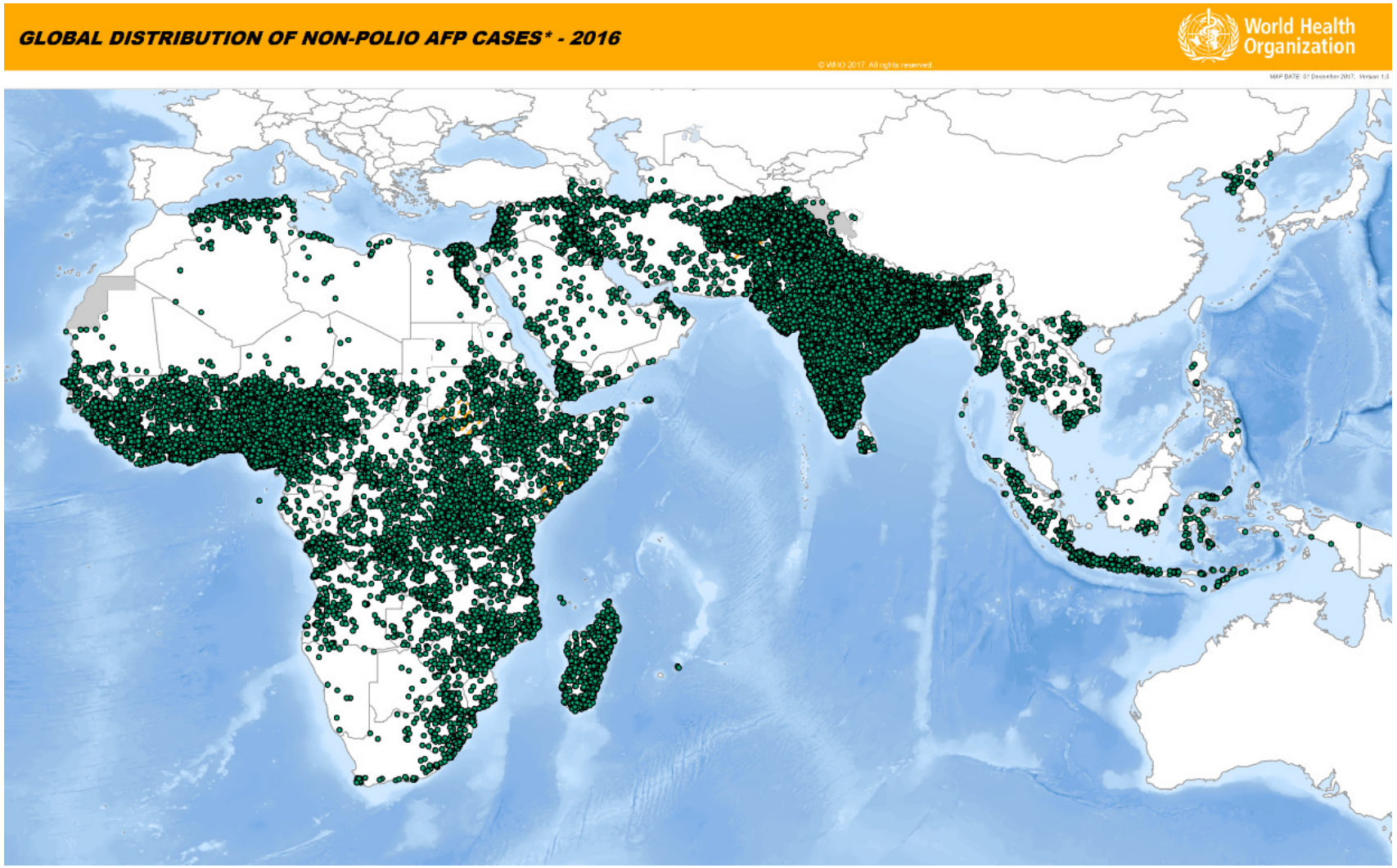
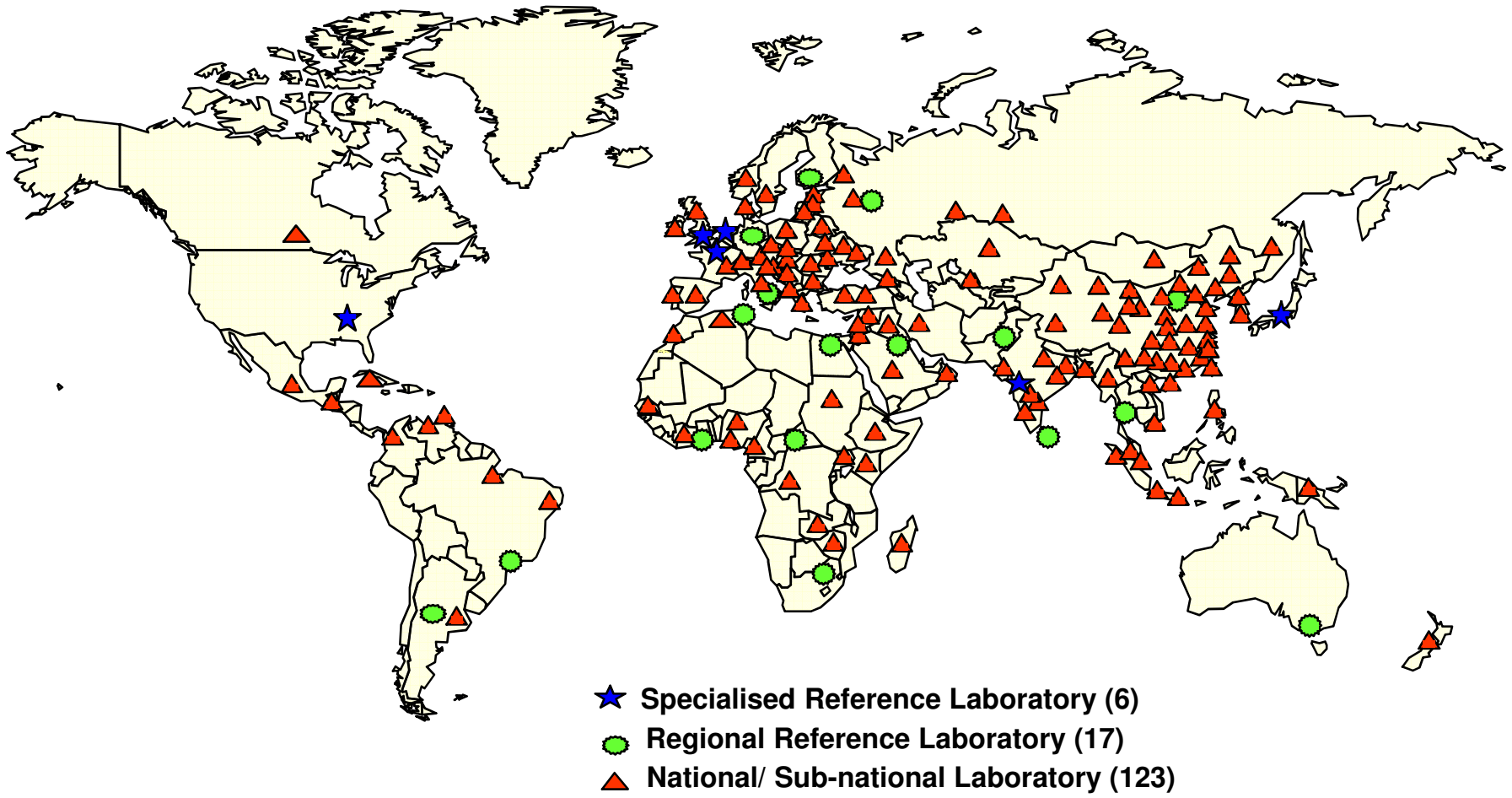
Polio Eradication and Surveillance

Acute Flaccid Paralysis (AFP) surveillance for polio eradication: >100,000 reported AFP per year

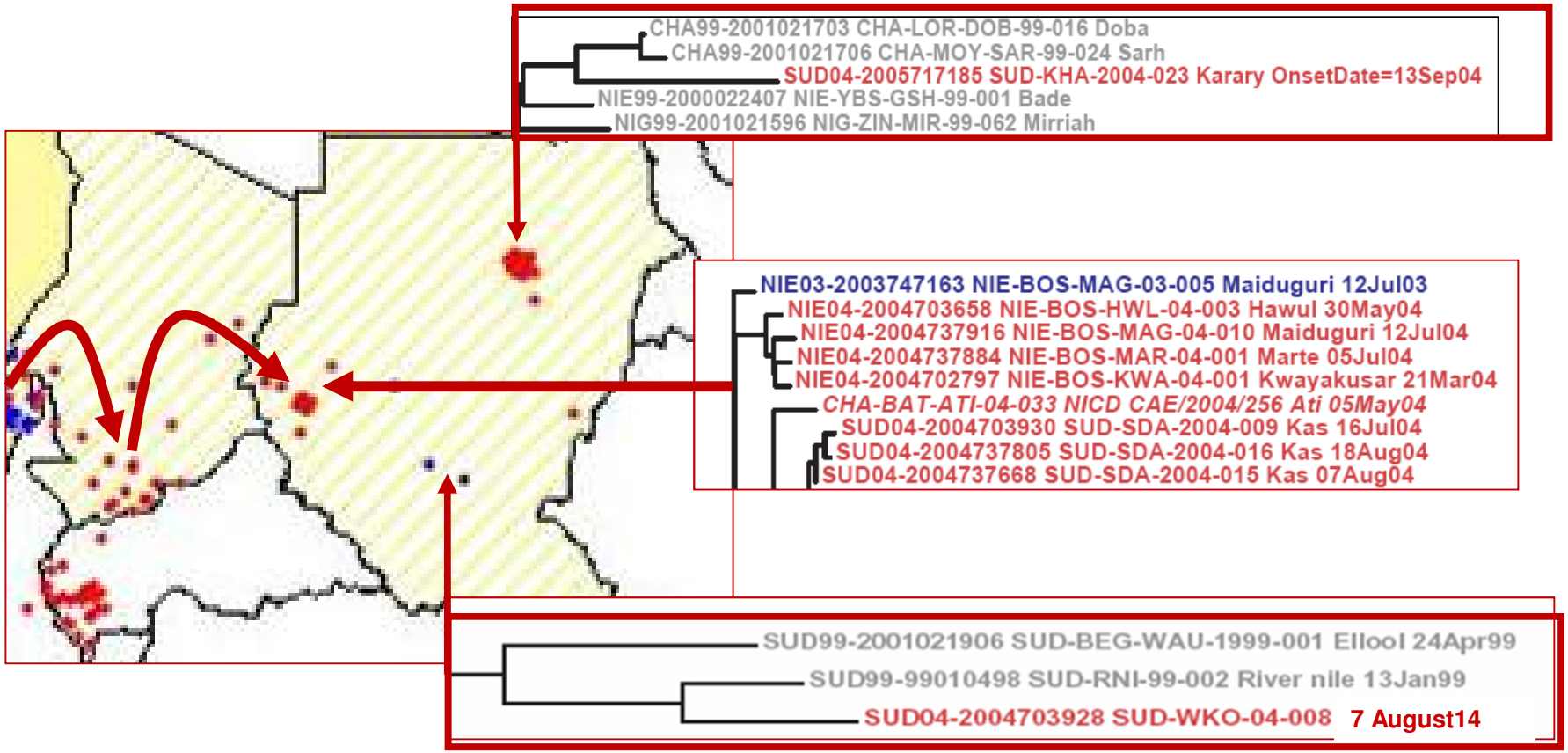


Global Laboratory Network for Polio Eradication

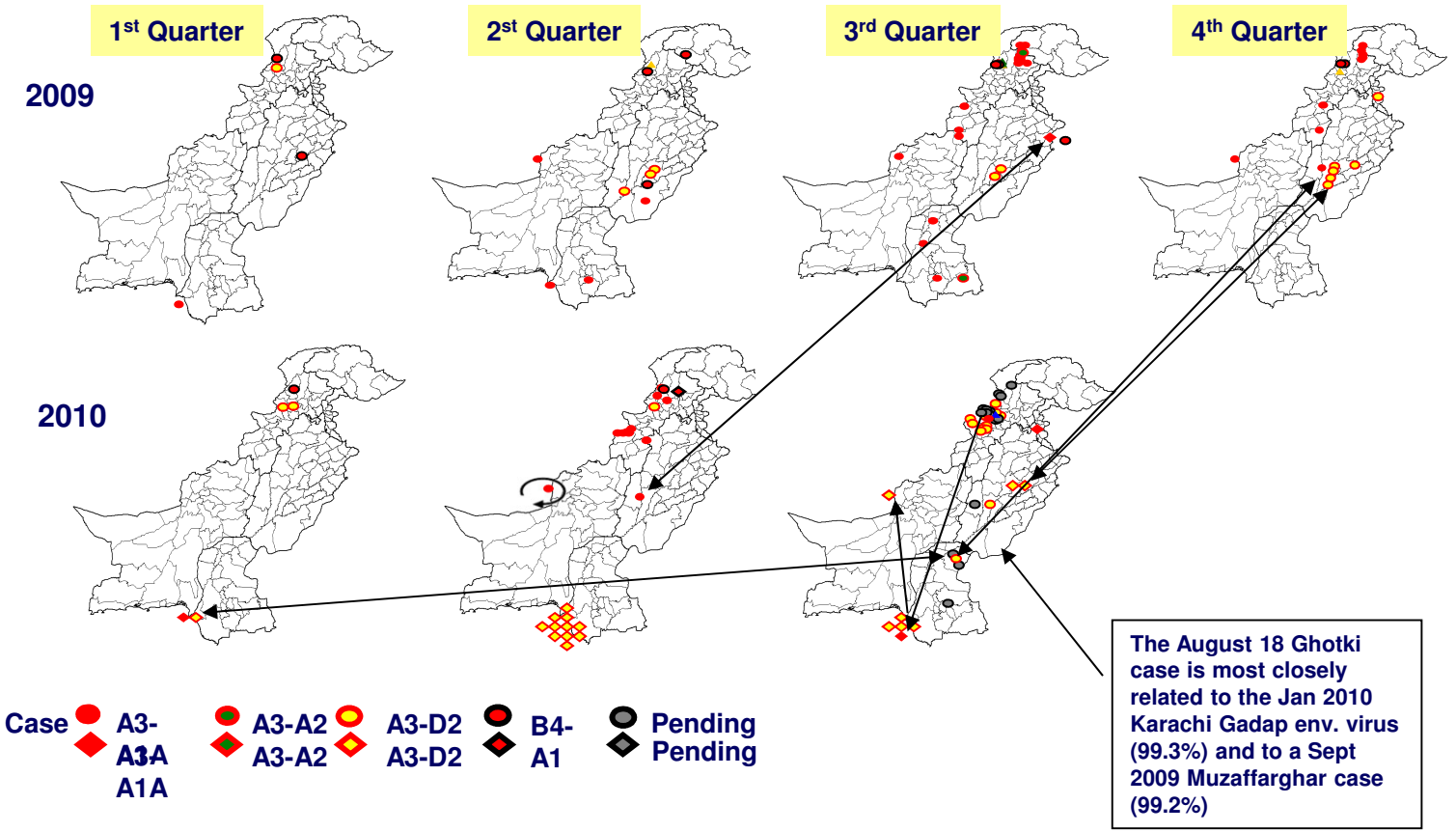
N = 146 laboratories



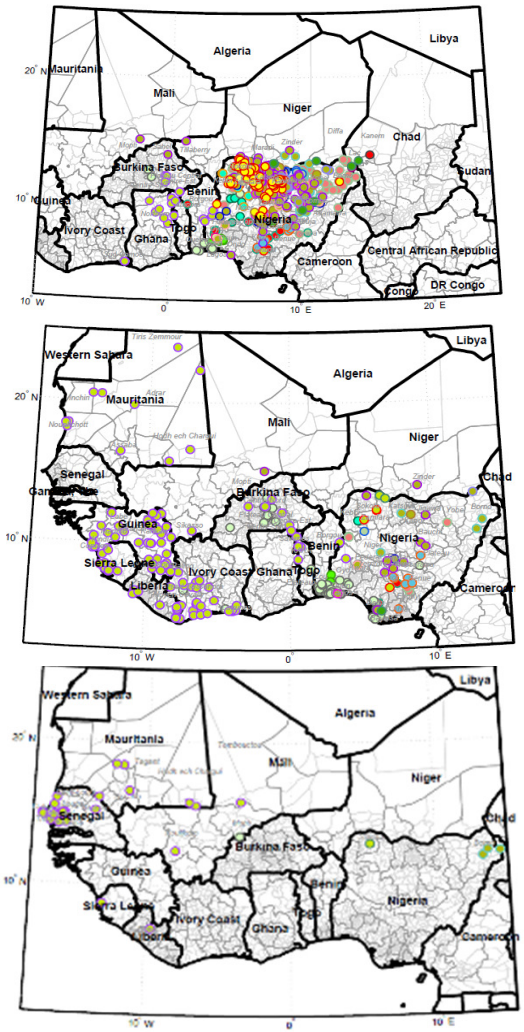
Virus linked to common ancestor, West and Central Africa, 2004



WPV1 by genetic cluster and quarter, Pakistan 2009 and 2010



Progress in polio eradication, West Africa, 2008-2010



2008

2009

2010

Genetic Clusters of Poliovirus 1

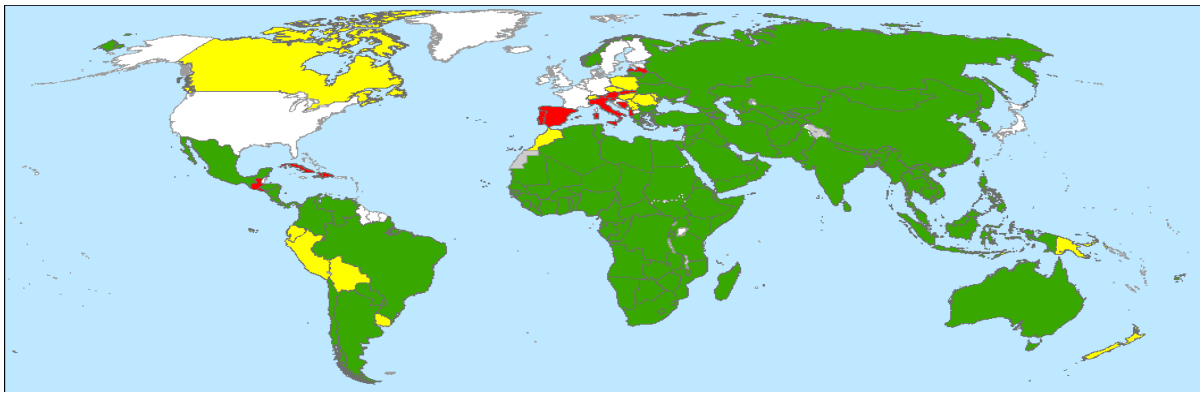
2008	2009	2010
B4B1C1A	B4B1C1B	I6C2B4A2A
B4B1C1B	B4B1C2A	I6C2B4A2B
B4B1C2A	I1C1B1A	I6C2B4A3A
B4B1C2B	I6C2B1B	I6C2B4C1A
I1C1B1A	I6C2B2B1	
I1C1B1B	I6C2B4A1	
I1C1B1C	I6C2B4A2A	
I6C2B1B	I6C2B4A2B	
I6C2B2B1	I6C2B4A3A	
I6C2B2B2	I6C2B4C1A	
I6C2B3B	I6C2B4C1B	
I6C2B4A1	I6C2B4C2	
I6C2B4A2A	I6C2B4C3	
I6C2B4A2B	I6C2B4C4	
I6C2B4A3A	I6C2B4C5	
I6C2B4A3B	I6C2B4C6A	
I6C2B4B1	I6C2B4C6B	
I6C2B4B2	I6C2B4C7	
I6C2B4C1A		
I6C2B4C1B		
I6C2B4C2		
I6C2B4C3		
I6C2B4C4		
I6C2B4C5		
I6C2B4C6A		
I6C2B4C6B		
I6C2B4C7		
I6E2		
J1A		
J1B1		
J1B2		

Acute flaccid paralysis (AFP) surveillance system: targets

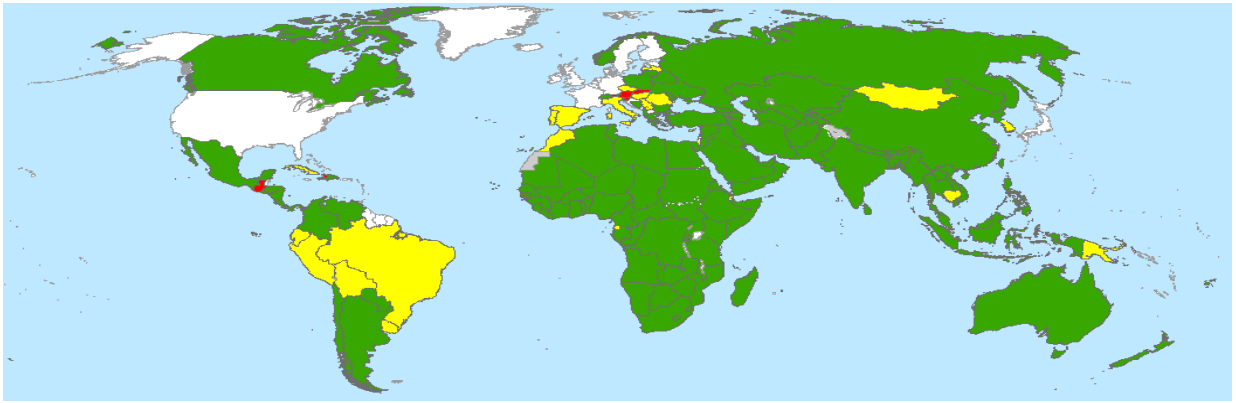
- AFP reporting (*AFP reporting rate*)
  - > 1 report < 15 years of age per 100 000
- Specimen collection (*stool collection rate*)
  - > 80% samples collected within 14 days of onset

AFP reporting rate world-wide, 2015 and 2016

February 2015 – January 2016



February 2016 – January 2017



< 0.5

0.5 - 0.99

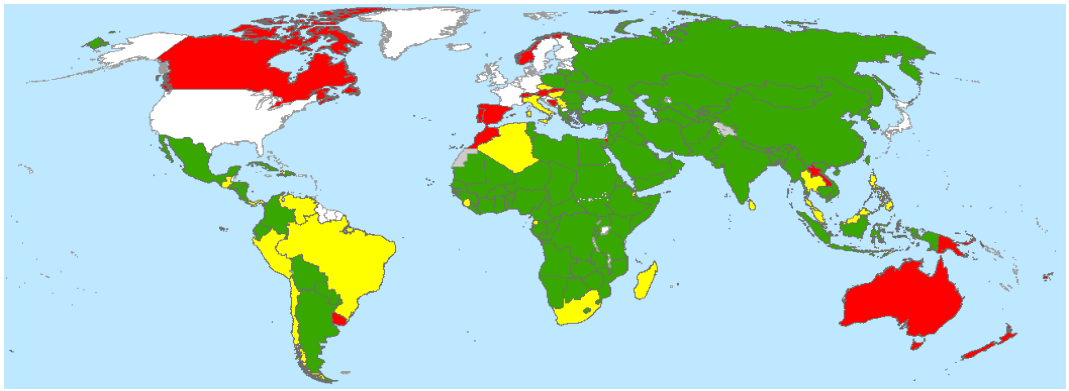
≥ 1

No AFP Surveillance/data

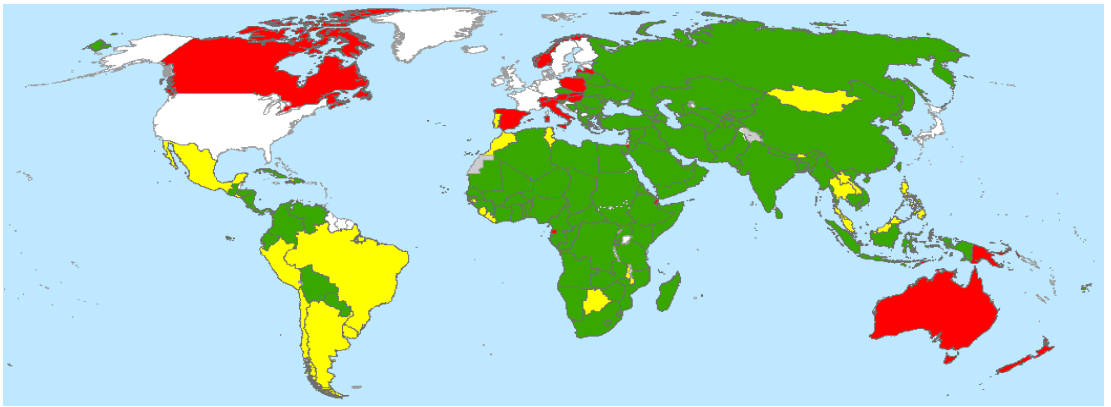
Data in WHO HQ as of 14 March 2017

Stool collection rate world-wide, 2015 and 2016

February 2015 – January 2016



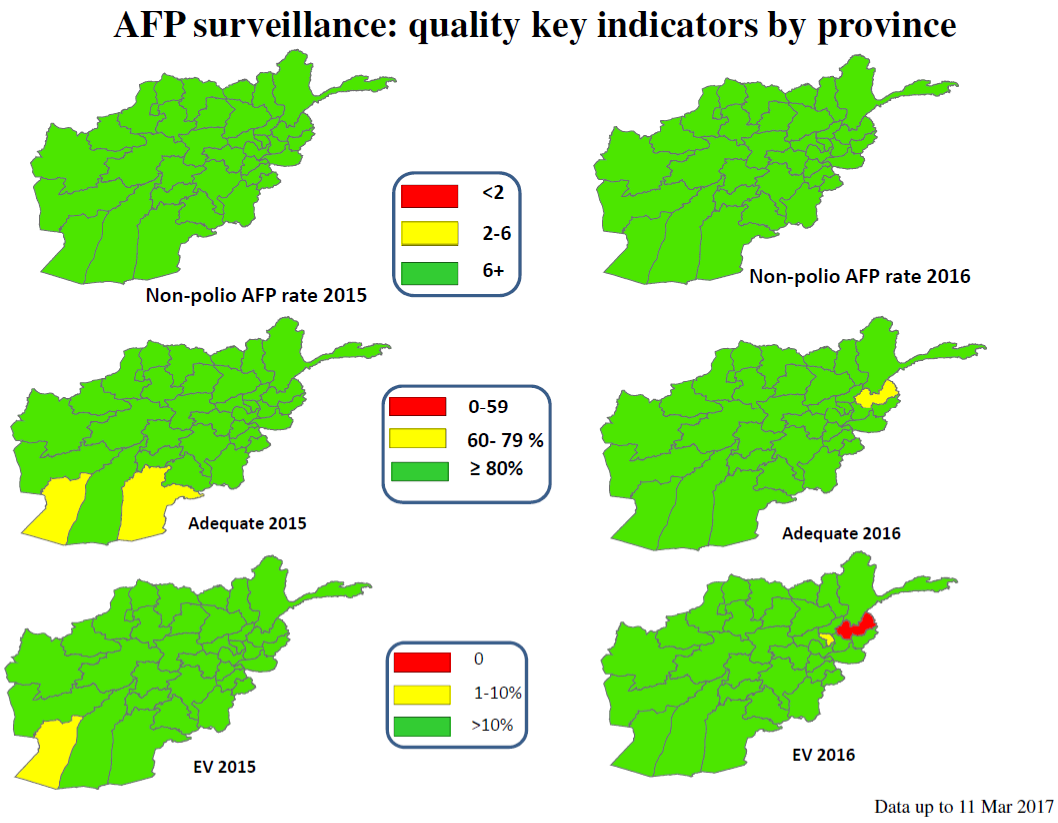
February 2016 – January 2017



- < 60%
- 60% - 79.99%
- ≥ 80%
- No AFP Surveillance/data

Data in WHO HQ as of 14 March 2017

Afghanistan – Quality key AFP surveillance indicators (by province)



Polio AFP surveillance officers and staff

- Surveillance focal points in central government and provinces/states/districts
- Each has polio-funded driver with vehicle
- Per diem for surveillance staff and driver for 10 field days per month
  - Fuel, local maintenance of vehicle
  - Specimen collection
- Real-time communication (cell or satellite phone, laptop)

Polio AFP surveillance network: an active surveillance and response system

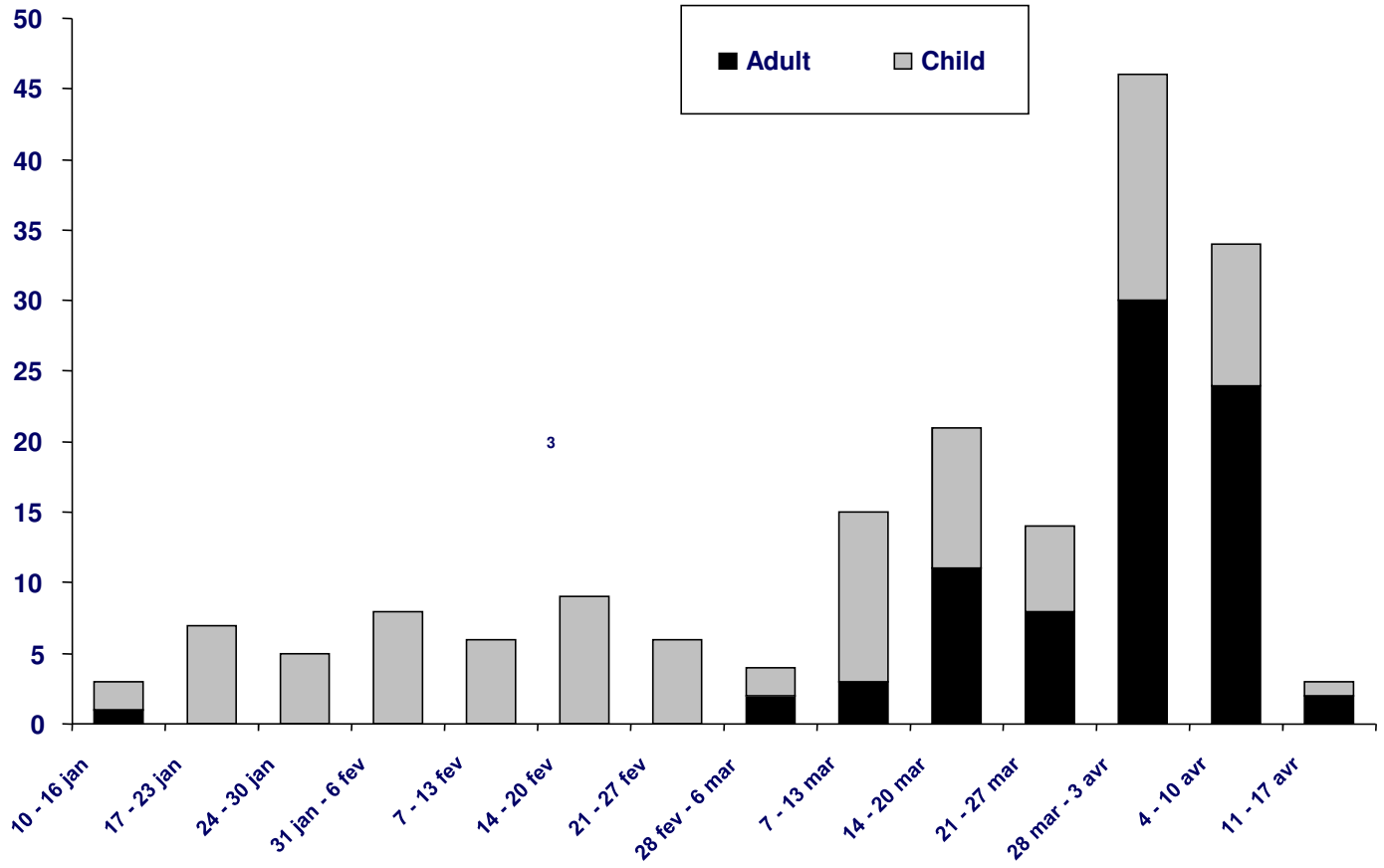
- Accurately identifies children with acute flaccid paralysis
- Investigates each child, collects and transports specimens to laboratory
- Analyzes specimen results, determines where polio is, and where polio is not
- Ensures supervised vaccination response, "pulling" vaccines from manufacturers to national stores and children providing over 90% access
- Maintains vehicles, cell and satellite phones, computers, offices and office equipment/supplies, laboratory equipment and supplies

Micro-planning and mapping for Immunization campaigns in rural Pakistan

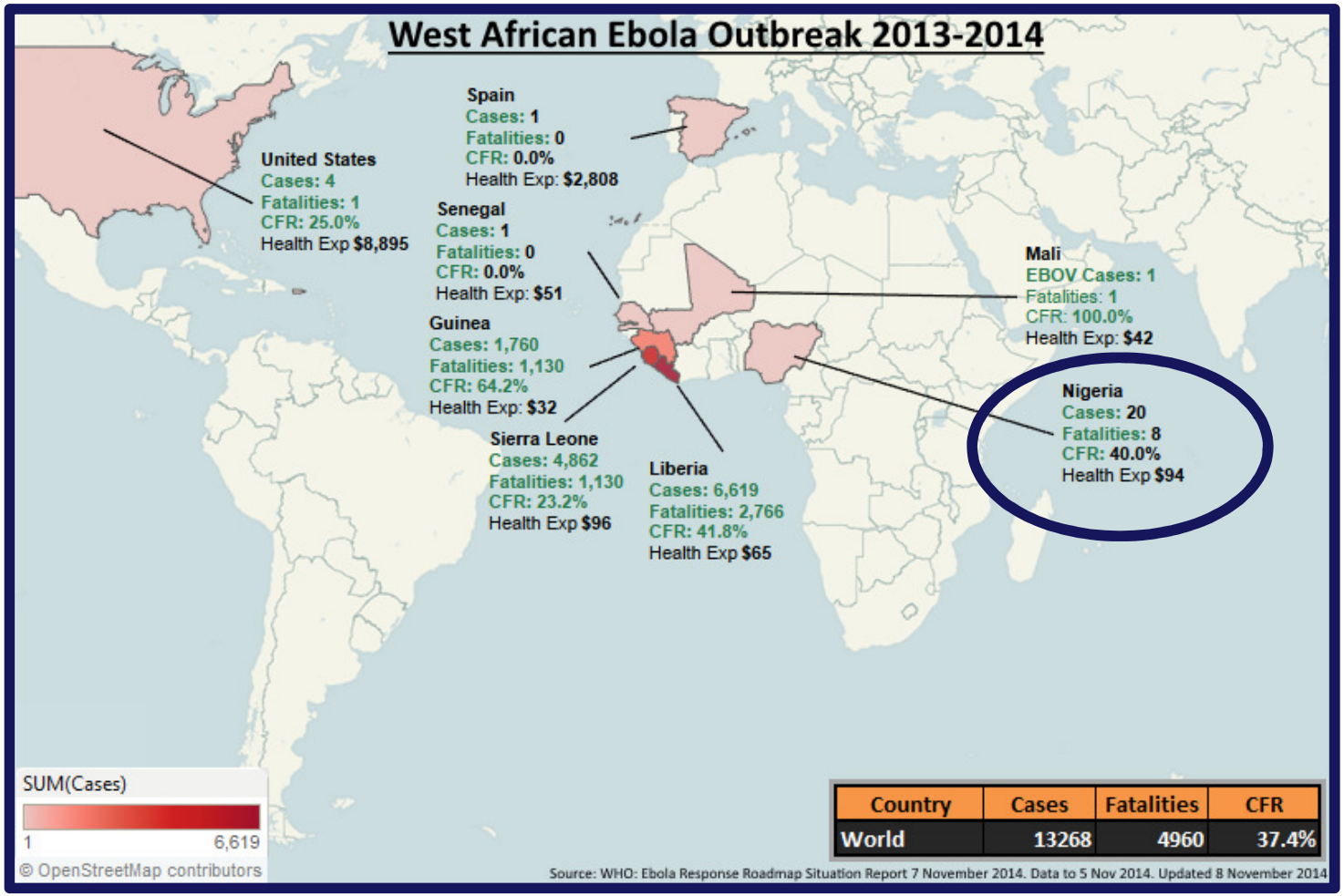
Other activities of polio-funded AFP surveillance staff since 2002

- Case reporting/investigation:
  - Cholera, meningitis sub-Saharan Africa, periodic since 2002
  - Haemorrhagic fever Afghanistan/Pakistan border, 2002
  - SARS, 2003
- First response epidemiological assessment
  - Tsunami South Asia, 2004
  - Pakistan earthquake, 2005

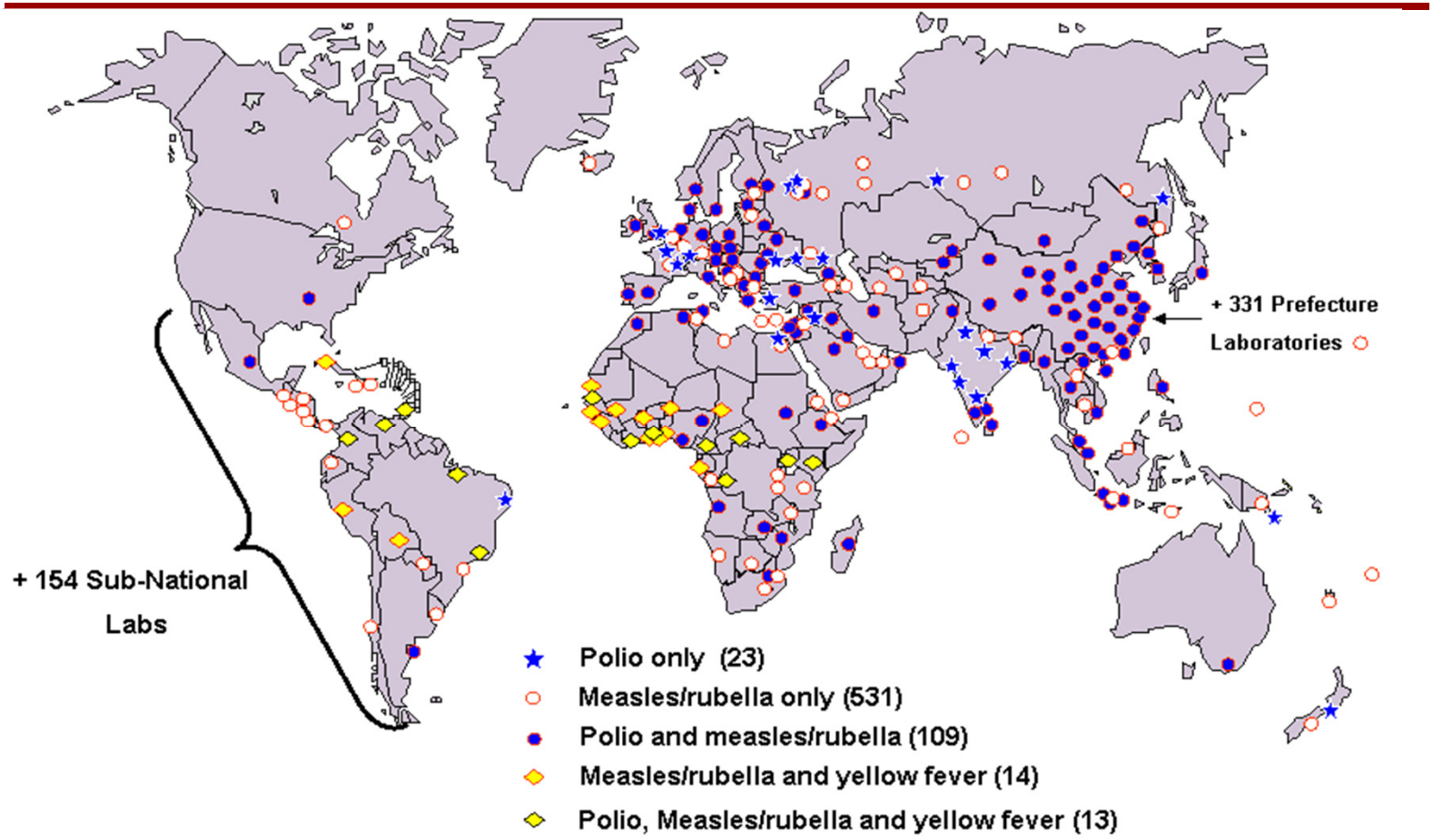
Marburg Viral Haemorrhagic Fever Angola, 2005



Ebola outbreak, Nigeria, 2014



Expansion of the polio-funded AFP surveillance network: measles, rubella, yellow fever



Potential for further expansion, polio-funded AFP surveillance network

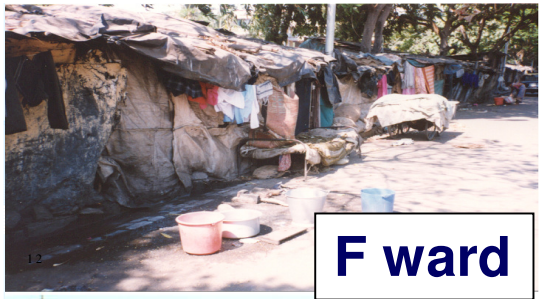
- Influenza
  - 66/112 current influenza labs are located in the same institute as polio laboratories
  - Lab assessments combined with polio and/or measles accreditation reviews
  - Links with Polio and Measles for virus culture and molecular techniques
- Other viral diseases
  - Japanese Encephalitis
  - Dengue
  - Rotavirus
  - HPV
- Bacterial diseases
  - Hib
  - Pneumococcus
  - Meningococcus

Polio-funded staff by region, 2005

Region	International Staff		National Staff					Total
	FT	ST*	FT	ST*	SSA	NPO	APW	
AFRO	31	120	5	572	355	14	0	**1097**
AMRO	1	0	0	3	0	2	0	**6**
EMRO	13	83**	7	19	439	0	457	**935**
EURO	2	1.5	2	2	0	2	0	**9.5**
SEARO	13	12	5	11	1151	0	0	**1192**
WPRO	2	0	0	0	1	0	0	**3**
HQ	23	12	11.5	4.5	0	0	0	**51**
TOTAL	85	145.5	30.5	611.5	1946	18	457	3293.5

Polio environmental surveillance (ES)

Environmental polio surveillance, open sewage, Mumbai, India



Photos courtesy Jagadish Deshpande, Entero Virus Research Centre, Mumbai

Polio virus Detected In Sewage in Mumbai, India 2005-2009

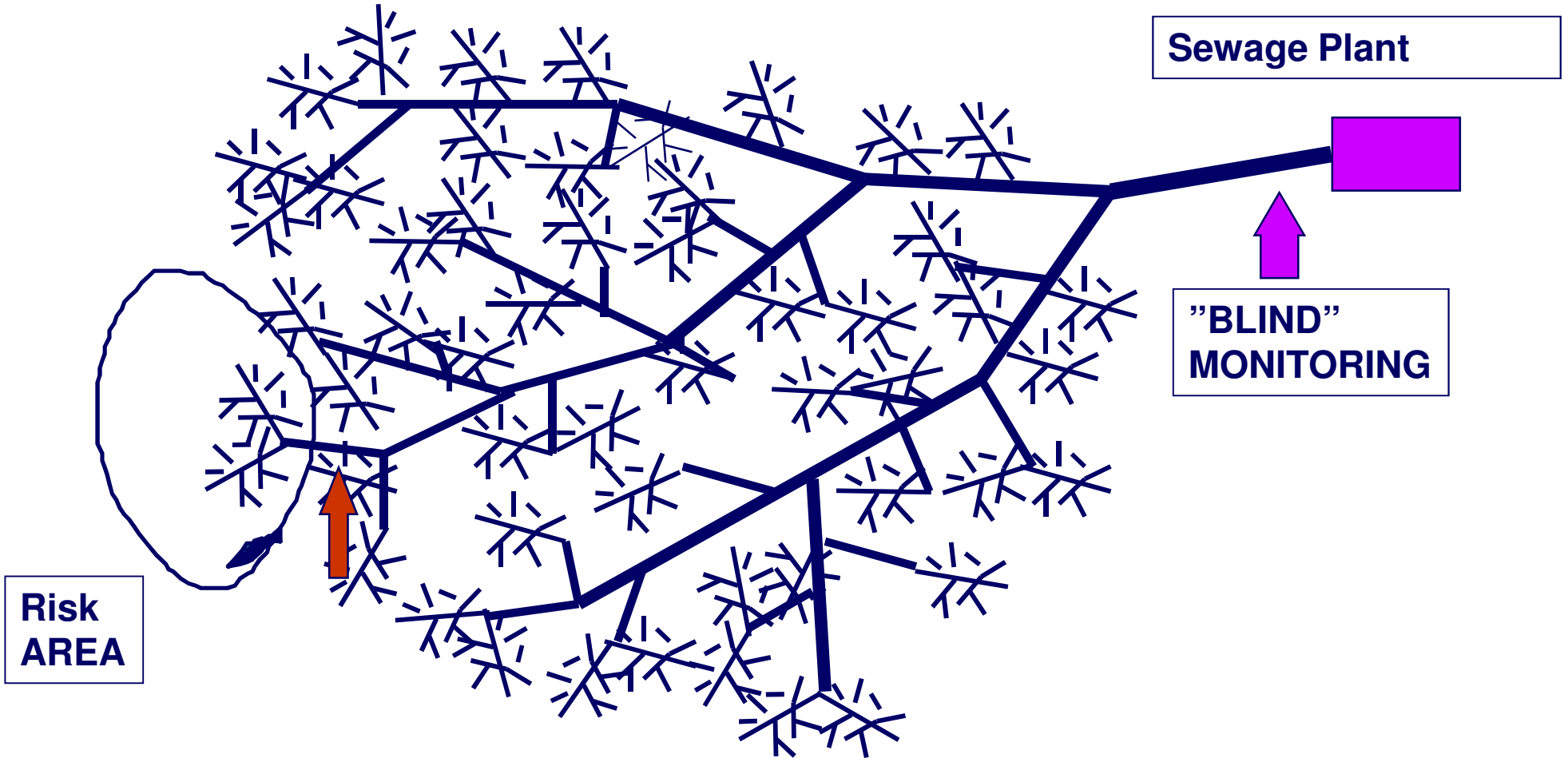
Ward	Total Samples*	Total Polio	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Date of Last Poliovirus
			Samples	Polio	Samples	Polio	Samples	Polio	Samples	Polio	Samples	Polio	Samples	Polio	Samples	Polio	Samples	Polio	Samples	Polio	Samples	Polio	Samples	Polio	Samples	Polio	
Year 2005																											
F	50	2	4	0	4	0	5	0	4	1	4	0	5	0	3	0	4	0	4	0	4	0	5	0	4	1	14-Dec-05
G	50	7	4	1	4	0	5	0	4	0	4	0	5	0	3	0	4	0	4	0	4	3	5	1	4	2	27-Dec-05
M	50	7	4	0	4	0	5	0	4	2	4	0	5	0	3	0	4	3	4	1	4	1	5	0	4	0	19-Oct-05
Total	**150**	**16**	**12**	**1**	**12**	**0**	**15**	**0**	**12**	**3**	**12**	**0**	**15**	**0**	**9**	**0**	**12**	**3**	**12**	**1**	**12**	**4**	**15**	**1**	**12**	**3**	
Year 2006																											
F	15	0	4	0	4	0	5	0	2																		-
G	15	2	4	2	4	0	5	0	2																		24-Jan-06
M	15	0	4	0	4	0	5	0	2																		-
Total	**45**	**2**	**12**	**2**	**12**	**0**	**15**	**0**	**6**																		
Year 2007																											
F	35	4									5	1	4	3	4	0	5	0	4	0	5	0	4	0	4	0	20-Jun-07
G	35	3									5	0	4	3	4	0	5	0	4	0	5	0	4	0	4	0	20-Jun-07
M	35	5									5	0	4	0	4	1	5	0	4	1	5	0	4	2	4	1	21-Nov-07
Total	**105**	**12**									**15**	**1**	**12**	**6**	**12**	**1**	**15**	**0**	**12**	**1**	**15**	**0**	**12**	**2**	**12**	**1**	
Year 2008																											
F	53	2	5	1	4	0	4	0	5	0	4	0	4	0	5	0	4	0	4	0	5	0	4	1	5	0	19-Nov-08
G	53	7	5	0	4	3	4	3 [1]	5	0	4	0	4	0	5	0	4	0	4	1	5	0	4	0	5	0	10-Sep-08
M	53	23	5	3	4	4	4	2	5	4	4	4	4	0	5	2	4	1	4	1	5	1	4	1	5	0	26-Nov-08
Total	**159**	**32**	**15**	**4**	**12**	**7**	**12**	**5**	**15**	**4**	**12**	**4**	**12**	**0**	**15**	**2**	**12**	**1**	**12**	**2**	**15**	**1**	**12**	**2**	**15**	**0**	
Year 2009																											
F	48	3	4	1	4	0	4	0	5	1	4	1	4	0	5	0	4	0	5	0	4	0	4	0	1	0	20-May-09
G	48	0	4	0	4	0	4	0	5	0	4	0	4	0	5	0	4	0	5	0	4	0	4	0	1	0	-
M	48	0	4	0	4	0	4	0	5	0	4	0	4	0	5	0	4	0	5	0	4	0	4	0	1	0	-
Total	**144**	**3**	**12**	**1**	**12**	**0**	**12**	**0**	**15**	**1**	**12**	**1**	**12**	**0**	**15**	**0**	**12**	**0**	**15**	**0**	**12**	**0**	**12**	**0**	**3**	**0**	

P1 | P3 | Both P1 & P3

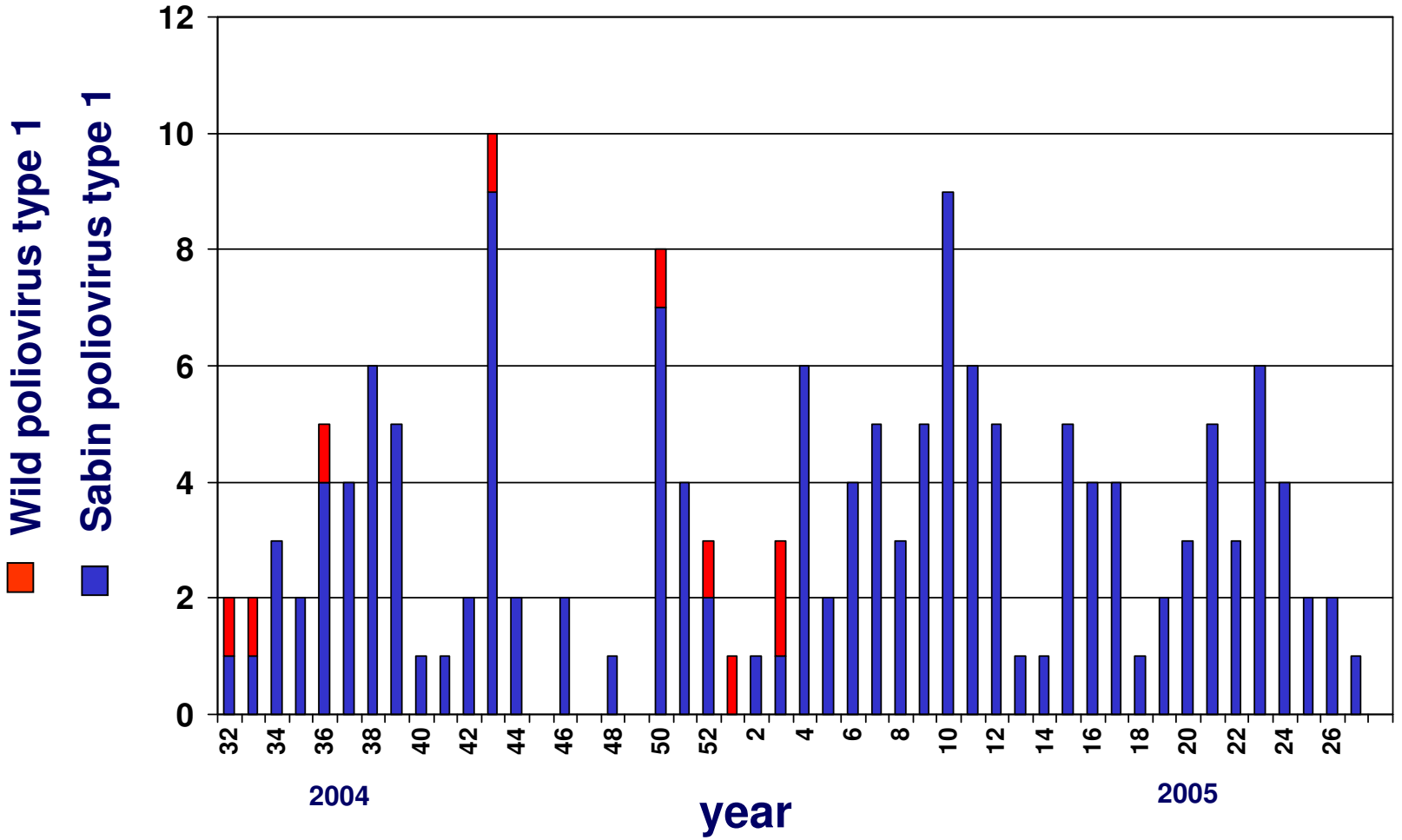
P1 VDPV | P3 VDPV

- WPV introductions from UP and Bihar with limited circulation in Mumbai
- VDPVs detected for the first time in 2009

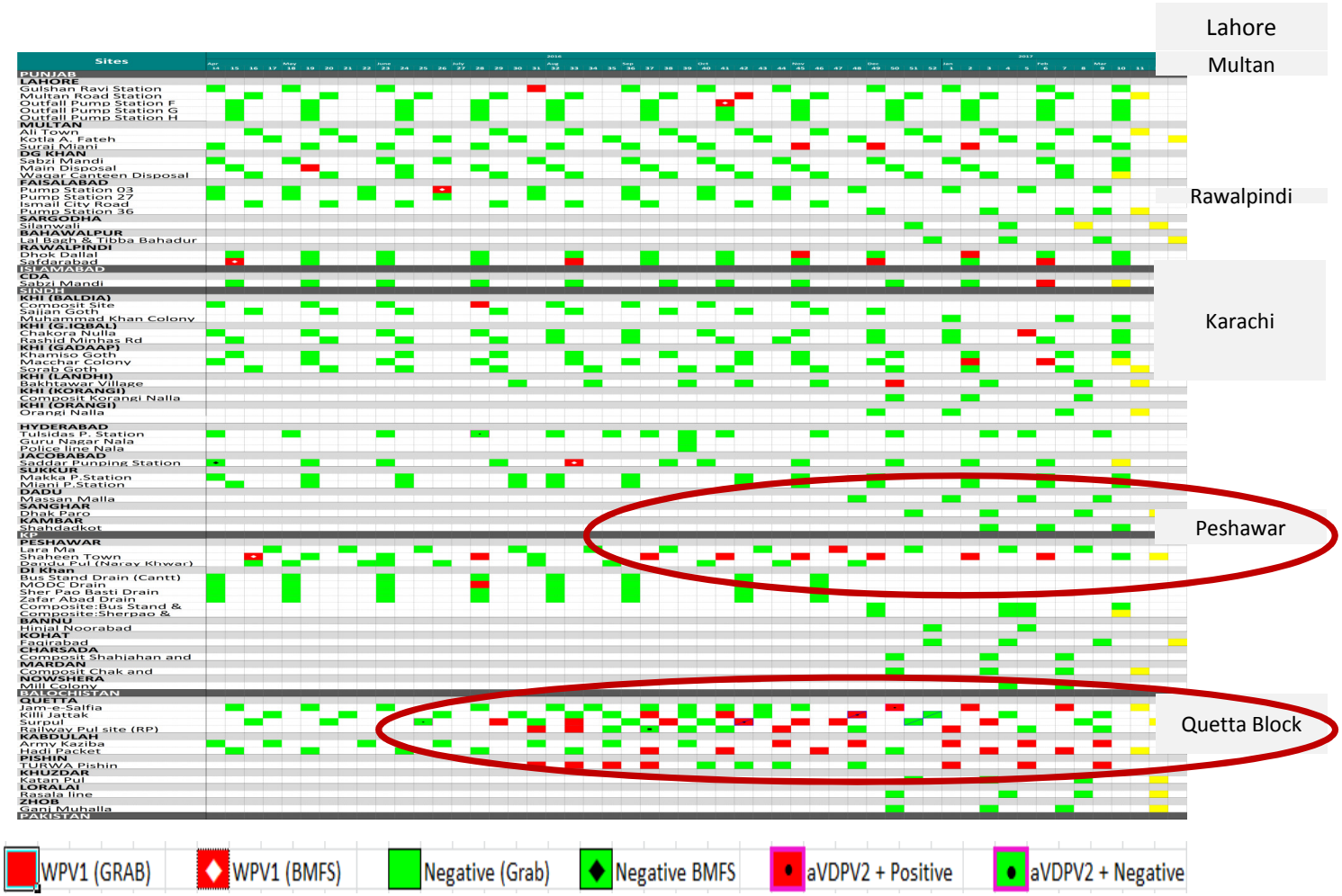
Environmental polio surveillance, sewage network, Cairo, Egypt



Poliovirus isolated from sewage by week, Egypt, August 2004 – August 2005



Pakistan: Environmental Surveillance, Quetta and Peshawar, 2017



Environmental Surveillance, Africa, 2017

Environmental Surveillance in other polio non-endemic countries

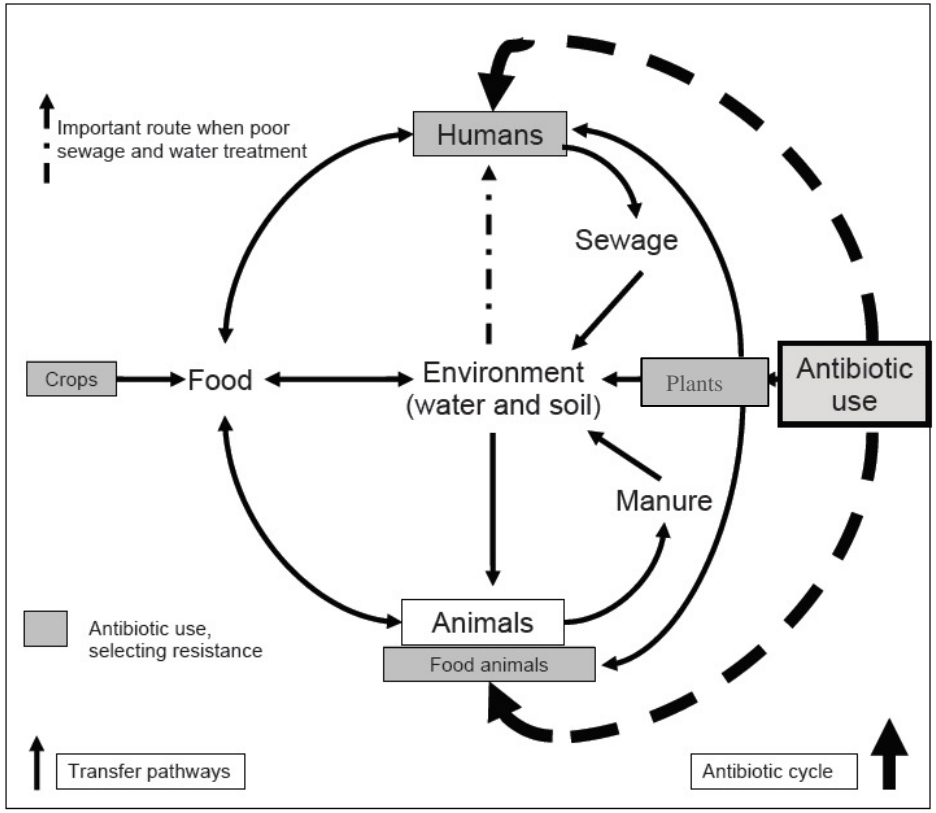
	Countries with established ES Surveillance and reporting to WHO	No	Planned
AMR	*Mexico*, Haiti	2	Guatemala
EUR	Azerbadjian, Belarus, Georgia, Kyrgystan, Kazakhstan, Latvia, Lithuania, Moldova, Russian Federation, Turkey, Ukraine, Italy, Estonia, Finland, Croatia, Netherlands, UK, Czech, Slovakia, Greece, Israel, Italy, Spain, Uzbekistan, Romania	25	-
SEAR	India, Indonesia, Thailand, Bangladesh, Myanmar	5	Nepal, Timor-Leste
WPR	China, Philippines, Australia,	3	PNG, Vietnam, Cambodia, Laos

Containment after certification of poliovirus after eradication

- Polio virus in laboratories throughout the world:
  - Known wild poliovirus
  - Known Sabin poliovirus
  - Potential infectious materials (wild and Sabin poliovirus)
  - Wild and Sabin poliovirus used in production of inactivated polio vaccine (IPV)

Possible role of environmental surveillance in the future: antimicrobial resistance

Shared microbes at the animal/human interface



Source: DARC/ARHAI joint report, UKI

View from outside

- Eradication of wild poliovirus Type 2 has been certified before containment has been completed

View from outside

- Eradication of wild poliovirus Type 2 has been certified before containment has been completed
- **GCC will likely follow precedent – eradication certified with interruption of transmission of wild poliovirus Types 1 and 3**

View from outside

- Eradication of wild poliovirus Type 2 has been certified before containment has been completed
- GCC will likely follow precedent – eradication certified with interruption of transmission of wild poliovirus Types 1 and 3
- **Is it time for WHO to integrate surveillance and containment with other activities in surveillance (IHR) and biosecurity of WHO while there are still resources available, and in view of the need for long term sustainability ?**