Pulse Polio Immunization
India
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   Health

2. Sub-sector
   Child Health

3. Policy/Area
   Polio Eradication

4. Program

4.1. Title
Pulse Polio Immunization

India is polio-endemic country. The main defence against poliomyelitis is prophylactic immunization, as public health measures only play a very small and subsidiary role in prevention.

The World Health Organization (WHO) wanted a polio-free world by 2000. The Government of India wanted a polio-free India by 2002. Even in 2004, 69 cases have been confirmed till October. The revised target date for polio eradication in India is 2005. For a healthier future generation, it is important that this disease is completely wiped out.

83% of all new polio cases are now found in India.

Today there is simply no moral or economic justification for any child anywhere in the world to be crippled by polio.

-Dr. Gro Harlem Brundtland, Director-General WHO - Frontline, April-May 2003

This case is about how India is fighting this dreadful disease through massive and simultaneous immunization program launched by the Government of India assisted by international agencies and in cooperation with state governments and non-government/voluntary organizations.
5. Executive Summary

**Situation before the practice**
Infant mortality rate, is a good indicator of socio-economic and health status of a community. Immunization is one of the most cost-effective and surest means to give protection against vaccine-preventable diseases.

In India, vaccination against polio was initiated in 1978 under Expanded Program on Immunization (EPI) and the coverage achieved by 1984 was around 40% of all infants with 3 doses of Oral Polio Vaccine (OPV). In 1985 the Universal Immunization Program (UIP) was launched and implemented in phased manner to cover all districts in the country by 1989-90. During 1986 the UIP was accorded the status of a Technology Mission under the banner of the **Technology Mission on Immunization**. This resulted in significant increase in coverage to over 95% during 1990-91 and is being sustained over 90% since then. The number of reported cases of polio declined from 28757 during 1987 to 3265 in 1995. UIP became a part of Child Survival and Safe Motherhood Program (CSSM) in 1992 and Reproductive and Child Health Program (RCH) in 1997.

Following the Global Polio Eradication Initiative of WHO in 1988, the Government of India launched the Pulse Polio Immunization (PPI) Program in 1995 in addition to UIP. Under this program all children under 5 years are to be administered 2 doses of OPV in December and January every year until polio is eradicated.

**Encounters and challenges faced by the innovators**
- a. The size of the campaign (6.5 lakh polio booths; ~125 million children to be administered on each immunization day; IEC, cold chain and vaccine management)
- b. The attitudinal diversity (diverse religious, socioeconomic and cultural background)
- c. Management of Human Resources (Doctors, Nurses, Health, Anganawadi Workers, School Teachers and Students, Volunteers, NGOs)

**Strategy adopted**
The basic strategy for eradicating polio consists of:

- a. Immunizing every child below 1 year with at least 3 doses of OPV.
- b. National Immunization Days during which every child below 5 years gets 2 additional doses of OPV on 2 days separated by 4 to 6 weeks.
- c. Surveillance of AFP to identify all reservoirs of wild poliovirus transmission.
- d. Extensive house-to-house immunization mopping-up campaigns in the final stages where wild poliovirus transmission persists.

Social mobilization, national and international cooperation technically and financially were the hallmarks of the strategy.

**Results achieved/ anticipated**
India has registered truly impressive progress in polio eradication. Polio has survived mainly in Uttar Pradesh and Bihar. Here too, the virus is now confined within a few districts. PPI was initiated with the objective of achieving hundred per cent coverage under OPV. According to estimates of Department of Family Welfare, Government of India, the estimated nationwide coverage under PPI is 92% and about 8% of the children did not receive any dose of pulse polio immunization. The missing children are being covered during house-to-house search operations.
Sustainability
The medical goal of polio eradication is to prevent paralytic illnesses due to polioviruses by elimination of the wild poliovirus so that the countries of the world need not continue to immunize all children perpetually. If there are no more wild poliovirus cases till 2005, India will be declared polio-free by WHO. Even then there are chances of the disease returning from vaccine-derived viruses (Error! Reference source not found.). Such mutant viruses have caused outbreaks of polio when immunization coverage drops. Therefore it may not be possible to discontinue polio immunization. Several polio-free countries are using IPV. India may have to consider this option.

Wild Poliovirus*, 01 Jan – 19 Oct 2004

Lessons learnt
- To reach the unreached children through improved social mobilization.
- Plan and perform good mop-up operations in the other parts of country where poliovirus has almost disappeared.
- Continuation of high standard of surveillance.
- Greater intersectoral cooperation among Government Departments, States, NGOs, Media, Technocrats, Medical Fraternity.
- Maintaining high level of morale among the public.
6. Case Study

6.1. Title

Pulse Polio Immunization

6.2. Description

Poliomyelitis (Derived from Greek - polio meaning Gray and myelon meaning Marrow, indicating the spinal cord) is indicative of the effect of poliomyelitis virus on the spinal cord that leads to the classic manifestation, paralysis. Known commonly as polio, it is a dreadful infectious disease.

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Causes of Poliomyelitis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
<td>Poliovirus is a member of the Enterovirus Group, Family Picornaviridae, with an RNA Genome. It has 3 Serotypes: P1, P2, and P3. Immunity to one type does not confer immunity to the other two. The virus enters the body through the mouth and multiplies in the intestine.</td>
</tr>
<tr>
<td>Fatigue</td>
<td></td>
</tr>
<tr>
<td>Headache</td>
<td></td>
</tr>
<tr>
<td>Vomiting</td>
<td></td>
</tr>
<tr>
<td>Stiffness in the neck</td>
<td></td>
</tr>
<tr>
<td>Pain in the limbs</td>
<td></td>
</tr>
</tbody>
</table>

**Symptoms**

- Invades the nervous system
- One in 200 infection leads to irreversible paralysis (usually in the legs)
- Total paralysis in a matter of hours
- Among those paralyzed 5%–10% dies when their breathing muscles become immobilized

**Persons at Risk**

Children under 5 years of age

Figure 1: Polio affected child

Figure 2: Poliovirus as seen in an Electron Microscope

This 22-32-nanometer virus can lead to Polio affected child
Polio epidemics in temperate climates occurred most frequently in the summer and early fall. The poliovirus flourishes in warm weather. Children were more often affected than adults were, which is why the disease was once known as infantile paralysis.

There is no cure for polio; it can only be prevented. *Polio vaccine*, given multiple times, can protect a child for life. But this protection is limited to the particular type of poliovirus involved. Thus people infected with one type of poliovirus could suffer further acute episodes of polio from either of the other two types of poliovirus. This is why polio vaccine contains the three strains of poliovirus.

<table>
<thead>
<tr>
<th>Types of polio vaccine</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>A killed vaccine</em> given by injection known as Salk Vaccine or Inactivated Polio Vaccine (IPV) after Jonas Salk who developed it.</td>
</tr>
<tr>
<td><em>A live attenuated vaccine</em> given by mouth (known as Sabin Vaccine or Oral Polio Vaccine (OPV) after Albert Sabin who developed it.</td>
</tr>
</tbody>
</table>

**Figure 3: Polio Vaccine Administration**

It has now been shown that the live attenuated vaccine is not only much cheaper, but has many other advantages over the dead vaccine. In addition, by modern methods of manufacture, it is extremely safe, and the chances of causing paralysis are less than one in a million.

<table>
<thead>
<tr>
<th>Trivalent OPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contains P1, P2, P3 of poliovirus in a 10:1:3 ratio + traces of streptomycin and neomycin</td>
</tr>
<tr>
<td>Viruses are grown in monkey (Vero) kidney cell culture.</td>
</tr>
<tr>
<td>The vaccine is supplied as a single 0.5-ml dose in a plastic dispenser.</td>
</tr>
<tr>
<td>Shed in stool for up to 6 weeks after vaccination.</td>
</tr>
</tbody>
</table>

**OPV administration**

Usually four doses of OPV are administered to the child: at two, three and four months and then again between three and five years. It is a very safe vaccine and the child rarely has any reactions following a dose.

**OPV**

1. Highly effective in producing immunity
2. 50% immune after one dose
3. > 95% immunity after 3 doses
4. Immunity probably lifelong

**In the USA**

About 1 out of 6.2 million doses of OPV actually caused vaccine-associated paralytic polio (VAPP). To reduce this terrible side effect, a new polio vaccine schedule was recommended in 1997 (two doses of IPV followed by two doses of OPV). The new schedule decreased, but did not guarantee elimination, of VAPP; so, effective from the year 2000, an all-IPV schedule was recommended, and OPV is no longer administered in the U.S.
## Diagnosis

<table>
<thead>
<tr>
<th>P1</th>
<th>P2</th>
<th>P3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Causes paralysis and consequently the most deaths.</td>
<td>Normally causes meningitis and a less severe paralysis.</td>
<td>Is usually associated with sporadic cases of poliovirus.</td>
</tr>
<tr>
<td>95% of polio cases include only diarrhea symptoms or the individual is completely asymptomatic.</td>
<td>5% of polio cases show flu-like symptoms of fever, malaise, headache, nausea, sore throat, upset stomach, and achy muscles.</td>
<td>1% of individuals, where poliovirus is able to enter the gray matter of the central nervous system, suffer from paralysis.</td>
</tr>
<tr>
<td>Incubation time is 3-5 days for minor symptoms and 1-2 weeks in the case of paralysis.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Several key risk factors have been identified as increasing the likelihood of paralysis in a person infected with polio. These include:

- Immune deficiency
- Intramuscular injections
- Injury
- Removal of the tonsils
- Strenuous exercise
- Pregnancy

## Treatment

Treatment is entirely symptomatic. Moist heat is coupled with physical therapy to stimulate the muscles and antispasmodic drugs are given to produce muscular relaxation. Polio affected patients were treated in Iron Lungs (Figure 5)

![Figure 4: Iron Lungs (to help respiration) used to treat polio-paralytic patients](image)

### Key words

- Acute Flaccid Paralysis (AFP)
- Expanded Program of Immunization (EPI)
- Global Polio Eradication Initiative (GPEI)
- Inactivated Polio Vaccine (IPV)
- National Immunization Day (NID)
- Oral Polio Vaccine (OPV)
- Poliomyelitis (commonly called Polio)
- Pulse Polio Immunization (PPI)
- Intensive Pulse Polio Immunization (IPPI)
- Sub-National Immunization Day (SNID)
- Surveillance
- Universal Immunization Program (UIP)
Contributors and References

**Key Architects**
- Ministry of Health and Family Welfare, Government of India (MOHFW)
- World Health Organization (WHO)

**Implementers/ Stakeholders**
- State Governments and Union Territories' Administrations in India
- United Nations Children's Fund (UNICEF)
- Rotary International
- The World Bank
- The United States Agency for International Development (USAID)
- The Danish International Development Agency (DANIDA)
- The Japan International Cooperation Agency (JICA)
- The Department for International Development (DFID, UK)
- Voluntary Agencies, Volunteers, Anganawadi Workers, Health Workers
- The beneficiary children and their parents

**Documenting Authors**
- MOHFW, Government of India
- Planning Commission, Government of India
- Print and Electronic Media (Door Darshan, All India Radio, Newspapers)
- Evaluation Teams (WHO, AIIMS, Indian Academy of Pediatrics...)

**Sources/ References**
7. [http://mohfw.nic.in/dofw%20website/family%20welfare%20programme/polio.htm](http://mohfw.nic.in/dofw%20website/family%20welfare%20programme/polio.htm)
9. [http://www.cdc.gov/mmwr/preview/mmwrhtml/00041414.htm](http://www.cdc.gov/mmwr/preview/mmwrhtml/00041414.htm)
15. [http://medind.nic.in/maa/t04/i1/maat04i1p84.pdf](http://medind.nic.in/maa/t04/i1/maat04i1p84.pdf)
18. [http://mohfw.nic.in/reports/1999-20Er/part1_Chapter%207.pdf](http://mohfw.nic.in/reports/1999-20Er/part1_Chapter%207.pdf)
20. [http://grameensanchar.net/health/immune_01.asp](http://grameensanchar.net/health/immune_01.asp)
The existing organizational network of H & FW in Central Government (including Regional Offices, Training Institutes and Laboratories) and State Governments (Directorate of FW, District H & FWOs, Community Health Centres, Primary Health Centres, Rural Sub-centres) is actively involved in the Pulse Polio Initiative.
Project Design

Key Objectives

a. Not a single child should miss the immunization and leaves any chance to polio occurrence.

b. Cases of Acute Flaccid Paralysis (AFP) be reported completely in time and stool specimens collected within 14 days and Outbreak Response Immunization (ORI) conducted as early as possible.

c. India should be polio-free by 2005.

Outcomes

- PPI coverage surveys show over 99% of target children reached. 19 NIDs and 12 SNIDs conducted during 1995-2004 have covered about 150 to 160 million children each year.

- Performance indicators show that AFP rate is over 1 in every state. Specimens are collected within 14 days of the onset of disease in 70% of all AFPs. Testing is conducted in over 90% of all AFPs. The laboratory network is functioning efficiently, providing rapid and accurate results.

- Wild polio transmission is now limited to 4 states - Bihar, Delhi, UP and West Bengal. Polio cases have been reduced from an estimated 32,000 cases in 1995 to 69 cases in 2004 (till October).

Figure 6: Number of cases of Poliomyelitis in India
Strategy

- Immunizing children less than 3 years with a single dose of OPV at polio booths all over the country on two National Immunization Days (NID)
- Extending it to children under 5 years subsequently
- Evaluating/reviewing the program periodically
- Searching and immunizing missed children through house-to-house search
- Adapting a differential approach (Identifying LBZ, MBZ and HBZ)
- Immunizing additionally on Sub-National Immunization Days (SNID)
- Surveillance

1978

Universal Immunization Program (EPI)

1985

Expanded Program of Immunization (EPI)

Figure 7: Pulse Polio Immunization Program Strategy

1. Assam, Bihar, Gujarat, MP, Orissa, Rajasthan, UP and West Bengal
2. High Burden Zone: Bihar, Delhi, UP, West Bengal
3. Middle Burden Zone: MP, Assam, Rajasthan, Gujarat, Punjab, Haryana, Orissa
4. Low Burden Zone: Remaining 21 states

Access, Funding, and Political Commitment are the three critical success factors for the Polio Immunization Program.

Though PPI achieved immense success, about 14 million children missed immunization. Modified IPPI was launched so that the missing children under 5 years of age could be covered.
Mop-up Activity

Mop-up activity is a house-to-house activity where two rounds of polio immunization with 4-6 weeks apart are conducted to limit the transmission of wild poliovirus. Under the mop-up activity, 15-20 lakhs children below 5 years of age are covered in affected and neighbouring districts around every detected positive polio case.

Presumptions and Risk Perception

- There are some people who on pretext or the other do not bring their children to the polio booth for immunization. They should be convinced of the advantages of PPI.
- Children missing pulse polio immunization are the potential carriers of wild poliovirus. They should be traced and immunized.

Key processes

a. Setting-up PPI booths all over the country
b. Creating a cold chain consisting of Walk-in Cold Rooms & Freezer Rooms at Regional Level, Deep Freezers & Ice-lined Refrigerators at District & PHC Levels and Cold Boxes for transporting vaccine to booths
c. Mobilizing employees and volunteers
d. Arranging OPV.
e. Ensuring labeling Vaccine Vial Monitors (VVMs) on every polio vaccine vial
f. IEC activities
g. Immunizing children with OPV on scheduled NIDs and SNIDs
h. Organizing secondary school children for identifying missing children for immunization
i. Providing additional cold storage facilities
j. Surveillance

5 Securing access to all children for immunization

6 Necessary financial resources must be secured to purchase oral polio vaccine (OPV), plan and implement national immunization days and mop-up campaigns, and cover certification standard surveillance and laboratory costs)

7 Sustaining political commitment from the highest levels of government is particularly challenging in the face of a disappearing disease. Personal monitoring by health is key to improving the quality of activities.

Program timeframe

<table>
<thead>
<tr>
<th>Activity</th>
<th>Polio Eradication Time Frame in India</th>
</tr>
</thead>
<tbody>
<tr>
<td>Launch of PPI(-3)</td>
<td></td>
</tr>
<tr>
<td>PPI (-5)</td>
<td></td>
</tr>
<tr>
<td>Surveillance</td>
<td></td>
</tr>
<tr>
<td>IPPI</td>
<td></td>
</tr>
<tr>
<td>Modified IPPI (HBZ)</td>
<td></td>
</tr>
<tr>
<td>Modified IPPI (MBZ)</td>
<td></td>
</tr>
<tr>
<td>Modified IPPI (LBZ)</td>
<td></td>
</tr>
<tr>
<td>Mop-up Activity</td>
<td></td>
</tr>
<tr>
<td>Polio-free India</td>
<td></td>
</tr>
</tbody>
</table>

16
Key stakeholders, Implementers and Agencies involved

List of stakeholders
- Family Welfare Departments at Centre and States
- Funding Agencies (Rotary International, World Bank, UNICEF, USAID, DANIDA, DFID, JICA)
- Collaborating Agencies (WHO, NGOs, Schools, Volunteers, Film Stars, Print & Electronic Media)
- Beneficiaries (Children & Parents)

Key Implementers
- Government of India, Department of Family Welfare
- State Family Welfare Directorates
- District Family Welfare Units
- Community Health Centres
- Primary Health Centres
- NGOs & Voluntary Organizations
- Medical and Paramedical Personnel
- Media Units (Press, Radio, TV)

Roles/responsibilities during implementation
- The network of Family Welfare Offices of the Central & State Governments are responsible for organizing the PPI, providing vaccine, maintaining cold chain and providing logistic support.
- Medical & Paramedical Personnel manning the polio booths are responsible for checking the quality of the vaccine and immunizing children.
- Voluntary Agencies, NGOs, Volunteers, Anganawadi Workers are responsible for social mobilization.
- Media units are responsible for IEC activities.
- The NPSP/NPSU are responsible for surveillance.

The campaign enjoyed a very high degree of coordination and cooperation as a number of agencies and individuals were involved and the immunization had to be undertaken throughout the country simultaneously on NIDs.
## Unfolding Story

**Overview of genesis - Major events in fighting poliomyelitis**

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC 2500</td>
<td>Egyptian Mummy with Equinous Foot, possibly polio</td>
</tr>
<tr>
<td>1500</td>
<td>Egyptian mural depicting a probably a polio-affected man</td>
</tr>
<tr>
<td>1500</td>
<td>Oil painting of a beggar by Pietter Bruegel in 1559 showing a man crawling using rollers by both hands</td>
</tr>
<tr>
<td>1789</td>
<td>British physician Michael Underwood provides the first clinical description of polio, referring to it as “debility of the lower extremities.”</td>
</tr>
<tr>
<td>1908</td>
<td>That polio is a virus rather than a bacteria was established by Austrian Physician Karl Landsteiner</td>
</tr>
<tr>
<td>1916</td>
<td>Polio outbreak in USA. Over 9000 cases were reported in New York City alone. <em>Isolation &amp; Quarantine - only ways of treatment</em></td>
</tr>
<tr>
<td>1921</td>
<td>Franklin Delano Roosevelt (Elected as US President in 1932) was paralyzed due to polio in 1921 at 39 years of age.</td>
</tr>
<tr>
<td>1934</td>
<td>Polio epidemic in Los Angeles. 2500 cases from May-November treated at Los Angeles County General Hospital alone.</td>
</tr>
<tr>
<td>1935</td>
<td>Vaccines developed by Maurice Brodie and John Kolmer fail in field trials with disastrous results causing many cases of polio.</td>
</tr>
<tr>
<td>1943</td>
<td>Sister Kenny’s procedures of treating polio patients with hot packing and stretching affected limbs became the standard treatment for polio patients in the United States.</td>
</tr>
<tr>
<td>1945</td>
<td>Polio strikes the U.S. immediately after the war with an average of more than 20,000 cases a year during 1945-49.</td>
</tr>
<tr>
<td>1952</td>
<td>About 58,000 people contract polio in USA. Virus Typing and the Vaccine developed by Jonas Salk (IPV) was successfully tested.</td>
</tr>
<tr>
<td>1954</td>
<td>2 million school children participated in large-scale field trials of Salk Vaccine. Albert Sabine developed Oral Polio Vaccine (OPV) and tested it in Russia.</td>
</tr>
<tr>
<td>1957</td>
<td>The 1st immunization (about 6 million children) using Salk Vaccine done reducing the polio cases to 5600 that year in USA.</td>
</tr>
<tr>
<td>1961</td>
<td>OPV approved for use by the American Medical Association.</td>
</tr>
<tr>
<td>1974</td>
<td>49,293 cases of polio reported worldwide.</td>
</tr>
<tr>
<td>1978</td>
<td>India initiated Expanded Universal Immunization Program (EUIP) with the goal of reducing the morbidity and mortality due to measles, diphtheria, whooping cough, tetanus, polio, and tuberculosis aimed at covering the whole country by 1990.</td>
</tr>
<tr>
<td>1985</td>
<td>Rotary International launches Polio Plus.</td>
</tr>
<tr>
<td>1988</td>
<td>166 member countries of the 41st World Health Assembly set 2000 (now revised to 2005) as target year for eradicating polio. Delegates from 166 countries to the 41st World Health Assembly resolved polio eradication by 2000.</td>
</tr>
<tr>
<td>1994</td>
<td>The Americas are certified polio-free.</td>
</tr>
<tr>
<td>1995</td>
<td>Nearly 300 million children receive OPV during National Immunization Days (NID) conducted in 51 countries including China and India.</td>
</tr>
<tr>
<td>1995</td>
<td>India launched Pulse Polio Program to eradicate the disease by 2002.</td>
</tr>
<tr>
<td>1996</td>
<td>26 sub-Saharan African countries hold coordinated NIDs.</td>
</tr>
<tr>
<td>1997</td>
<td>More than 260 million children are vaccinated in nine countries in Asia.</td>
</tr>
<tr>
<td>1999</td>
<td>150 countries polio-free, 85% reduction in polio cases since 1998.</td>
</tr>
<tr>
<td>2000</td>
<td>India intensified the Pulse Polio Program</td>
</tr>
<tr>
<td>2001</td>
<td>India launched the modified IPPI</td>
</tr>
<tr>
<td>2005</td>
<td>India scheduled to be declared a polio-free country</td>
</tr>
</tbody>
</table>
Synopsis of development that led to design of initiative

**Global Public Good**

Once polio is eradicated, the world can celebrate not only the eradication of a disease but the delivery of a global public good – something from which every person, regardless of race, sex, ethnicity, economic status or religious belief, can benefit for all time, no matter where they live.

**Savings**

The humanitarian benefit is tremendous, as between 2002 and 2040; over ten million new cases of polio worldwide would manifest themselves. Additionally, the savings of polio eradication are potentially as high as US$ 1.5 billion per year – funds that could be used to address other public health priorities.

**Risk Avoidance**

As long as a single child remains infected with poliovirus, children in all countries are at risk of contracting the disease. In January 2003, a child was paralyzed by polio in Lebanon, the first case seen in that country in nearly ten years. Genetic sequencing confirmed this case was an importation from India. The poliovirus can easily be imported into a polio-free country and can spread rapidly amongst unimmunized populations.

**Polio can be eradicated**

Because:
- Polio only affects humans, and there is no animal reservoir
- An effective, inexpensive vaccine exists (OPV)
- Immunity is life-long
- The virus can only survive for a very short time in the environment

**Significant events and facilitating factors**

The Universal Immunization Program over the years, resulted in vaccinating only 35.4% of babies between the ages of 12 and 23 months with all vaccines in the schedule and only 53.4% with all three doses of OPV.

The Global Polio Eradication Initiative (GPEI) spearheaded by WHO, Rotary International, the US Centers for Disease Control and Prevention (CDC) and the United Nations Children's Fund (UNICEF) in 1988 provided the impetus to launch the Pulse Polio Immunization by the Government of India.

**GPEI towards a Polio-free world**

GPEI during its 15 years of operation resulted in the number of cases falling by over 99%, from an estimated more than 350,000 cases in 1988 to 1919 reported cases in 2002 (as of 16 April 2003). In the same time period, the number of polio-infected countries was reduced from 125 to 7. In 1994, the WHO Region of the Americas (36 countries) was certified polio-free, followed by the WHO Western Pacific Region (37 countries and areas including China) in 2000 and the WHO European Region (51 countries) in June 2002.

Major achievements at the end of 2003:
- A reduction in polio-endemic countries to 6 (Nigeria, India, Pakistan, Niger, Afghanistan and Egypt).
- Immunization of over 500 million children in 93 countries during 266 supplementary immunization activities (SIAs)
- Improvement in global polio surveillance in 2002, as reflected in an increase in acute flaccid paralysis (AFP) rates from 1.6 in 2001 to 1.9 in 2002.
Despite these achievements, the Polio Eradication Initiative faced an increase in global cases in 2002 over 2001. In 2002, 1,919 cases were reported (as of 16 April 2003), compared to 483 in 2001. This increase can be attributed to an epidemic in India, and a further increase in cases in Nigeria.

**Figure 8: Major Polio-endemic Countries 2004**

**Present status**
Out of 851 cases of polio cases reported worldwide, 763 are from polio-endemic countries and out of these, 69 cases are from India.

**Impact**

**Performance Metrics**
- Coverage
- Proportion of zero dose children
- Reasons for non-compliance
- Surveillance Results

are the indicators to measure impact.

**Assessment Methodology**
- Prior to October 1997, surveillance for polio in India was by passive reporting of clinically suspect polio cases. In October 1997, the National Polio Surveillance Project (NPSP) came into being resulting in active surveillance of AFP at district, state and national levels.

**Evaluation/ Reviews/ Surveys**
A number of evaluation studies have been conducted. Some of them are:
- UNICEF sponsored Institute for Research in Medical Statistics Delhi (IRMS) Evaluation on the Reach of PPI in 2001
- MOHFW -UNICEF Action Research 1999 on PPI Non-acceptors
- Process Evaluation of PPI in Delhi
- AIIMS IndiaCLEN Program Evaluation
Findings

**a. Coverage**
Coverage by doses in 1999-2000 is shown in Figure 9. Children who missed immunization in 1999-2000 is shown in Figure 10. Nationwide IPPI coverage in 1999-2000 is shown in Booth-based coverage and House-to-House coverage is shown in Figure 11.

Observe

Figure 9: PPI coverage by number of doses 1999-2000

Figure 10: Children missing PPI 1999-2000
Reasons for non-compliance
a. Lack of attitude among parents
b. Unaware of date and time
c. Unaware of need for additional doses
d. Child ill/ too young
e. Not convinced
f. Apprehensions about side effects of polio drops
   - Fever, Loose Motion
   - Death
   - Infertility (among Muslims and Lower Sections)
   - Polio drops cause polio

g. Traditional Barriers-Elders' discouragement, Caste/ Religion, Purdah System
h. Attitudinal Barriers-Frequent occurrence of Ids, Complacency, Preference to Private Doctors

<table>
<thead>
<tr>
<th>The Gujarat Incident</th>
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<tbody>
<tr>
<td>Immunization officers inquiring into seven cases of polio reported in 1998 in Bhavnagar district found that 96 children in the village of 2,000 had missed the previous pulse polio campaign. Health workers were first prevented from entering the village. Even when they eventually set up a booth, none of the parents brought their children for vaccination. Parents justified their actions saying that on earlier occasions, some children had developed polio paralysis even after immunization.</td>
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<thead>
<tr>
<th>The West Bengal Incident</th>
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<tbody>
<tr>
<td>Health officers visiting a village where two children had developed polio found an angry community waiting, because they contracted the virus after taking the vaccine. In another instance, parents of a two-and-a-half-year-old child who developed cellulites in the heel were convinced it had been caused by the vaccine administered a week earlier. The entire village gheraoed the doctor who had administered the vaccine and forced him to pay for the child's treatment.</td>
</tr>
</tbody>
</table>
**Beneficiaries’ Perceptions**
- Polio is acknowledged as a dreadful disease
- Known prevention-polio drop with cleanliness and healthy food
- People want more information on polio
- IEC activities-TV most effective in urban and IPC in rural; Others - Rallies by school children, wall paintings, puppet shows
- Repeat dose in same round (Delhi & MP)

**Service Providers’ Perceptions**
- Training Gap
- Resistance from beneficiaries
- Poor participation by Doctors, Nurses and NGOs
- Dissatisfaction
- Difficulty in procuring & maintaining vaccine
- Difficulty in procuring vehicle
- Inadequate support from community
- Lack of recognition

**Surveillance**
Surveillance is a major step in the polio eradication strategy. It is the intelligence network that underpins the entire polio eradication initiative. Surveillance (active search) involves
- Identification of every possible case of Acute Flaccid Paralysis (AFP)
- Collection and testing of stool samples
- Outbreak response immunization if required
- Reporting

- As per WHO estimates, in India, 1,934 cases were detected in 1998; followed by 1,186 in 1999; 265 in 2000; and 211 in 2001. However, there was a stupendous increase in 2002, when 1,556 cases were reported in India, most of them in Uttar Pradesh.
- In 2000, reported polio cases are confined to a few states, and polio-free areas have emerged in the south of the country. The surveillance system has also improved in these two years.
- The national non-polio acute flaccid paralysis (AFP) rate went from 0.22/100,000 in 1997 to 1.83/100,000 in 1999, meeting international standards for surveillance. The rate of 'adequate stool collection' from AFP cases rose from 34% to 72% in the same period.
- A network of reporting units and national polio laboratories were also established to isolate the poliovirus in samples, and to identify the type of virus found. Finally, 1999 reported more than 90% of results reported within 28 days.

**Case Report on AFP & ORI (Son of a serving soldier)**
- Family quarters of 550-acre area in Ferozepur Cantonment.
- Reported on 28th February 2002 with acute onset of fever and paralysis of left lower leg for last 7 days.
- A diagnosis of AFP was made. On investigation it was revealed that child had not taken any routine immunization in first 1½ years, whereas he had taken few irregular doses in the Pulse Polio Program for last two years. Last dose was taken on 21 January 2002.
- The AFP case was notified within 6 hours to Civil Surgeon, District Immunization Officer, Surveillance Medical Officer and Armed Forces
Central Epidemiological Investigation Cell through proper channel.

- 2 samples of stools were collected 24 hours apart, labeled and transported in reverse cold chain by courier to the Central Research Institute (CRI), Kasauli (a WHO accredited laboratory for isolation of wild polio virus).
- An Outbreak Response Immunization (ORI) was planned & vaccine was procured, based on the estimated target population. Cold chain, ice packs, vaccine carriers were prepared. Houses in the identified locality were numbered. ORI took place next Sunday to ensure presence of maximum children in their houses. All 0-59 month children were given one dose of OPV irrespective of their previous immunization status while going house to house.

**Strategy Revision**

- Strategy for 1996 and 1997 included all children below 5 years of age.
- Strategy for year 2000-2001 was revised as follows.
- House-to-house strategy was successful in reaching 18 percent previously unreached children in high-risk states of UP, Bihar, Delhi and WB.
- India was divided into 3 zones to modify the IPPI strategy.

**High-burden zone**, comprising of States of Delhi, Bihar, UP and West Bengal, where in year 2000, 2 NIDs (10th December 2000 and 21st January 2001) and 2 SNIDs (24th September 2000 and 5th November 2000) were conducted.

**Middle-burden zone**, comprising of the States of Punjab, Haryana, Rajasthan, Gujarat, MP, Orissa and Assam, where 2 NIDs and 1 SNID were conducted.

**Low-burden zone**, which consists of all other States, where only 2 NIDs were conducted.

Extensive *Mop-up immunization* was conducted in low- and middle-burden zones immediately after isolation of case of wild poliovirus. The house-to-house component was extended to 7 days in high-burden zone states.

25 million children are born in India every year, and there is an interval of 11 months between two PPIs. So the total of 10-15 percent missed children in each PPI (as reported in Action Research) + birth cohort of 25 million becomes a very large susceptible pool of children where wild poliovirus can maintain its circulation and multiply.

**Feedback**

**Machinery/ Mechanism for eliciting feedback**

- Periodic evaluation/ reviews of PPI and IPPI programs
- Workshops organized by the Indian Academy of Pediatrics (20, 21 May 2000 at New Delhi)
- Task Force Meeting of Experts for Polio Eradication (India)
- Media/ Journalistic Reports

**Institutional mechanism for acting on feedback**

Before a WHO region can be certified polio-free, three conditions must be satisfied:

(a) At least three consecutive years of zero polio cases due to wild poliovirus;
(b) Excellent certification standard surveillance;
Each country must illustrate the capacity to detect, report and respond to "imported" polio cases.

**Policy Support and Systemic Changes Implemented**

**Nature of policy support extended**

It is the policy of the Government of India to eradicate polio and make India polio-free by 2005. Many organizations-national and international are assisting the Government of India in this program technically and financially.

**Infrastructure/ Systems Support**

The existing network of Health and Family Welfare Units at Central and State Governments, the Cold Chain [Walk-in Cold Rooms and Walk-in Freezer Rooms at Regional Level, Ice-lined Refrigerators and Deep Freezers (ILR & DF) at District Level, Twin Set of ILR and DF at PHC Level, Cold Boxes for Transportation] are supporting the PPI initiative. The surveillance mechanism is a major element of infrastructure that was added in 1997.

![The National Polio Surveillance Project](image)

**The National Polio Surveillance Project**

*(A collaborative Project of GOI-MOHW and WHO)*

- National Polio Surveillance Unit NPSU (Logistical & Technical Backup)
- 243 Surveillance Medical Officers
- 7 Regional Coordinators
- Sub-Regional Coordinators (UP, Bihar, MP, Orissa, Rajasthan and West Bengal)
- 9 Polio Laboratories (Virological Investigation of AFP Cases)

![Figure 12: NPSP Organization](image)

The National Polio Surveillance Project (NPSP) has been tasked with the job of building and maintaining surveillance of AFP in India until certification of polio eradication is achieved in the South-East Asia Region of the World Health Organization.

Data is made available on the location of confirmed and virus positive polio cases to help in planning the immunization activities of the Government of India in high-risk areas. In addition to surveillance, NPSP is involved in planning, training and monitoring of pulse polio immunization and mopping-up.

From 2004, NPSP operations are expanding to cover support and monitoring of routine immunization services, an important pillar of polio eradication.
Infrastructure gaps
Cold chain equipment needs replacement. Training of mechanics is needed for their maintenance.

HR & Capacity Building Measures
Training offered under Reproductive and Child Health Programs cover immunization aspects.

Change Management Strategy
There are four core strategies to stop transmission of the wild poliovirus.
- High infant immunization coverage with four doses of oral polio vaccine in the first year of life;
- Supplementary doses of oral polio vaccine to all children under five years of age during national immunization days (NIDs);
- Surveillance for wild poliovirus through reporting and laboratory testing of all cases of acute flaccid paralysis (AFP) among children under fifteen years of age;
- Targeted “mop-up” campaigns once wild poliovirus transmission is limited to a specific focal area.
All the above are being addressed in the Indian initiative for polio eradication.

Deployment Model
The global eradication of polio involves both halting the incidence of the disease and the worldwide eradication of poliovirus that causes the disease.

The polio eradication strategy is based on the premise that poliovirus will die out if it is deprived of its human host through immunization.

Information and Communication Model
An allocation of Rs. 14501.199 lakhs was made to States/Union Territories during 1999-2000 for conducting IEC activities and social mobilization for the Intensified Pulse Polio Program (Rs.4806.565 lakhs for IEC activities, Rs.542.80 lakhs to Gram Panchayats and Rs. 9141.834 lakhs for social mobilization of volunteers posted at polio booths and door-to-door campaigns).
- Video spots on Pulse Polio Immunization on National Door Darshan Network were telecast at prime time including appeals from Prime Minister and MOHFW.
- AIR broadcasted PPI Jingles through its Regional Kendras.
- Directorate of Field Publicity organized special programs and plays to sensitize people about PPI.
- PIB provided the media coverage. Intensive print media coverage through advertisements in national newspapers before the scheduled immunization days and appeal to doctors to cooperate and participate in PPI were given.
- The Song and Drama Division organized special programs to sensitize people about PPI. A booklet with appropriate graphs and visuals was produced and distributed all over the country to sensitize District Health Officers about PPI. A similar booklet was produced and distributed to sensitize Zilla Panchayat and Gram Panchayat leaders about PPI.
- The Indian Academy of Pediatrics extended its full support to IPPI. More than 12,000 members of IAP convinced parents of their patience in taking these additional doses; kept their clinics open to serve as polio booths; and played a major advocacy role by giving interviews and writing articles for local newspapers and magazines.
An evaluation of media coverage of the PPI based journalistic reports, comments, interviews, campaign material reveals that the polio eradication campaign is a poorly understood subject as far as journalists are concerned.

Leadership/ Champion Attributes

Nature of project leadership
The ability to involve all sections of society and making PPI as a peoples' movement.

Key factors which led to success/failure
The Pulse Polio campaign in India is by far the greatest success story in healthcare in recent times. It owes its success to the countrywide mobilization of parents, religious organizations, health workers, administrators, local community leaders, star personalities and voluntary and professional associations.

Impediments
It was difficult to cover children during NID:
- In urban slums, remote rural areas and areas controlled by militant groups (Assam)/dacoits
- Of migrant populations (in Gujarat), of people working at quarries, brick kilns, construction sites and fields

Standard Operation Procedures

Manuals, Guidelines, operation procedures developed
The National Quality Control Laboratory at Kasauli does statutory testing of vaccines. In addition samples of OPV are picked up at various levels of storage and sent to designated laboratories for potency testing to ensure effectiveness of the cold chain system. Potency test reports indicate that 91% of samples are satisfactory.

Before October 1977, surveillance for polio in India consisted of passive reporting of clinically suspected cases among children below 5 years. In 1998, less than a year after National Polio Surveillance Project (NPSP) was established, AFP surveillance indicators almost reached the international standards required for certification.

What is an AFP case?
A case where there is acute onset of flaccid paralysis without obvious cause (such as severe trauma or electrolytic imbalance) in a child aged less than 15 years or if there is paralytic illness in which polio is suspected in a person of any age.

Information needed to classify an AFP case as polio or non-polio
The epidemiological, clinical (including initial investigation and 60-day follow-up examination to assess the presence of residual weakness) and laboratory information is collected and used to classify AFP cases as either polio or non-polio.
Two adequate stools are defined as
- Two stool specimens collected from an AFP case at least 24 hours apart, within 14 days after the onset of paralysis,
- And received by a WHO-accredited laboratory in sufficient quantity (>5 g) and in good condition, i.e. specimens must arrive at the laboratory with adequate documentation, no leakage or desiccation, and evidence that the cold chain was maintained.
### When an AFP case is polio?
When one of the following applies.
1. Wild poliovirus is isolated in the stools or
2. In the absence of two adequate stool samples, residual weakness is present for 60 days after the onset of paralysis or if the patient dies or is otherwise unavailable for the 60-day follow-up.

### When an AFP case is non-polio?
When one of the following applies.
1. Cases where two adequate stool samples have given negative results in respect of wild poliovirus even if there is residual weakness at the 60-day follow-up examination.
2. In the absence of two adequate stool samples, cases with no residual weakness at the 60-day follow-up examination.

### Polio Surveillance System Performance Indicators
1. A reported annual non-polio AFP rate of $\geq 1/100000$ children aged < 15 years
2. 80% of AFP cases with adequate stool collection
3. Isolation of non-polio enterovirus from $\geq 10\%$ of stool specimens
4. 80% of laboratory results reported within 28 days of receipt of specimens

### Resource Procurement/ Mobilization

#### Project fund requirements
It costs approximately US$ 14 million per day of pulse polio immunization (vaccine cost) and another US$ 14 million for staffing.

#### Manner in which funds were mobilized
Financing of immunization is the responsibility of the Government of India, which releases funds to state governments.

The estimated cost of India's first PPIDs was $30.3 million and included contributions from India ($18.0 million), the British Overseas Development Agency ($6.1 million), Rotary International ($5.0 million), and the United States Agency for International Development ($1.2 million).
The external funding is shown in the following table.

<table>
<thead>
<tr>
<th>Year</th>
<th>Agency</th>
<th>Funding (US$ million)</th>
</tr>
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<tbody>
<tr>
<td>1995-96</td>
<td>Rotary International</td>
<td>0.5</td>
</tr>
<tr>
<td>1996-97</td>
<td>CDC, DANIDA, JICA, DfID, UNICEF</td>
<td>34.95</td>
</tr>
<tr>
<td>1997-98</td>
<td>Rotary, DANIDA, JICA, DfID, UNICEF</td>
<td>37.87</td>
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**Expenditure on Polio Eradication in 1998-99**
- Rs. Million (US $ Million)

<table>
<thead>
<tr>
<th></th>
<th>Government of India – Direct Costs</th>
<th>Government of India – Indirect Costs</th>
<th>UNICEF</th>
<th>DANIDA</th>
<th>JICA</th>
<th>DFID</th>
<th>KFW</th>
</tr>
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<tr>
<td></td>
<td>1,410 (30.0)</td>
<td>1,246 (26.5)</td>
<td>118 (2.5)</td>
<td>273 (5.8)</td>
<td>132 (2.8)</td>
<td>973 (20.7)</td>
<td>658 (14.0)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4,810 (102.3)</strong></td>
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The pulse polio budget this year (2003-2004) will be a huge Rs.600 crores; up from Rs.450 crores last year. Over the eight years roughly Rs.2,500 crores has been spent on PPI.


**Three year-Immunization Strengthening Project 2000-2003**

Government of India, Ministry of Health & Family Welfare and the Governments of Assam, Bihar, Gujarat, MP, Orissa, Rajasthan, UP and West Bengal have started implementing this project.

Costing Rs. 1118.40 crore (US $ 142.6 million) of which Rs. 709.99 crore is the World Bank’s (IDA credit) contribution, the project has a polio eradication component of US $ 100.20 million.

The project would provide support for about 50% of polio vaccine and social mobilization required to carry out the NIDs and sub-NIDS in states where polio transmission is significant. Social mobilization activities would include orientation and training, transport, IEC, surveys and evaluations, managing polio booths and other activities necessary to assure coverage of the target population. The number of NIDs and sub-NIDs in states with significant transmission would be determined annually, based on surveillance data of polio cases that occur during the summer transmission season. At about the end of each summer, WHO, with assistance from the International Certification Committee, would review the surveillance data and provide advice to GOI and the Bank regarding activities required for the next 12-month period.

Domestic inputs into Polio campaigns are estimated at US$30 million for expenditures relating to booth management, transportation, anganwadi workers, schoolteachers and other NGO activities. An additional US$26.5 million is estimated for indirect GOI inputs including staff and management.

Social Mobilization includes small-scale activities carried out over a large number of administrative blocks including activities such as rallies, managing polio...
booths, house-to-house visits by community volunteers, community information dissemination.

**Artifacts - Associated supplementary details, Software**

- **Project Design Documentation**
  Details of the Immunization Strengthening Project can be found on the World Bank Website listed under references.

- **Detailed Project Implementation Plan**
  Government of India MOHFW Website provides details of PPI

- **Status Report on Project Implementation**
  Government of India MOHPW Website has Annual Reports and Demand for Grants

- **Evaluation, Assessment Reports**
  Some websites are listed under references.

Vaccine Information available on:  
http://www.vaccineinformation.org/polio/gandavax.asp
Seven video clips on Polio can be downloaded from:  
http://www.vaccineinformation.org/video/polio.asp
http://www.onlypunjab.com/fullstory1104-insight-India+inches+closer+to+eradicating-status-22-newsID-3432.html