to eliminate infection. What factors might limit the impact of immunization in UP and Bihar?

Case-control analyses of the AFP database have suggested that the efficacy of OPV in northern India is lower than expected (Grassly NC, Fraser C, Wenger J, et al. New strategies for the elimination of polio from India. *Science* 2006;314:1150 - 1153). The decline in the relative odds of serotype 1 poliomyelitis with increasing number of doses of trivalent OPV received was consistent with an estimated protective efficacy against type 1 poliomyelitis of only 9% per dose in UP, an estimate significantly lower than the 21% per dose in the rest of India. Recent estimates of the efficacy of newly introduced serotype 1 monovalent OPV indicate at least threefold greater efficacy of this vaccine (~30% per dose) compared with trivalent OPV (Grassly NC et al. Protective efficacy of a monovalent oral type 1 poliovirus vaccine: a case-control study. *Lancet* 2007;369:1356-1362). Frequent use of this vaccine has resulted in high levels of vaccine-induced immunity to serotype 1, recently confirmed by a serosurvey and clinical trial data from UP which found antibody to type 1 in 99.6% of over 3 years and in 6 -12 month olds was 85%.

Despite the high prevalence of serum antibodies to serotype 1 poliovirus among at-risk populations in Uttar Pradesh, type 1 wild poliovirus continues to circulate, albeit at very low levels and with limited genetic diversity. A perplexing situation has thus evolved in Bihar and UP whereby there is continued circulation of wild virus in populations that have received multiple doses of OPV. A key advantage in the use of OPV is the induction of gut immunity such that poliovirus is shed rapidly and does not multiply in the gut. Grassly and coworkers have recently reviewed the extent of asymptomatic wild poliovirus transmission in India by measuring the prevalence of virus in stool samples taken from 14,005 healthy children who were in contact with 2,768 suspected poliomyelitis cases reported between 2003 and 2008 (ms under review). Wild poliovirus serotypes 1 and 3 were isolated from the stool of 103 (0.74%) and 104 (0.74%) healthy contacts. Among contacts of laboratory confirmed poliomyelitis cases 12.7% (27/213) and 13.9% (29/209) had serotypes 1 and 3 isolated from their stool. Prior immunization with OPV was found to be somewhat protective but despite this protective effect 15% of children reporting 10 or more doses of OPV who were in contact with laboratory-confirmed cases of poliomyelitis had serotype 1 wild poliovirus isolated from their stool, consistent with the imperfect nature of gut mucosal immunity. They concluded that OPV-immunized children could be playing a role in the continued circulation of wild poliovirus, but that further studies are required to assess the extent of this contribution.

The implications of using a weakly infectious/immunogenic vaccine are obvious. The team's field visits established beyond question that the GOI's SIAs are reaching over

95% of populations in UP and Bihar. However, a less than optimally immunogenic vaccine dramatically dilutes the public health benefit of these campaigns.

- *Questions that may be asked by an integration of clinical, epidemiologic and virologic findings include:* 1) a preliminary analysis suggests that in the presence of a nonpolioenterovirus (NPEV) there is less recovery of Sabin strains. (N.B. there may be technical reasons for this but such data should be available from the lab) Is this a clue that the higher rate of NPEV recovery in UP and Bihar than seen elsewhere in India interferes with the take of Sabin strains? 2) What other nonpolio enteroviruses are associated with classical poliomyelitis? 3) What is the current rate of isolation of Sabin strains in samples collected within 7 days of a campaign by age? This may be a clue to how effective a campaign is in boosting immunity to vaccine types given in the campaign. 4) How long is type 2 – now rarely being used - persisting in the environment? Noted were 3 instances in which wild type 1 and 3 were isolated simultaneously from the same patient. Additionally wild type 3 has been isolated from a contact of a wild type 1 case. The chances of that happening seemed remote to the team and *modeling the resultant inapparent circulation of different wild type viruses seemed important to get a perception of the wild type virus load still circulating in the communities at risk.* Inapparent carriage may occur more widely in an OPV immune population without causing flaccid paralysis.
- *We have no real description of the flavors of vaccine derived polio.* Island populations as seen in Kosi may become ingrown. Are a significant percentage of VAP cases immunodeficient as was the case in the developed world? Circulating vaccine derived polio has only recently been described and we still do not know extent of genetic change indicating duration of circulation. Given extensive surveillance this suggests that this may be less likely to occur in these settings in India. e.g. multiple sustained spread of type 2 in Nigeria. What does this say about immunization of contacts by vaccine spread?

Attachment 4 Further details – Communication Assessment

The polio communication program is led by Unicef supported by the CORE Group of NGOs and NPSP, with Rotary International supporting some elements of high level advocacy and mobilization with minority community leaders. Some of the key strengths and challenges confronting communication are detailed below based on field observations.

Perception of the Program

- Polio is a highly *visible and recognized program*. However, perceptions of the program ownership is mixed, with government and key program partners each attributing it to the other
- Due to the increasing intensity in recent years in the endemic states, there is a *sense of frustration and fatigue among donors and senior government officials* with constantly shifting timelines for eradication, and the “missing link” that hinders eradication objectives despite a highly evolved and intense program. High-ranking government officials cite examples of Members of Parliament raising questions on the efficacy of the vaccine in light of cases where multiple doses have been received. District medical officers point out that the intensity of the program detracts from other programs in terms of time, money and human resources. About 20 percent of caregivers in both states felt that the rounds were too frequent.⁴
- There is a strong sense of *pride and commitment to the program at the state, district and sub district levels*, aided partly at the community level by financial remuneration to field level workers. Annual district events recognize and felicitate the efforts of vaccination teams through small incentives such as branded PPI umbrellas, bags etc which serve to enhance and sustain community morale. It is recommended that these activities are conducted on a regular basis and extended to district level staff.
- *Among caregivers and the general community, the program is perceived favorably*, with resistance to OPV due to myths and misconceptions having reduced substantially thanks to the intensive mobilization of influencers especially among minority communities. OPV is seen as a safe, credible solution, with some limited resistance if a child is unwell which is reversed by the completion of the round. It must be borne in mind, however, that data relevant to perception of the program and OPV safety is often lower in the high-risk areas, especially in lower class and Schedule Caste categories in western Uttar Pradesh.⁵
- The program is perceived as *fulfilling a government-driven agenda*⁶ rather than responding to the community’s real and felt needs, hence it is often used to leverage and demand much-needed services such as water and electricity. In some instances, entire communities have refused to vaccinate their children until the government provides them with certain basic services (however, in most cases,

⁴ Concurrent Knowledge, Attitude, Behaviour and Practices (KABP) Study for Polio Eradication, UNICEF. Feb 2009.

⁵ Ibid

⁶ Ibid

- we were told, they were eventually convinced to participate and the refusals reversed).
- The *program's credibility in recent years has occasionally suffered following media reportage on cases of AEFI* (Adverse Event Following Immunisation) in Chennai, Delhi and the north eastern part of the country. It would be realistic to assume that this pattern of coverage is likely to continue whenever there is an AEFI, or a polio case despite multiple OPV doses; necessary pre-emptive and proactive action must be undertaken to address public perception and media reportage in these situations.
 - *Media advocacy* efforts have been initiated including workshops and media tracking based on tonality (positive, negative and neutral) of the coverage.⁷ However, a more in-depth and rigorous analysis of content and tonality shifts would better inform and shape media advocacy efforts in terms of eradication objectives. Information cells have been formed for journalists at the state level, but their visibility and outreach needs to be enhanced to ensure that the quantity and quality of reportage is significantly enhanced. Highlighting key success stories – such as the improvement in sanitation in Aligarh district, western UP as a strategy to reduce resistance to immunization – could contribute to a greater support for the program in view of its potentially more wide-ranging benefits.

Knowledge and Understanding of the Program

- Overall, *awareness levels in the two states are high*, with significant variations across endemic areas, caste and class. For example, awareness of the government's polio program, and belief that eradication is possible, was over 80% in both states, with 72% correctly identifying the benefits of OPV. However, awareness levels in polio-endemic western Uttar Pradesh (UP) and schedule caste (SC) segments were only 68% compared to eastern UP's 92%.⁸ While 85 % in Bihar and 93% in UP were able to correctly identify one symptom of polio, the figure drops to 75% for lower classes and castes in western UP. Clearly, mobilization and programme communication efforts for these groups will need to receive far greater emphasis.
- However, *beyond this basic awareness there is little knowledge (or interest)* among caregivers regarding the number of doses, the need for “herd immunity” in order to meet eradication objectives, or of any links to routine immunization. Primary sources of information are friends, family, health workers. Program participation and demand among caregivers is extremely limited.
- Similarly, *among frontline workers there is limited understanding of the program's achievements and challenges* beyond their limited operational areas, despite regular updates with SMOs before and after immunization rounds. Strengthening intra-project communication at this level, and providing them with a global/national context within which they can further value their roles (as the “last warriors” in a historic eradication program watched by the world) could significantly boost their sense of collective achievement.

⁷ Regular media analysis studies undertaken by UNICEF nationally, and in Bihar, Uttar Pradesh

⁸ Concurrent Knowledge, Attitudes, Behaviours and Practices (KABP) for Polio Eradication, UNICEF. Feb 2009

- In addition to regular meetings, intra-project communication is facilitated through a bi-annual newsletter developed by UNICEF featuring key achievements and challenges, and is disseminated from the national through district levels in the endemic states.

Communication Strategies and Activities

- UNICEF's communication program has evolved considerably, together with CORE Group of NGOs the Social Mobilisation Network (SMNet) has successfully bolstered the human resources at the field level to strengthen management and implementation. A strong foundation of communication research informs and shapes the program, and efforts to track and cover mobile and nomadic populations have recently been introduced. The development of a new communication strategy (the previous one is dated 2004) is currently underway to respond to the emerging and dynamic needs of the program. The focus on celebrity involvement and maintaining the positive visibility of the program will continue.
- However it is felt that the sheer intensity of managing and implementing the programme in an "emergency framework" challenges the possibility for new and innovative thinking that is time and population sensitive.
- The PPI's short-term, shifting milestones for eradication have negatively impacted program continuity, and must be substituted by more medium-term milestones. Short-term consultancy positions and the attendant job insecurity have resulted in the loss of experienced professionals. Following a hiatus, the team has been expanded and some of the communication positions at the national and state levels have only recently been filled. The new team is currently in the process of assimilating and responding to the challenges of a complex program.
- Following global guidelines, rigorous communication reviews by external consultants have been initiated at the national level in 2007 and at the six sub-regional levels in the endemic states in 2008. These provide valuable insights, and many of the 45 recommendations provided in phase two of the review process (ending Jan 2009) have been acted upon. However, adhering to timelines, scaling up and translating local recommendations to a larger district level are challenges.
- Currently programme communication and advocacy materials are limited. Two key communication materials – banners and posters announcing the immunization dates – define the program, are easily recognizable due to program branding, and are effectively displayed. Frontline workers also carry printed appeals from religious leaders endorsing immunization. However, flipcharts for interpersonal communication (focused specifically on polio, and UNICEF's *Facts for Life* which incorporates polio messages) are rarely, if ever, used due to constraints of time and motivation during house-to-house visits.
- It is recommended that communication strategies, channels and materials be explored that use mid media channels rather than IPC alone, thus reducing the burden on overworked frontline workers as well as facilitating a greater sense of community involvement (beyond individual families alone) in the program.

The challenge of unreached populations: mobile/migrant, transit and nomadic groups

- During the field visits, the evaluation team met migrant workers at construction sites and agricultural families in villages whose children were immunized only on the last day of the round because they had been traveling either to or from their destination sites. Discussions revealed *that they had not previously met any vaccination team during the current round at their source/ destination sites, nor in transit*, signaling the difficulty of covering these groups.
- Children are often missed in the case of private transportation for long distance travel, or at busy transit points such as train/bus stations. We observed young women vaccinators back away immediately if there was any display of resistance from caregivers; clearly, pursuing interpersonal communication in such situations is difficult. The presence of additional teams of mobilisers, the establishment of attractive booths, and outdoor media/communication activities (which emphasise the link between mobility and the risk of missing a vaccination round) could serve to draw mothers towards the vaccination teams, thus reducing the pressure on the latter to identify, mobilise and vaccinate children.
- An important and often overlooked feature of the program is the role of mobile telephony, especially in remote and difficult terrain. Whether it is to report a polio case, inform mobilisers and vaccination teams in other blocks/districts about the day-to-day movement of a mobile population from one location to the next to ensure coverage during the round, or to report urgent issues such as an AEFI that requires urgent responses, cell phone technology has become a key artery for effective, speedy communication across the program, especially in geographically difficult terrain. During the field visit, when this evaluation team was unable to visit the home of a just-reported polio case; the CMC simply played the recorded case description by the child's mother on his cell phone for the team – thus demonstrating the multiple and innovative uses for this technology.