The Global Polio Eradication Initiative – Current Status

www.polioeradication.org
Polio – fears in industrialized countries in the 1950s...
Polio – a paralysing disease for life
Polio Cases, 1985-2009*

1988: WHA Resolution to Eradicate Polio

Wild poliovirus cases, 2000-2009*

Source: WHO/Polio database, data as of October 2009

193 WHO Member States.
Polio Cases by type, 2001-2009*

1988: WHA Resolution to Eradicate Polio

Source: WHO/Polio database, data as of October 2009
193 WHO Member States.
Polio Eradication Strategies

- Routine Immunization
- Immunization Days (NIDs)
- Surveillance
- Mop-ups
3-dose tOPV Immunogenicity
(median seroconversion of developing country studies)


Routine Polio Vaccine Coverage, by WHO Region 2001

<table>
<thead>
<tr>
<th>Region</th>
<th>Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>49%</td>
</tr>
<tr>
<td>Americas</td>
<td>89%</td>
</tr>
<tr>
<td>Eastern Med.</td>
<td>70%</td>
</tr>
<tr>
<td>Europe</td>
<td>93%</td>
</tr>
<tr>
<td>S.E. Asia</td>
<td>68%</td>
</tr>
<tr>
<td>Western Pacific</td>
<td>88%</td>
</tr>
</tbody>
</table>
Polio-endemic Countries and Re-infected Countries, & Countries Conducting Supplementary Immunization Campaigns, 1985-2008

Endemic countries
Re-infected countries
Countries conducting SIA

AMR starts SIAs
WPR
EMR/SEAR
Operation MECACAR
Kick Polio out of Africa

Data as of September 2009
Active surveillance for polio: acute flaccid paralysis (AFP)

- Transverse myelitis
- Traumatic neuritis
- Guillain-Barré Syndrome
- Poliovirus
- Other enteroviruses
- Other causes
Active surveillance for AFP:
More than 60,000 AFP cases investigated each year

<table>
<thead>
<tr>
<th>Region</th>
<th>AFP cases 2005</th>
<th>Polio cases 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>11,632</td>
<td>823</td>
</tr>
<tr>
<td>Americas</td>
<td>1,919</td>
<td>0</td>
</tr>
<tr>
<td>Eastern Med.</td>
<td>8,812</td>
<td>716</td>
</tr>
<tr>
<td>Europe</td>
<td>1,459</td>
<td>0</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>31,292</td>
<td>417</td>
</tr>
<tr>
<td>West. Pacific</td>
<td>5,891</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>61,005</td>
<td>1,956</td>
</tr>
</tbody>
</table>

Global polio lab network
Wild Poliovirus, 1988

Polio-endemic countries: > 125 (est'd)
Paralysed children: > 350,000 (est'd)
Wild Poliovirus, 2006

Endemic countries: 97% reduction
Paralysed children: 99% reduction

Polio-infected Countries

- **Endemic (4)**
- **Reinfected (13)**
Successful Proof of Principle

Type 2 wild poliovirus has not been found since 1999
(last case: Alighar, India)
Polio-reporting districts, last 6 months*

* 11 May–10 Nov 2009

Int'l Spread of Polio

from Nigeria (& Chad, Sudan)

from India (& Angola)

Indigenous Poliovirus

<table>
<thead>
<tr>
<th>type 1</th>
<th>type 3</th>
<th>types 1 &amp; 3</th>
</tr>
</thead>
</table>

* 11 May–10 Nov 2009
Surveillance indicators, polio endemic regions
October 2008 - September 2009

Non-polio AFP rate

- < 1
- 1 – 1.9
- >= 2
- no data

Adequate stool collection rate

- < 50%
- 50 – 79%
- >= 80%
- no data

Data in WHO HQ as of 27 Oct 2009
In India: geographic scope of type 1 & 3 virus has been further reduced

Alternating type 1 & 3 outbreaks

Type 1 = 5 states
Type 3 = 5 states
INDIA: Circulating WPV type 1 genetic lineage clusters, 2006 to 2009

2006

Grey 1 ▲ 89
Grey 2 □ 38
Grey 3 ★ 2
Black 1 ▼ 11
Black 2 ● 12
Pink 1 △ 459
Yellow 2 □ 11
Yellow 3 ★ 14
Yellow 4 ○ 4

2007

Grey 1 ▲ 29
Grey 2 □ 14
Grey 3 ★ 1
Black 1 ▼ 1
Black 2 ●
Pink 1 △
Yellow 2 □
Yellow 3 ★

2008

Grey 1 ▲ 2
Grey 2 □ 2
Grey 3 ★
Black 1 ▼
Black 2 ●
Pink 1 △ 71
Yellow 2 □ 3
Yellow 3 ★ 2

2009*

Pink 1 △ 18

Kosi river system

*as of 22nd Jun, 2009
Persistence of Type 1 polio in Bihar – 2007-09

Kosi River flood plain, Bihar, India

* data as on 7th November 2009
Why is WPV1 Transmission Persisting in India?

- Pockets of under-vaccinated sub-populations
  - In the Kosi river basin in Bihar
  - Among Migrant labor, nomads
  - In pockets in high risk blocks of UP
- High force of infection in core endemic areas
- Possible re-seeding from infected asymptomatic WPV carriers?
Afghanistan & Pakistan, in 2009 to date

Poliovirus reservoirs reflect a combination of operational & security problems
Afghanistan & Pakistan P1 isolates by genetic cluster 2009

Data up to 14 Nov 09
Pakistan: complex challenge
polio cases, at Oct 2009

75% of cases are in 6 districts in 2009

Swat (350,000 < 5 target)

Performance of the August SNID

<80 %
80-89 %
90-94 %
≥95 %
Postponed
February 2009
PM Gilani announces his Action Plan & Nat'l Polio Control Cell to hold districts accountable

October 2009
President Zardari opens NIDs

High-level political support: Pakistan
Endemic focus: southern Region, Afghanistan, 2009
(10 very high risk districts)

March 2009
NATO announced it will observe Days of Tranquility in the 11 highest risk districts

Frequency of polio in last 5 years

- All 5 years (1)
- 4 years (1)
- 3 years (8)
- 2 years
- 1 year
- No polio

Source: data in WHO/HQ as of 28 Aug 2009
Instruction from Taliban leadership to observe tranquility & allow children to be immunized. September 2009

Recommitment of NATO/ISAF command to Days of Tranquility for polio immunization. October 2009

Enhancing access in southern Afghanistan
2003-2009* Monthly Case Counts of Wild Poliovirus and cVDPV2 Cases, Nigeria

Nigeria: WPV at 11 Nov., 2009

*Data in WHO/HQ as of 08 Sep 2009

**includes 3 cases in 2004, 3 in 2005, 2 in 2006, 1 in 2008 and 2 in 2009 with mixture of W1W3 virus
NIGERIA: Polio type 1 infected districts
July 2008 - Nov 2009

Qter_3’08
# Infected LGAs: 111
WPV1 (n=193)

Qter_4’08
# Infected LGAs: 32
WPV1 (n=38)

Qter_1’09
# Infected LGAs: 6
WPV1 (n=6)

Qter_2’09
# Infected LGAs: 0
WPV1 (n= 0)

Qter_3’09
# Infected LGAs: 6
WPV1 (n=6)

Qter_4’09
# Infected LGAs: 0
WPV1 (n= 0)
Kano state, northern Nigeria

Governor of Kano vaccinating his daughter
Jan 2009

Number of OPV doses reported by n.-p. AFP cases
6-35 months, Kano, 2009

Polio Vaccine Doses
- ≥ 3 doses
- 1 - 2 doses
- 0 doses
Nigeria: improved political support

ABUJA COMMITMENTS TO POLIO ERADICATION IN NIGERIA
- A communiqué following the meeting of governors with Mr. Bill Gates
- 02 February 2009

We, the Executive Governors of the thirty-six (36) States of the Federal Republic of Nigeria, meeting in Abuja, with Mr. Bill Gates, on 2 February, 2009 at a special session on health convened under the leadership of His Excellency, Umaru Musa Yar'Adua, President of the Federal Republic of Nigeria.
Age (median) & OPV status of polio cases, India, Pakistan, Afghanistan + Nigeria, 2009

**India**
18 months

**Pakistan**
17 months

**Afghanistan**
18 months

**Nigeria**
24 months

* as of 10 Nov 2009
WPV importation into previously polio-free countries, 2003-2007

*Data in HQ as of 04 June 2009
WPV importation into previously polio-free countries, 2008-2009

- Endemic countries*
- Countries with outbreak due to imported wild poliovirus, prior to 2008
- Countries infected with wild poliovirus in 2009, for the first time since 2003

Importations from Nigeria (Viral origin)
Importations from India (Viral origin)
Sustained transmission of an imported wild poliovirus (onset prior to 2008, and still active as of November 2009)

*Data in HQ as of 10 November 2009
Countries with ‘active importations’ as of November 2009*

* importation-associated case or outbreak within the past 6 months
Progress in Stopping New Outbreaks
West Africa & Horn of Africa, 2008-9*

Jul – Dec 2008

Jan – Jun 2009

Jul 2009 – to date*

* Data in WHO/HQ as of 10 Oct 2009
New bivalent 1+3 OPV

Seroconversion after 2\textsuperscript{nd} bOPV, India, 2008-09

- bOPV: superior to tOPV & 'non-inferior' to mOPVs
Outbreaks of circulating vaccine-derived poliovirus (cVDPV), 2000 - 2009
## Risks of Polio After 'Eradication' with Continued OPV Use

<table>
<thead>
<tr>
<th>Risk</th>
<th>Frequency to date</th>
<th>Annual burden</th>
<th>Evolution over time</th>
</tr>
</thead>
<tbody>
<tr>
<td>VAPP</td>
<td>2-4/m birth cohort</td>
<td>250-500</td>
<td>stable</td>
</tr>
<tr>
<td>iVDPV</td>
<td>39 identified (since 1962)</td>
<td>~1</td>
<td>decreases</td>
</tr>
<tr>
<td>cVDPV</td>
<td>0-3* per year</td>
<td>~20</td>
<td>increases</td>
</tr>
<tr>
<td>IPV sites</td>
<td>1 accident (1990s)</td>
<td>&lt;1</td>
<td>decreases</td>
</tr>
<tr>
<td>Lab accident</td>
<td>1 investigation</td>
<td>NK</td>
<td>decreases</td>
</tr>
<tr>
<td>Deliberate</td>
<td>0</td>
<td>NK</td>
<td>unknown</td>
</tr>
</tbody>
</table>

*based on current understanding
After interruption of wild poliovirus, continued use of OPV would compromise the goal of a polio-free world.

Expert Consultation on Vaccine-derived Polioviruses (VDPVs), Sept 2003, Geneva
Prerequisites for OPV Cessation

- Interrupt & contain wild polioviruses.
- Ensure global surveillance/notification capacity.
- Establish mOPV stockpile & response mechanism.
- Affordable IPV option & implement IPV requirements in biohazard settings.
- Synchronize cessation of trivalent OPV.
- Contain Sabin polioviruses.
Strategies & Research for Affordable IPV

- **Schedule**
  - Routine schedule for IPV use in tropical areas (Cuba & Puerto Rico).

- **Dose Reduction**
  - Intradermal administration of 1/5 fractional IPV dose (Cuba & Oman).

- **Schedule & Dose Reduction**
  - 2-dose fractional schedule (DTP4 & measles)

- **Adjuvants**
  - Evaluate adjuvants for antigen reduction (S-IPV project).

- **Seed strains for IPV production (Sabin & others)**
  - Permit production of IPV in developing countries (S-IPV & NIBSC).

- **Needle-free Device to Administer IPV Intradermally**
  - Easier administration of fractional doses & use of volunteers.
SAGE IPV Working Group  
(established August 2008)

Deliverables & Timelines

**April 2010:** SAGE input on 'WHO Position Paper: Polio Immunization in Pre-eradication Era', outlining role of OPV & IPV.

**April 2011:** options for post-eradication IPV policy for low- & low-middle income countries.
SAGE IPV Working Group decided that the primary objectives of a post-eradication immunization strategy in low income countries should be to:

- reduce the risks of a cVDPV emergence,
- mitigate the consequences of a cVDPV introduction,
- maintain preparedness for the possibility of a wild poliovirus re-introduction (i.e. failure of biocontainment),
- minimize disruption to the broader immunization programme, and
- achieve the lowest acceptable cost.
SAGE WG evaluating implications 4 potential post-eradication IPV strategies

• no polio immunization after OPV cessation,

• population 'priming against polio (1 IPV dose in the 1st year of life),

• polio immunity by 1 year of age (2 IPV doses, 4-6 months apart),

• continue polio immunity in early childhood (3-4 IPV doses in 1st 6 months of life).
### Implications of potential IPV options following OPV cessation in low-income countries

<table>
<thead>
<tr>
<th>Attributes</th>
<th>No IPV vaccination (used as baseline / comparator)</th>
<th>1 X IPV</th>
<th>2 X IPV</th>
<th>3 X IPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPV supply implications&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Total</td>
<td>0</td>
<td>97 million</td>
<td>194 million</td>
</tr>
<tr>
<td></td>
<td>Less India, China, Indonesia</td>
<td>0</td>
<td>53 million</td>
<td>106 million</td>
</tr>
<tr>
<td>Expected level of individual protection&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
<td>0</td>
<td>20% to 40% ?</td>
<td>~ 90%</td>
</tr>
<tr>
<td>Expected level of individual priming / protection</td>
<td></td>
<td>0</td>
<td>60% ?</td>
<td>90 - &gt; 95%</td>
</tr>
<tr>
<td>Expected level of population protection&lt;sup&gt;3&lt;/sup&gt;</td>
<td></td>
<td>0</td>
<td>15 to 31%</td>
<td>68%</td>
</tr>
</tbody>
</table>
Finding #4 – Several factors can provide an indication of potential IPV pricing, but manufacturers will need to be engaged in a dialogue around indicative pricing to obtain more definitive estimates: manufacturing costs will decline as wtIPV manufacturers expand; given the nature of wtIPV manufacturing, IPV will, however, never reach a price equal to that of OPV; pricing will be determined by a small set of manufacturers.

- Also: complexity of predicting 'break-even' cost of IPV-containing combos (6-valent) with cost of stand-alone IPV (+ pentavalent combo)
### Implications of potential IPV options following OPV cessation in low-income countries - PART II

<table>
<thead>
<tr>
<th>Attributes</th>
<th>No IPV vaccination (used as baseline/comparator)</th>
<th>1 X IPV</th>
<th>2 X IPV</th>
<th>3 X IPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probable range of price per dose</td>
<td>0</td>
<td>$1.00\textsuperscript{5} - $3.00\textsuperscript{4}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Programmatic implications: Incremental administration cost per child vaccinated\textsuperscript{5}</td>
<td>0</td>
<td>$0.25 - $0.40</td>
<td>$0.50 - $0.80</td>
<td>$0.75 - $1.20 \sim$0 if done via a combination</td>
</tr>
<tr>
<td>Programmatic implications: Cold chain space requirements\textsuperscript{7}</td>
<td>0</td>
<td>+ 6 - 26%</td>
<td>+ 12 - 52%</td>
<td>+ 17 - 77% \sim 0% if done via a combination</td>
</tr>
<tr>
<td>Expected reduction on cVDPV emergence and outbreaks\textsuperscript{5}</td>
<td>Comparator</td>
<td>0 to 5%</td>
<td>15-20%</td>
<td>15-20%</td>
</tr>
<tr>
<td>First 6 years post-OPV</td>
<td>Comparator</td>
<td>Less than 20%</td>
<td>\sim 20%</td>
<td>\sim 20%</td>
</tr>
<tr>
<td>First 20 years post-OPV</td>
<td>Comparator</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expected reduction in disease burden\textsuperscript{9}</td>
<td>Comparator</td>
<td>5 - 15%</td>
<td>55-65%</td>
<td>55-65\textsuperscript{a}</td>
</tr>
<tr>
<td>First 6 years post-OPV</td>
<td>Comparator</td>
<td>10 - 30%</td>
<td>60-70%</td>
<td>60-70\textsuperscript{a}</td>
</tr>
<tr>
<td>First 20 years post-OPV</td>
<td>Comparator</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Risk reduction modelling: limitations and uncertainties

Modeling - limitations

• critical tool - helps stakeholders understand trade-offs related to different choices, in view of (often major) uncertainty
• BUT: models limited by quality of assumptions used and in the amount of complexity they can capture

Uncertainties - impact of IPV use on risks?

• model suggests some (probably limited) reduction of risks
• however, extent of reduction is very uncertain
• key limitations / uncertainties are caused by critical knowledge gaps still to be filled:
  • impact of IPV options on individual / population protection?
  • impact of IPV options on poliovirus / VDPV circulation (humoral vs. intestinal immunity)?
GPEI Annual Expenditure, 1988-2008
Resource Req'ts, Contributions, Funding Gap, 2009-13

2009 GPEI expenditure = US$ 780 m
Contributions to the
Global Polio Eradication Initiative, 2009

OTHERs includes: European Commission, France, Italy, Russian Federation, Netherlands, Norway, Luxembourg, Spain, Turkey, Saudi Arabia, Monaco, UN Foundation, OPEC Fund for International Development, UNICEF Regular and Other Resources, Bangladesh HNPSP Pooled Funds and Nigeria.
Independent evaluation of major barriers towards interrupting PV transmission

Commissioned following the WHO Executive Board in January 2009 due to delays in achieving eradication.

- 28 experts: public health, EPI, vaccinology, social mobilization, security, health systems.
- 24 'person-months' of work
- 5 sub-teams:
  - India: Delhi, UP, Bihar.
  - Afghanistan: Kabul, Kandahar.
  - Pakistan: Islamabad, Peshawar, Lahore, Karachi.
  - Int'l Spread: s Sudan, Angola.
'And today I am announcing a new global effort with the Organization of the Islamic Conference (OIC) to eradicate polio.'

President Barack Obama
Cairo, Egypt
4 June 2009
'I will call for Days of Tranquility this year in all areas where conflict is preventing access to children during polio eradication drives.'

UN Secretary-General
Mr Ban Ki Moon
Birmingham, UK
21 June 2009
Conclusions

- Despite greatly accelerated efforts, progress toward eradication slower-than-expected.
- Each polio-endemic country represents unique challenges that must be overcome with tailored solutions.
- New sharper tools (mOPVs, bOPV) expected to further accelerate progress.
- "Without OPV cessation no polio eradication"
The Polio Partnership

Gates Foundation
OPV Producers
UN Foundation

World Bank
ADB, EC

Rotary, WHO
CDC, UNICEF

Health Ministries

Political Bodies
UN, OIC, AU, G8,
Commonwealth,
SAARC, EU

Red Crescent
& Red Cross
Societies

NGOs
e.g. MSF, CPHA,
CARE, CORE

Technical Agencies
CDC, ERC, NIV, RIVM
NIID, NIBSC, KTL

Australia, Austria,
Belgium, Canada, Denmark,
Finland, France, Germany, Ireland,
Italy, Japan, Luxembourg, Malaysia,
Netherlands, New Zealand, Norway,
Portugal, Russian Federation, Saudi
Arabia, Spain, Sweden,
U.A.E., U.K., USA