Polio’s Last Stand?

12 November 2014

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Independent Monitoring Board of the
Global Polio Eradication Initiative
Only one human disease has been eradicated

In 1977, the last case of naturally transmitted smallpox was recorded, and by 1979 the global eradication of one of the most devastating diseases known to humanity was officially certified.

Edward Jenner developed the first smallpox vaccine in 1796.
Indicators of Eradicability

1. An effective intervention is available to interrupt transmission of the agent – polio ✓

2. Practical diagnostic tools with sufficient sensitivity and specificity are available to detect levels of infection that can lead to transmission – polio ✓

3. Humans are essential for the life-cycle of the agent, which has no other vertebrate reservoir and does not amplify in the environment – polio ✓

Source: Walter Dowdle. MMWR. Dec 31, 1999
Wild Polio Virus (WPV)

- There are three types of WPV – 1, 2, and 3
- There has been no case of WPV2 since October 1999
- WPV3 has not been detected since November 2012 (Nigeria)
The clinical manifestation of polio greatly increases the challenge of its eradication.

For every:
1 infected child who develops paralysis
20 have non-specific symptoms
180 have no symptoms at all
Polio vaccines

• Trivalent oral polio vaccine (OPV) induces mucosal immunity against all three types
  – In high-income countries, three to four doses confer adequate immunity
  – In some areas of low-income countries with poor access to water and sanitation, ten or more doses may be required because the high prevalence of other enteroviruses interferes with immune response to the oral vaccine

• Monovalent OPV against types 1 and 3 are now available that induce greater immunity against each specific PV type than trivalent vaccine
  – Bivalent OPV (1 and 3), available since 2009, is a valuable new tool

• Inactivated polio vaccine (IPV) is injectable and induces humoral immunity – this vaccine is used in all high-income countries
  – Protects individuals from clinical disease but does not prevent transmission
Vaccine derived poliovirus

- The oral polio vaccine contains a live, attenuated vaccine-virus
- Vaccine-associated paralytic poliomyelitis (VAPP) occurs in an estimated **1 in 2.7 million children** receiving their first dose of oral polio vaccine

- When a child is vaccinated, the child excretes the vaccine-virus for a period of six to eight weeks
- As it is excreted, some of the vaccine-virus may be genetically altered during replication – this is called a vaccine-derived poliovirus
- On rare occasions, if a population is under-immunised, there are enough susceptible children for the excreted vaccine-derived polioviruses to begin circulating in the community
- These viruses are called circulating vaccine-derived polioviruses (cVDPV)
cVDPV cases in 2013 and 2014

- Zero cases of cVDPV type 1 since 2011

- 65 cases of cVDPV type 2 in 2013 and 43 in 2014
  - 68 cases in Pakistan
  - 25 cases in Nigeria
  - <5 cases in Chad, Cameroon, Niger, Afghanistan, South Sudan, and Somalia

- Most recent case (in Yemen) of cVDPV type 3 in 2013
Global Polio Eradication Initiative

• This is the largest eradication effort in history
  – It has lasted 22 years and cost more than $10 billion
  – Annual budget currently $1 billion

• In the mid-1980s, around 350,000 people, mainly children, were paralysed and/or died annually due to wild polio virus

• Only 223 cases of WPV in 2012 (0.06% of the original caseload)

• Rebound to 416 in 2013 due to an epidemic in the Horn of Africa
One of the polio campaign’s greatest victories -- eradication from India in 2011

Eradicating polio: Cases in India since 1980

Number of cases

Source: World Health Organisation
WPV1 Cases, 2013

Data as of 26 Sep 2014 (including advance notifications as of this date)

<table>
<thead>
<tr>
<th>Country</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pakistan</td>
<td>93</td>
</tr>
<tr>
<td>Afghanistan</td>
<td>14</td>
</tr>
<tr>
<td>Nigeria</td>
<td>53</td>
</tr>
<tr>
<td>Somalia</td>
<td>194</td>
</tr>
<tr>
<td>Cameroon</td>
<td>4</td>
</tr>
<tr>
<td>Equatorial Guinea</td>
<td>0</td>
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<tr>
<td>Iraq</td>
<td>0</td>
</tr>
<tr>
<td>Syria</td>
<td>35</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>9</td>
</tr>
<tr>
<td>Kenya</td>
<td>14</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>416</strong></td>
</tr>
</tbody>
</table>
### WPV1 Cases, 2014*

<table>
<thead>
<tr>
<th>Country</th>
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<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pakistan</td>
<td>93</td>
<td>174</td>
</tr>
<tr>
<td>Afghanistan</td>
<td>14</td>
<td>10</td>
</tr>
<tr>
<td>Nigeria</td>
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<td>6</td>
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<tr>
<td>Somalia</td>
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<td>5</td>
</tr>
<tr>
<td>Cameroon</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Equatorial Guinea</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Iraq</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Syria</td>
<td>35</td>
<td>1</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Kenya</td>
<td>14</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>416</td>
<td>209</td>
</tr>
</tbody>
</table>

*Data as of 26 Sep 2014 (including advance notifications as of this date)*

Israel = Env. positive isolates (2013 – 136 ; 2014-14 , last 30 Mar 2014)
Gaza = Env. positive isolates (2013 – 7 ; 2014-1, Jan)
Pakistan is now the main obstacle to global eradication
Polio Eradication and Endgame Strategic Plan 2013-2018

1. Detect and Interrupt Poliovirus
   - 2013: Interrupt wild poliovirus transmission
   - 2014-2017: Respond to continuing vaccine-derived poliovirus outbreaks
   - 2018:

2. Strengthen Immunization Systems and Withdraw OPV
   - 2013: Strengthen immunization systems, prepare for vaccine switch
   - 2014-2016: Introduce IPV, withdraw OPV2
   - 2017: Continue immunization with IPV and OPV
   - 2018: Continue immunization with IPV and OPV
   - 2019: Stop all OPV

3. Contain and Certify
   - 2013: Finalize containment plans
   - 2014-2017: Carry out global containment and eradication certification procedures
   - 2018: Continue with containment and certification procedures
   - 2019: Finalize certification procedures

What are the challenges to eradicating WPV in the near future? (end-of-2014 goal has been missed)

1. Insecurity
   - All three endemic countries face barriers to accessing children due to armed conflict
   - Conflict in Somalia has led to half a million children going unvaccinated for three years because of a ban by Al Shabaab
   - The Pakistan Taliban has issued a ban on polio vaccination in North and South Waziristan where 142 of the 220 cases in Pakistan have been reported in 2014
   - However, the Afghan Taliban issued a declaration supporting polio vaccination in May 2013
Since December 2012, 27 polio workers in Pakistan, 12 in Nigeria, and three in Afghanistan have been murdered.
The world’s last sanctuary for the poliovirus?
Proportion of NPAFP cases 6 to 35 months, by OPV status, FATA sanctuary, Pakistan

Source: WHO

**Data as of 2 September 2014**
There have been 36 cases of WPV1 reported in Syria and two in Iraq since October 2013.
Maintaining political neutrality

- High-level political support is critical at the national, provincial, and district levels to ensure accountability

- BUT, the polio program must be perceived as politically neutral

- In Afghanistan, the program has distanced itself from ISAF and UNAMA but retains support by the President

Pres. Karzai, both vice-presidents, and Minister of Health at the launch of national immunisation days, Kabul, August 2013
## Distribution of WPV cases and infected districts, Afghanistan 2011-13

<table>
<thead>
<tr>
<th>Region</th>
<th>Confirmed Polio cases by year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2011</td>
</tr>
<tr>
<td>Central</td>
<td>4</td>
</tr>
<tr>
<td>East</td>
<td>2</td>
</tr>
<tr>
<td>South east</td>
<td>1</td>
</tr>
<tr>
<td>South</td>
<td>62</td>
</tr>
<tr>
<td>North</td>
<td>2</td>
</tr>
<tr>
<td>Northeast</td>
<td>3</td>
</tr>
<tr>
<td>West</td>
<td>6</td>
</tr>
<tr>
<td>Country</td>
<td>80</td>
</tr>
</tbody>
</table>

![Map of Afghanistan showing the distribution of WPV cases and infected districts from 2011 to 2013.](attachment:image.png)

- **2011**: District = 34 WPW = 80
- **2012**: District = 21 WPW = 37
- **2013**: District = 04 WPW = 04

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**Non infected district** (green) vs **Infected district** (red)
WPV cases reported in Nigeria in 2012
2013

WPV – 47

CVDPV - 4

2014

WPV – 6

CVDPV - 20
International exportation of poliovirus in 2014
2. Refusal to vaccinate children

- The vaccine has become “toxic” in some communities due to false information being spread by radical clerics (Pakistan) and vaccination “denialists” in Nigeria

- A meeting of Islamic scholars in Cairo in March, convened at the renowned Al-Azhar University, led to the formation of an Islamic Advisory Group for polio eradication
  - A fatwa supporting polio vaccination by the Grand Imam of Al Azhar has been widely disseminated

- The Crown Prince of Abu Dhabi sponsored a conference in Islamabad in June 2014 of leading Islamic scholars from Pakistan, the Middle East and Egypt to promote vaccination
Highly supportive Sheik Ousman in eastern Chad

Campaigns achieve 100% coverage among his supporters
Further challenges

• Inadequate surveillance for acute flaccid paralysis
  – WPV has been circulating undetected in Somalia
  – “Orphan” viruses detected in western Pakistan
  – Some countries where WPV has been eliminated do not now meet surveillance standards and are vulnerable to undetected transmission
    • these include Yemen, Central African Republic, Northern Mali, Syria, and Ukraine

• Environmental surveillance is a valuable tool
  – WPV was recently detected in environmental samples in Cairo, Israel, West Bank, and Gaza (WPV1 genetic type from Sindh, Pakistan via Egypt)
Silent WPV transmission in a country with high coverage of IPV

Environmental surveillance, Israel, West Bank and Gaza, May – Sep 2013

WPV1 identified in 26 locations in central and southern Israel, including Jerusalem and Haifa

IPV coverage 95% in Israel, IPV/OPV is 99% in West Bank and Gaza

Stool survey, n = 2,203

Bedouins <9 yrs – 4.2% +ve
Jews <9 yrs – 0.6% +ve

Mass supplementary OPV campaign in latter half of 2013, repeated in early 2014
This outbreak posed a real risk of reintroduction of WPV into countries that use IPV.

Estimated Jewish population 41,000

Fully immunised at 24 months 85-90%
Costs increase dramatically in the final phase of eradication.
The Vaccine Summit in Abu Dhabi in April 2013 raised $4 billion out of $5.5 bn needed for the 2013-2018 Plan.
### Summary by the most recent IMB meeting

<table>
<thead>
<tr>
<th>3 endemic countries</th>
<th>3 outbreaks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nigeria</td>
<td>Middle East</td>
</tr>
<tr>
<td>Afghanistan</td>
<td>Horn of Africa</td>
</tr>
<tr>
<td>Pakistan</td>
<td>Central Africa</td>
</tr>
</tbody>
</table>

- Game has changed
- Program hasn’t

- Made progress but will not meet the end-2014 deadline
- Risk-laden throughout

Risk-laden throughout
Thank You