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POLIO ERADICATION: HISTORY, LESSONS AND LEGACY

A LITERATURE REVIEW AND ANNOTATED BIBLIOGRAPHY
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LIST OF ABBREVIATIONS

ACPE	Advisory Committee on Polio Eradication
AFP	acute flaccid paralysis
AIDS	Acquired Immune Deficiency Syndrome
BMGF	Bill and Melinda Gates Foundation
BMZ	Federal Ministry of Economic Cooperation and Development (Germany)
bOPV	bivalent oral polio vaccine
CDC	US Centers for Disease Control & Prevention
CIA	US Central Intelligence Agency
cVDPV	circulating vaccine-derived polio virus
DFID	UK Department for International Development
DG	Director General (of WHO)
DRC	Democratic Republic of the Congo
EB	Executive Board (of WHO)
EC	European Commission
EOC	emergency operations centre
EPI	Expanded Programme on Immunization
FATA	Federally Administered Tribal Areas (Pakistan)
G8	Group of Eight
GAVI	the Vaccine Alliance
GCC	Global Commission for the Certification of Poliomyelitis Eradication
GPEI	Global Polio Eradication Initiative
HIV	Human Immunodeficiency Virus
ICRC	International Committee of the Red Cross
IHR	International Health Regulations
IMB	Independent Monitoring Board
IPD	immunization and preventable disease
IPV	inactivated polio vaccine
KP	Khyber Pakhtunkhwa (Pakistan)
LHWs	Lady Health Workers
LMG	Legacy Management Group
LPDs	low-performing districts
MDGs	Millennium Development Goals
mOPVs	monovalent oral polio vaccines
MTR	Midterm Review
NEAP	National Emergency Action Plan
NIDs	national immunization days
NGOs	non-governmental organizations
NWFP	North West Frontier Province (Pakistan)
ODA	Official Development Assistance
OPV	oral polio vaccine
PCR	polymerase chain reaction
PEI	Polio Eradication Initiative
PHC	primary health care
PHEIC	Public Health Emergency of International Concern
POB	Polio Oversight Board (of GPEI)
PPG	Polio Partners Group (of GPEI)
PwC	PricewaterhouseCoopers
SAGE	Strategic Advisory Group of Experts on Immunization
SC	Strategy Committee (of GPEI)
SIAs	supplementary immunization activities
SNIDs	sub-national immunization days

STOP	Stop Transmission of Polio
TAGS	technical advisory groups
TNSM	Tehreek Nifaz-e-Shariat-e-Muhammadi (Movement for the Enforcement of Islamic Law)
tOPV	trivalent oral polio vaccine
TTP	Tehrik-i-Taliban Pakistan
UNF	United Nations Foundation
UNICEF	United Nations Children's Fund
UK	United Kingdom of Great Britain and Northern Ireland
UNF	United Nations Foundation
UP	Uttar Pradesh
USA	United States of America
VAPP	vaccine-associated paralytic polio
WHA	World Health Assembly
WHO	World Health Organization
WPV	wild type polio virus
WPV1	wild type polio virus type 1
WPV2	wild type polio virus type 2
WPV3	wild type polio virus type 3

EDITOR'S NOTE

This literature review and annotated bibliography by Marianne Haslegrave was commissioned by the Global Health Centre at the Graduate Institute of International and Development Studies, Geneva in 2015. It provided the background for a study of the endgame and legacy aspects of polio eradication, with a focus on the European dimension within the global eradication initiative.

The review covered literature up to February 2016. During the subsequent editing process, a few references were added or substituted to ensure the accuracy of the text at the time of publishing. However, new material has not been added to describe events that took place later in the year – including such important matters as the successful global switch from the trivalent to the bivalent form of the oral polio vaccine in April, the establishment of a new Transition Independent Monitoring Board, the global shortage of inactivated polio vaccine that worsened during the year, or the unfortunate re-appearance of polio in Borno, Nigeria in July-August which led to regional emergency action in the countries bordering Lake Chad.

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PART 1

1. INTRODUCTION

The polio eradication programme has reduced polio cases by over 99% since 1988

Poliomyelitis is a viral infection. It is usually limited to the gastrointestinal tract, nose and throat and often asymptomatic, but the central nervous system and primarily the spinal cord may be affected and it is most often recognised by the onset of acute onset of flaccid paralysis, occurring in less than 1% of infections and primarily affecting children under the age of 5. There is no cure and prevention is the only approach available, with oral or injectable vaccines.¹

In 1988 when the Global Polio Eradication Initiative (GPEI) partnership was initiated, there were more than 350,000 cases of polio per year occurring across 125 polio-endemic countries. Since then, reported global polio cases decreased by over 99% to 415 in 2014, including 359 due to wild type poliovirus (WPV) and 56 due to circulating vaccine-derived polio virus (cVDPV) infections.² In 2015, 100 cases (including 72 wild type) had been reported and WPV remained endemic in only two countries (Afghanistan and Pakistan), with cVDPV-related outbreaks in other countries including Guinea, Lao PDR, Madagascar, Myanmar, Nigeria and Ukraine.³ No cases were reported anywhere in January 2016. The GPEI's Polio Eradication and Endgame Strategic Plan 2013–18 aimed to deliver a world certified to be polio-free by 2018, at a cost of US\$ 5.5 billion over the period.

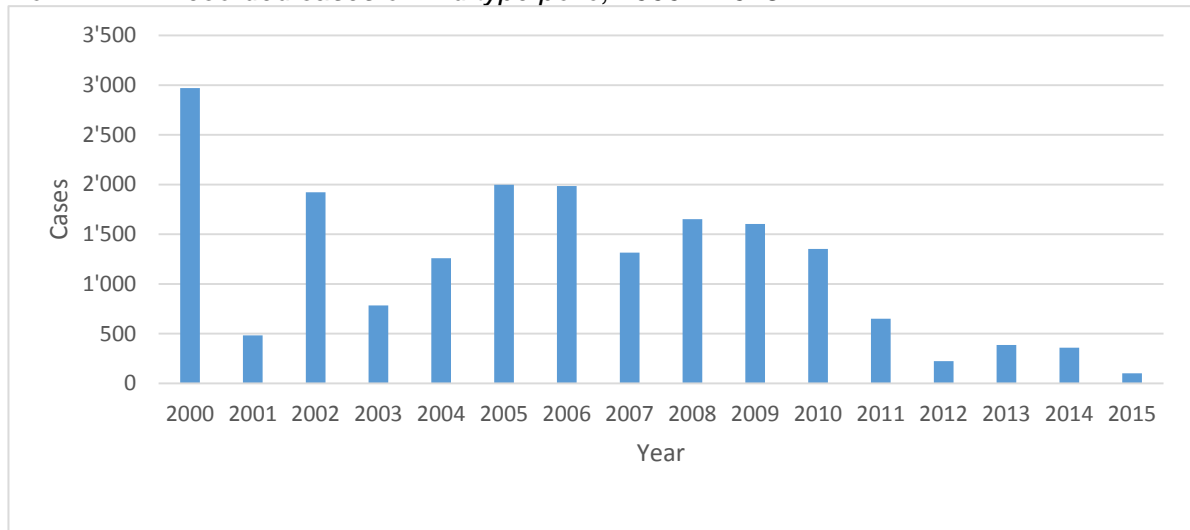
The costs of failure to eradicate polio would be very high for the whole world

The costs of failure to eradicate polio would be very high in both health and economic terms. At the current insufficient levels of immunization, especially in high-risk geographies, it is predicted that there would be a resurgence in the disease to 200,000 cases of paralysis a year within a decade; and the global costs of responding would amount to tens of billions of dollars.⁴

A shift in approach is essential in the polio eradication endgame

It is clear that the technical means to eradicate polio are available and many valuable lessons can be drawn from the successes achieved in the first 25 years of the GPEI. However, there have been numerous setbacks and delays in concluding the polio eradication effort (Box 1.1), with the date for completion having been repeatedly revised from the original target of 2000 and the latest plans from the GPEI anticipating certification of global eradication in 2019 and the need for an additional US\$ 1.5 billion in funding.⁵ Indeed, at the beginning of 2016 it remained uncertain when the eradication programme can be successfully concluded. It has become evident that reaching the last 1 percent – and especially the last few cases – necessitates overcoming major hurdles, since the remaining barriers are not simply technical in nature but relate to specific local factors in the residual polio-endemic countries.

Box 1.1 Recorded cases of wild type polio, 2000 – 2015



Drawn from data in Refs 2,3

Polio vaccine is being changed: only two strains of the wild poliovirus remain in circulation

Three different serotypes (types 1, 2 and 3: variants requiring the development of separate antibodies to generate immunity) of the poliovirus occurred in the wild state, but type 2 has been eliminated in the wild – the last wild type 2 poliovirus was detected in India in 1999.⁶

Oral polio vaccine (OPV), developed in 1961 by Albert Sabin, is a ‘trivalent’ polio vaccine, consisting of a mixture of live, attenuated (weakened) poliovirus strains of all three types of poliovirus. OPV has the advantages of being effective, relatively inexpensive (in 2011, the cost of a single dose for public health programmes in developing countries was between 11 and 14 US cents) and induces long-lasting immunity to all three types of poliovirus. For several weeks after vaccination, the vaccine virus replicates in the intestine, is excreted in the faeces, and can be spread to others in close contact. This means that in areas where hygiene and sanitation are poor, immunization with OPV can result in the “passive” immunization of people who have not been directly vaccinated. OPV is highly effective against all three types of wild poliovirus, but when administered there is competition to cause immunity among the three attenuated viruses, which results in protection but not with equal efficiency for each type. OPV is most effective against type 2 and three doses are needed to produce overall immunity in more than 95% of recipients.⁷

However, in extremely rare cases (c. 1 in every 2.7 million first doses of the vaccine) the live attenuated vaccine virus in OPV can cause vaccine-associated paralytic polio (VAPP). The extremely low risk of VAPP is well known and has been accepted by most public health programmes in the world because without OPV, hundreds of thousands of children would be crippled every year. A further disadvantage is that very rarely the poliovirus in the vaccine may combine with certain strains of another virus (Coxsackie) and exhibit other characteristics of persistent growth and spread. These recombinant strains or circulating vaccine-derived polioviruses (cVDPVs) can lead to outbreaks of polio.^{8,9}

Monovalent oral polio vaccines (mOPVs), consisting of live, attenuated poliovirus strains of a single type of poliovirus, give protection against that type of poliovirus only. From 2005, type 1 and type 3 mOPVs were introduced to more rapidly interrupt the final strains of poliovirus transmission around the world, both having been introduced in India and Afghanistan to interrupt endemic strains of polio types 1 and 3 in targeted areas and subsequently in

Nigeria, Pakistan and Chad. The mOPVs have the advantages that they create much stronger immunity on the first dose compared with trivalent OPV (tOPV) and a higher proportion of children develop immunity to the targeted poliovirus after the first dose of mOPV than after the first dose of tOPV. Monovalent oral polio vaccines are recommended for use in supplementary immunization campaigns in areas where only wild poliovirus type 1 or type 3 alone is circulating, but not recommended as a substitute for OPV in routine immunization programmes.¹⁰

Bivalent oral polio vaccine (bOPV), consisting of live, attenuated poliovirus strains of type 1 and type 3, simultaneously targets the two remaining types of wild poliovirus. It was developed to improve the efficiency and impact of vaccination campaigns in areas where both types of poliovirus co-circulate and was first used in Afghanistan in December 2009. Its advantages include that it is at least 30% more effective than trivalent OPV and almost as good as the monovalent vaccines, yet in a package that delivers both at once and allows countries to simplify vaccine logistics and optimize protection. In areas where access to children is limited, using bOPV helps maximise the impact of each contact with a child.¹¹

Inactivated polio vaccine (IPV) is produced from wild-type poliovirus strains of each serotype that have been inactivated (killed) with formalin. As an injectable vaccine, it can be administered alone or in combination with other vaccines (e.g., diphtheria, tetanus, pertussis, hepatitis B, and haemophilus influenza). Generally three spaced doses are administered to generate adequate levels of immunity to all three types of poliovirus and in most countries a booster dose is added during late childhood. IPV has been used successfully in the polio eradication programmes in a few countries, notably in Scandinavia and the Netherlands, but until recently most countries have used the oral polio vaccine.¹²

The GPEI's Polio Eradication and Endgame Strategic Plan 2013–18 calls for an important transition in the vaccines used to eradicate polio and requires the removal of all OPVs in the long term. This will eliminate the rare risks of VAPP and cVDPV. The withdrawal of OPVs must occur in a globally synchronized manner, starting in April 2016 with a switch from trivalent to bivalent OPV, removing the type 2 component from immunization programmes. Preparation for the removal of OPVs also includes the introduction of at least one dose of IPV into routine immunization programmes in all countries by the end of 2015.¹³

Overcoming the remaining barriers to polio eradication: critical determinants

Achieving polio eradication not only requires meeting the financial needs of the GPEI Strategic Plan and the diligent application of the well-established technical processes. There are complex factors at play in the remaining disease endemic countries that will determine whether surveillance and reporting of cases of acute flaccid paralysis (AFP) and the conduct of intensive immunization campaigns that reach the vulnerable can be achieved effectively. In particular, cultural, political, religious, security and social factors operate in the endemic areas, where there are civil conflicts, territorial disputes and high levels of distrust of authorities and of health workers. Polio eradication will only be achieved if these barriers are overcome – and this will require that supporters of the GPEI address both the economic and the other critical determinants.

Purpose of the review

Literature has been selected for review that depicts the evolution of the global programme to eradicate polio, with an emphasis on understanding the nature and magnitude of the remaining challenges, the lessons that can be drawn from the successes and failures to date and pointers towards what needs to be done to ensure a successful final outcome. Looking beyond the end goal of polio eradication itself, it also examines the legacy that can be derived from the last three decades of global effort.

The attempt to eradicate polio is taking place in a context that is constantly changing. The disease itself has gradually, if somewhat erratically, been reduced in the number of countries where it is endemic, the number of cases occurring annually and the number of wild virus serotypes causing infection. However, the remaining reservoirs are in countries (Afghanistan and Pakistan) with weak, fragmented or dysfunctional health systems, with civil conflicts or long-standing territorial disputes that make access to all areas very difficult and dangerous for health workers, and with a range of socio-cultural and religious factors operating that present barriers to identifying, accessing and vaccinating all the children that need to be protected against polio. Instability in these countries and the changing fortunes of conflicts (such as the surge in territorial conquests by the Taliban in Afghanistan in the latter part of 2015) make the planning of vaccination initiatives extremely uncertain. The picture painted in this review is therefore likely to continue changing and one of the challenges for the polio eradication endgame is how it can be flexible and adapt to a constantly shifting situation.

This review has therefore tried to identify and examine literature that gives an insight into these problems and the ways that they might be overcome. Four sources have been consulted: peer-reviewed papers; grey literature including reports from national and international agencies and non-governmental organizations (NGOs); articles and comments published in newspapers and online media; and personal contacts with local officials and health workers, especially in Pakistan. While these diverse sources may differ in the extent to which they are evidence-based and accurate, the local, informal and personal sources are of value in helping to understand attitudes and opinions on the ground – factors that, as discussed in this review, are crucial to the success of the polio eradication endgame.

The emphasis of this review is not on the technical details of polio eradication – such as the design of particular vaccines or the organization of vaccination programmes. Rather, it focuses primarily on the political, policy and governance aspects of the eradication initiative and in particular seeks to draw lessons about these elements that will be relevant for the polio endgame itself and, more broadly, for future efforts to improve health globally.

In this context, it is important to note that polio eradication is not the first disease eradication campaign¹⁴ and the review makes reference to experiences and lessons of these efforts. The first successful case of eradication of a disease in human beings was smallpox in 1980, but this was as the result of an intensified effort following the failure of an earlier campaign; and there had been previous unsuccessful attempts to eradicate other infectious diseases including hookworm, yellow fever and malaria. During the period of the GPEI there has also been a determined effort to eradicate dracunculiasis (Guinea worm), a campaign which now appears to be on the brink of success. These cases provide important reminders that, while the prize is great, success is not always guaranteed and the lessons and legacies of the efforts are not always well captured and applied.

This review was written in the context of a project being undertaken by the Global Health Programme at the Graduate Institute, Geneva, with the support of the Bill and Melinda Gates Foundation (BMGF). The project aims to address and work with European decision makers to foster critical action on the global public good of polio eradication and ensure a lasting legacy for sustainable health systems.

2. SUCCESSES AND LESSONS OF THE FIRST 25 YEARS OF THE GPEI, 1988-2013

In 1988, with an estimated 350,000 cases of paralytic poliomyelitis occurring, the disease was endemic in more than 125 countries,¹⁵ despite the availability of an inexpensive, cheap OPV. Against this background the GPEI was launched at the forty-first World Health Assembly (WHA). The reports to and resolutions passed by the WHA and the Executive Board (EB) of the World Health Organization (WHO), together with the documents from other special WHO meetings and speeches made by the WHO Director General (DG) form a core thread of literature that covers the period from 1988 to date.

2.1 Forty-first WHA resolution on global eradication of poliomyelitis by the year 2000, 13 May 1988¹⁶

The 41st WHA passed a resolution declaring “*the commitment of the WHO to the global eradication of poliomyelitis by the year 2000*”, following the Declaration of Talloires¹⁷ earlier that year. The resolution specified the inclusion of protection of infants with polio vaccines and called for the global eradication of polio by the year 2000. It was influenced by the progress that was being achieved by the Expanded Programme on Immunization (EPI). The resolution was important insofar as it highlighted the importance of “**political will of countries**” and “**investment of adequate human and financial resources**”. It also recognized the importance of linkages between eradicating polio and strengthening other immunization and health services, stating that eradication efforts should be carried out in ways that would strengthen the development of the EPI, health infrastructure and primary health care (PHC).

Three categories of Member States were also specified for involvement in polio eradication, namely those that were vaccinating at least 70 percent of their target populations; those that had not yet attained a 70 percent coverage rate; and those free of the indigenous transmission of WPVs that should both sustain their own success and offer their technical expertise, resources and support to those countries still working on eradication. All Member States should intensify surveillance and also work on rehabilitation.

The contributions of the partners collaborating in the EPI, especially the United Nations Children’s Fund (UNICEF) for its overall efforts and Rotary International¹⁸ for its ‘PolioPlus’ initiative, were also recognized. They were requested to continue their support of national immunization programmes, including for polio eradication, and to ensure the availability of adequate resources (see Chapter 4.2). The resolution requested the DG to strengthen the Organization’s technical capacities in planning, training and supervision within national immunization programmes to achieve eradication, including programme monitoring and evaluation at national, regional and global levels; improving national disease surveillance systems; strengthening clinical laboratory services; and improving the quality control and production of vaccines. WHO should also seek additional resources from extra-budgetary contributions. Regular plans and reports of progress concerning the poliomyelitis eradication effort should be reported through the EB to the WHA, in the context of progress in the EPI.

While the resolution clearly spelt out what was necessary to establish the framework for the polio eradication programme, the time frame of achieving eradication by the year 2000 proved to be highly over-optimistic.

2.2 Global progress by 1999...

Fifty-Second WHA. Eradication of poliomyelitis. Report by the Director-General, 9 March 1999¹⁹

According to the DG's report in 1999, global coverage for polio eradication was 80 percent of the world's infants. Eighty-nine countries (including all endemic countries except the Democratic Republic of the Congo [DRC] and Sierra Leone) were conducting national polio immunization days, reaching some 470 million children, with truces being declared for immunization campaigns in Afghanistan, El Salvador, Peru, Philippines, Sri Lanka, Sudan and Tajikistan.

At the prevailing rate of progress, it was expected that polio would be "eradicated globally by the year 2000 or shortly afterwards," as reported cases had fallen by 85 percent. Once immunization had stopped, savings made through eradication would be in the region of US\$ 1.5 billion annually. Programmes had assisted, for example, in re-establishing the cold chain; improving routine coverage and integrated surveillance systems; and training health staff. Vitamin A tablets were also distributed during national immunization days in 43 countries and polio eradication had led the Region of the Americas to adopt a measles elimination target.

Six countries (Bangladesh, Ethiopia, India, Nepal, Nigeria and Pakistan) were major polio reservoirs. They had in common large populations, high birth rates, crowded areas with poor sanitation and insufficient routine polio immunization. Seven countries (Afghanistan, Angola, Liberia, Sierra Leone, Somalia, Sudan and Tajikistan) were also in conflict. In addition, the DRC was both a major reservoir and affected by conflict. The report noted that eradication activities should be speeded up in the 14 most difficult countries, and further truces secured.

Initially countries paid 80-90 percent of total costs, but poor infrastructure and health resources in remaining countries meant that a high percentage of eradication costs would have to be met from external sources. WHO estimated that a total of US\$ 850 million was needed from external sources over three years, with the current shortfall being US\$ 370 million. An emergency fund was therefore required for a rapid and effective response.

103rd Session WHO EB. Poliomyelitis. Resolution (EB103.R10), 29 January 1999²⁰

The resolution to the 52nd WHA from the EB urged that Member States accelerate eradication activities, including house-to-house 'mopping-up' campaigns; sustain high levels of immunization coverage and high quality surveillance for wild polio importations; further mobilize human and financial resources and peace-building to facilitate ceasefires for National Immunization Days (NIDs) in countries in conflict and strengthen health systems and services. The DG should also "*urge all partners to facilitate acceleration of the initiative to eradicate poliomyelitis during the critical period 1999 to 2001*", thereby extending the date from the year 2000 and also take action in coordinating immunization activities in bordering areas of Member States and in mobilizing the necessary finance.

2.3 ...and onwards to 2008

Fifty-fifth WHA. Eradication of poliomyelitis. Report by the Secretariat. (A55/11), 27 March 2002²¹

During the period from 2002 the date for eradication was moved to 2005. Meanwhile, as reported to the 2002 WHA, efforts continued to intensify the impact of programmes. In 2000-2001, countries in West Africa had synchronized their NIDs, as also continued to be the case in Afghanistan, Islamic Republic of Iran and Pakistan. To achieve the acceleration of the

programme, large un-earmarked contributions were made by the Netherlands and the United Kingdom (UK) as well as the BMGF and the United Nations Foundation (UNF), totalling US\$ 308 million, with additional contributions through multilateral and bilateral channels. However, a funding gap of US\$ 275 million was projected to the end of 2005. Following a *“Meeting on the impact of targeted programmes on health systems: a case study of the Polio Eradication Initiative”* (PEI) in December 1999,²² WHO was working to ensure that lessons learnt from polio eradication and the infrastructure were used *“to improve the delivery of other immunization services and surveillance for other diseases of public health importance”*, although this might require substantial human resources.

Fifty-sixth WHA. Eradication of poliomyelitis. Report by the Secretariat. (A56/20), 28 March 2003²³

At the end of 2002 only seven countries were still endemic with the wild-type virus (Afghanistan, Egypt, India, Niger, Nigeria, Pakistan and Somalia). Meanwhile there was still a shortfall in funding of US\$ 275 million for 2003-2005, of which US\$ 85 million was required for 2003 for, *inter alia*, multiple additional rounds of large-scale supplementary polio immunization activities.

Fifty-seventh WHA. Eradication of poliomyelitis. Report by the Secretariat. (A57/8), 15 April 2004²⁴

By 2004, three countries, Nigeria, India and Pakistan, accounted for 93 percent of cases, with 355, 225, and 101 cases respectively. An emergency meeting of health ministers or their representatives from affected countries took place in 2004, at which the **Geneva Declaration for the Eradication of Poliomyelitis**²⁵ was adopted, in which they committed to direct national oversight of all eradication activities through their offices. In addition, a new Global Polio Eradication Strategic Plan for 2004-2008 was launched in January 2004, which outlined activities needed to interrupt poliovirus transmission (2004-2005), to achieve global certification and mainstream the Global Polio Eradication Initiative (2006-2008) and to prepare for the Global OPV Cessation Phase (2009 and beyond).²⁶

Fifty-eighth WHA. Poliomyelitis. Report by the Secretariat. (A58/11). 7 April 2005²⁷

Early in 2005, health ministers from Africa and Asia met twice in January and February to assess progress in implementing the Geneva Declaration and to identify actions to interrupt polio transmission in 2005. Mass campaigns were used to reach 95 percent of children in Egypt and India, as well as large scale “synchronized mopping-up activities” in Afghanistan and Pakistan and nationwide eradication campaigns. In comparison Niger and Nigeria had very low polio immunization coverage and the other affected African countries needed a marked increase in the number and quality of immunization campaigns. Meanwhile the funding gap for activities in the second half of 2005 was US\$ 75 million with US\$ 200 million for 2006.

Fifty-ninth WHA. Eradication of poliomyelitis. Report by the Secretariat. (A59/6), 4 May 2006²⁸

The report for 2006 noted that for the first time the number of polio cases in the countries newly affected was higher than in countries endemic for the disease (1046 compared to 904 at 6 April 2006). Meanwhile, northern Nigeria constituted the last reservoir of indigenous WPV in Africa and of types 1 and 3 together in the world, which required large-scale supplementary immunization activities (SIAs) of the appropriate vaccine combinations every four to six weeks. Large-scale SIAs at four to six week intervals were also required in Afghanistan, India and Pakistan. In ensuring financing for the 2006-2008 ‘mop up and certification phase’, the requirements were US\$ 575 million, of which US\$ 150 million was immediately required in 2006.

A resolution²⁹ was passed by the WHA, based on one from the EB, which concentrated on urging endemic countries to interrupt transmission of WPV and ensure rapid response to the detection of circulating polioviruses, including large-scale rounds of immunization and house-to-house vaccination, specifically targeting under-5s to reach at least 95 percent coverage. It also called for high routine immunization coverage with OPV of at least 80 percent and *“highly sensitive disease surveillance”*. The DG should ensure the availability of technical expertise and assist in mobilizing funds to implement emergency response to an outbreak as well as continuing to prepare for other potential risks of eradication and polio-free world in the short and longer term.

Speech by Dr Margaret Chan, WHO Director-General, to the ‘Urgent stakeholder consultation on interrupting wild poliovirus transmission’, 28 February 2007³⁰

In February 2007, DG Dr Margaret Chan convened an urgent stakeholder consultation on interrupting WPV transmission. Participants included Ministers from affected countries, the GPEI partners – Rotary International, the US Centers for Disease Control and Prevention (CDC) and UNICEF – as well as the WHO Regional Directors and the international donor community. As stated in the report for the Sixtieth World Health Assembly (see below), participants *“reaffirmed the technical, humanitarian and economic case for completing eradication”*.

In her address, Dr Chan described the consultation as a *“critical review of the case for finishing polio eradication”* and what might prove to be a watershed event as they were not only in the low season for virus transmission but that the cash flow was at the lowest level and that it could be negative by April. Without *“an immediate surge of commitment, the virus [might] win”*.

The task ahead looked *“more promising than ever before”*, as there was endemic transmission in only four countries and only a few other areas had been re-infected; there was very sensitive surveillance in place; and one WPV strain had been eradicated.

But there were very serious problems. They had missed the original deadline and scepticism had been heard. A number of questions had been raised about the efficacy of the vaccine, access, security, poverty, funding and competing health programmes. She stressed that they must *“reach every child in the last remaining areas”*, which would require commitment at the highest level of government. WHO had made *“polio eradication a top cross-regional priority”*. The commitment of the donor community was *“absolutely vital”* at a time when new data shows *“why, over a 20-year period, every proposed option for controlling polio will cost more, in human suffering and dollars, than finishing eradication”*.

In comparison with the earlier eradication of smallpox, *“eradication of a virus in a world of more than 6 million people is not an easy job”*. The problems, however, were not scientific but operational and financial. She also highlighted the issue of fatigue: *“Countries are tired. Staff are tired. Donors are tired”*. Nevertheless she said that they were *“on the verge of victory”*. Eighteen years work and almost US\$ 5 billion had been invested in polio eradication and they would not be forgiven for not *“marshalling the commitment, the funds and the determination to finish the job”*.

Already the eradication effort had shrunk the numbers of cases from an estimated 350,000 in 1988 to fewer than 2,000 in 2006. It had also established infrastructures and strategies of huge benefit to other programmes, e.g. the measles initiative, which had recently surpassed its own ambitious targets while being implemented through the polio infrastructure. The polio drive had shown that *“it is possible to achieve very high rates of population coverage despite weak health infrastructures and high levels of poverty”*, which was an inspiring message for other initiatives such as the achievement of the Millennium Development Goals (MDGs).

Polio had also proved that interventions can be scaled up to reach those in greatest need, because *“local communities themselves are at the centre of implementation”*. As she described it, *“since its inception, the drive to eradicate polio has been an expression of the power of public health partnerships to do great and lasting good”*. And they must finish the job: as was stated by Rotary International, *“polio eradication can be done, must be done and will be done”*.

This launched the ***‘intensified polio eradication effort’*** for 2007-2008 on 28 February 2007. The next day the Government of India committed US\$ 280 million in domestic resources for its 2007-2008 national efforts. Nigeria also pledged US\$ 32 million in 2007, of which US\$ 18 million had been contributed by of December 2008; and Pakistan committed US\$ 35 million for OVP for SIAs in 2008.³¹

Sixtieth WHA. Poliomyelitis: mechanism for management of potential risks to eradication. Report by the Secretariat. (A60/11), 12 April 2007³²

Four countries, Afghanistan, India, Nigeria and Pakistan, had still not interrupted WVP transmission, constituting the lowest ever number of endemic countries. They accounted for 94 percent of all new cases. The report noted that the President of Afghanistan established a National Polio Action Group so that his office could oversee strategies to increase access to all populations. Pakistan synchronized campaigns with Afghanistan to maximize coverage in insecure areas and among populations moving between both countries. ‘Immunization plus’ days had been introduced in May 2006 in northern Nigeria.

On the issue of international polio transmission, in line with the recommendations of the Advisory Committee on Polio Eradication (ACPE), resolution EB120.R1 included that all travellers from affected areas should be fully vaccinated before travel, To reduce the risk for pilgrims to the Hajj and umrah, the Ministry of Health of Saudi Arabia issued a directive saying that all travellers under 15 years from countries with recent or ongoing circulation of polioviruses, as well as all travellers from Afghanistan, India, Nigeria and Pakistan, regardless of age, should provide proof of vaccination before an entry visa could be issued. Other measures suggested for the endemic countries included the negotiation of ‘days of tranquillity’ in areas affected by insecurity to allow greater access to children for vaccination. On required funding it was noted that an additional US\$ 575 million was needed for 2007-2008, of which US\$ 100 million was required for the first half of 2007. A process was also included to minimize and manage the risks of re-emergence of polio in the post-eradication era.

The key recommendations were included in resolution WHA60.14 on ‘Poliomyelitis: mechanism for management of potential risks to eradication’.^{33,34}

Sixty-first WHA. Poliomyelitis: mechanism for management of potential risks to eradication. Report by the Secretariat. (A61/5), 3 April 2008³⁵

Following the 2007 stakeholder consultation (see above) new milestones for an intensified effort towards eradication were set for end-2007 and end-2008 and issued during the Sixtieth World Health Assembly.

The number of polio cases was reduced during 2007 by 63 percent, with type 1 WPV falling by 84 percent. Of particular importance was the absence of type 1 WPV in the western part of Uttar Pradesh (UP) State, an area in which indigenous transmission had not previously been interrupted. There was also a 76 percent overall decline in northern Nigeria. Efforts in 2008 were focused on the Southern Region of Afghanistan, the 72 highest-risk blocks of Bihar State, India, high-risk local government areas in Nigeri,; and the North-West Frontier Province (NWFP) and parts of Sindh and Balochistan in Pakistan. Responses to outbreaks also needed to be implemented in Angola and Chad. The intensified implementation plan for

2008-2009 had a budget of US\$ 1306 million.

Sixty-first WHA. Resolutions and decisions. WH61.1. Poliomyelitis: mechanism for management of potential risks to eradication. WHA61/2008/REC/1, Geneva, 2008³⁶

Under resolution WH61.1, affected Member States were urged to engage “*all levels of political and civil society*” to reach every child during the SIAs. Nigeria should reduce the spread of polio by stopping quickly the outbreak in northern Nigeria, while Afghanistan, India and Pakistan should implement the large-scale mop-up activities to interrupt the final chains of transmission. In addition, among other recommendations, immunization should be greater than 80 percent and necessary financial resources should be made available rapidly. The DG should, among other actions, continue to provide technical support, assist in mobilizing financial resources and “*develop a new strategy to reinvigorate the fight to eradicate poliomyelitis from the remaining affected countries, drawing on experience from regions where poliomyelitis is eradicated and on operations research in order to determine the most effective and cost-effective interventions*”. She should report to the WHA when WPV transmission is likely to be interrupted globally, as well as submitting with this report “*a proposal or proposals for review by the EB for a mechanism to mitigate the risk of the reintroduction that does not involve amending the 2005 International Health Regulations (IHR) or developing another binding instrument*”.

Summing up 2002 -2008

During this period, it became increasingly clear that ‘business as usual’ was not going to bring about polio eradication, even though declining rates of transmission were reported. The most telling event was the 2007 Urgent Stakeholder Consultation, during which Dr Chan spelled out, in her first statement to the stakeholders, the situation as she saw it. She made it very clear that very serious problems existed, including missed deadlines, fatigue and lack of funding as well as problems related to service delivery. At the same time she highlighted the benefits to other health programmes that resulted from polio eradication programmes, even in weak health systems. These benefits, such as measles immunization alongside polio vaccination and the scaling up of interventions, were contributing to achievement of the MDGs. But it was clear that concentrating on polio eradication as a health intervention alone would not bring the desired results. Indeed, the *intensified polio eradication effort* for 2007-2008 might be described as a ‘game changer’ at that time and it would lead the next phase of the process from 2009. For this, the proposal that the DG was asked to prepare, as set out in resolution WH61.1, would be an important pointer going forward, through the GPEI Strategic Plan for 2009-2013.

2.4 Next stage 2009 – 2013

Budgetary implications of the GPEI Strategic Plan and Financial resources requirements 2009 – 2013, as of January 2009. WHO/POLIO/09.01, 2009³⁷

Following the announcement by the DG in October 2008 that she was commissioning an independent evaluation of the intensified effort at its 24-month mark in March 2009, the GPEI published its strategic plan for 2009–2013. It focused on the principal affected areas and established a common roadmap for the necessary actions to achieve the 2009 and 2010 milestones of the GPEI Strategic Plan. Its main strategic points are summarized as follows, while its financing and budgetary implications are discussed in chapter 4.2.

Both the ACPE and the Strategic Advisory Group of Experts on Immunization (SAGE) concluded at the end of 2008 that the *intensified eradication effort* had demonstrated the remaining technical, financial and operational challenges. They both endorsed the framework for this new GPEI Strategic Plan, which incorporates “*bold new initiatives to scale-up the approaches needed to address the remaining operational challenges*”.

In looking at the impacts and prospects for the *intensified eradication effort*, a notable achievement had been cutting the incidence of polio by more than 99 percent from some 350,000 cases annually in 1988 to 1,633 in 2008. The full financing of the 2007-2008 budget had shown that financial challenges could be overcome, but it was critically important that there continued to be political will and progress in the remaining endemic countries.

India consistently reached more than 95 percent of its target population. The remaining infected areas in UP and Bihar had “*a unique combination of challenges (e.g. high population density, large birth cohorts, poor sanitation infrastructure, high enteric disease burden)*” which required “*the implementation of a number of contingency plans to cement the gains achieved in attaining a high-level of population immunity*”.

Afghanistan’s polio transmission was mainly restricted to the Southern Region, where insecurity hampered access to all populations during SIAs. To increase access to this part of the country the government issues a directive to NGOs working there to “*make polio eradication a priority*”. Negotiations were also being enhanced with community leaders and military forces to increase access while ensuring the safety of vaccination teams. In addition any window of opportunity to deliver additional OPV doses to populations living in security-compromised areas was used between the large-scale national and subnational immunization campaigns. This tactic was based on experiences in other countries affected by conflict such as Somalia.

Pakistan had a sound polio programme with good nationwide coverage during SIAs, but because of the “*very efficient poliovirus transmission and vaccination coverage gaps*” in what was then known as the NWFP and now as Khyber Pakhtunkwa (KP), where access in security-compromised areas was and is a problem, and also in parts of Sindh and Balochistan, due to operational challenges, an “*enhanced, cross-sectoral initiative*” was required.

To improve district-level ownership and accountability, the Minister of Health launched a major new inter-ministerial oversight body in December 2008, including provincial-level action plans to tailor eradication efforts, such as communication and social mobilization activities. In NWFP this included advocacy to increase access to populations in security-compromised areas. Objective monitoring data (e.g. finger-marking children immunized during SIAs) was also used to help identify coverage gaps. Nevertheless, as the ACPE concluded, in working to interrupt polio transmission in Pakistan further improvements in campaign quality and continued innovation were needed, because of the deterioration in security in a key transmission zone.

Nigeria was benefitting from “*a re-invigorated high-level political commitment at the national level*” through the establishment of a high-level task force by the Federal Minister of Health. While it had increased political engagement in several previously high-risk states, e.g. Jigawa, in states in the north more than 60 percent of children were under-immunized. Kano was a particular risk with nearly 30 percent of wild poliovirus type 1 (WPV1), which also re-infected six West African countries in 2008. The challenge was to replicate operational improvements achieved in 2008 in some areas of northern Nigeria, across all high-risk areas and particularly in Kano. This would require intense international technical support. And as the ACPE concluded, “*Nigeria [would] continue to pose a high risk to international health until the new, top political commitment is translated into field level improvements in campaign quality*”.

In addition to the risks demonstrated above in re-infection of type 1 virus in Benin, Burkina Faso, Ghana, Mali, Niger and Togo, type 3 spread from northern Nigeria to Benin, Chad and Niger and from India to Nepal as well as Angola with onward transmission to DRC. Transmission of imported viruses had persisted for more than 12 months in Angola, Chad,

DRC and parts of the Horn of Africa. Nepal also continued to be at risk because of its proximity to India and intense cross-border traffic. Lessons learned since 2003 had shown that outbreaks in re-infected countries could be stopped quickly, if the internationally-agreed outbreak response guidelines adopted³⁸ at the WHA in 2006 were fully and rapidly implemented.³⁹

The available information on the four endemic countries in 2009 clearly shows again that “*one size would not fit all*”. Individually-tailored strategies were required to address the key concerns that were mitigating against eradication, which were not just a question of availability of the vaccine.

A.J. Mohamed, et al. Independent evaluation of major barriers to interrupting polio virus transmission. Geneva: WHO 20 October 2009⁴⁰

The independent evaluation took place at the 24-month mark in the *intensive effort* and was carried out by teams that visited Nigeria, Pakistan, Afghanistan and India and a global team that visited Angola and Sudan. The evaluation submitted its progress report to the EB in January 2009. Overall, there were many programmatic considerations to such a unique undertaking, including funding, vaccine quality and global coordination and specific country constraints, such as security. The evaluators gained an impression that “*things had stalled*” from the overall numbers of cases, despite impressive progress in individual sectors. It was noted that resources in re-infected countries (e.g. South Sudan and Angola) were fewer than in endemic countries and that, both pre- and post-eradication, GPEI and EPI must work closely together, when reliance on injected IPV would make house-to-house delivery more difficult. Programme effectiveness was determined by local, grass-roots commitment and resources. Managerial, security and technical issues should be addressed for eradication to be achieved.

The background, findings and recommendations are set out below for those countries that were still endemic (Afghanistan, Pakistan and Nigeria), or re-infected countries (Angola and South Sudan). Only the findings are included for India.

Pakistan and Afghanistan

The evaluation found that there was an inability to sustain very high OPV coverage in the heavily-populated accessible areas as well as difficulties in achieving moderate coverage in the security-compromised areas of NWFP and Baluchistan. Polio transmission in Pakistan and Afghanistan was inter-connected, and, the annual number of confirmed polio cases in Afghanistan had remained static for the previous four years.

Findings

Insecurity posed the most significant barrier, and the situation was unstable, unpredictable and threatened by a range of armed factions. Poorly funded health systems and PHC resulted in weak routine services in **Pakistan**. Political interference in appointing vaccinators and their accountability was also a problem. Persistent rumours and misconceptions linked the vaccine to sterilization or infertility.

The high-profile endorsement by political, international and military figures in **Afghanistan** might be counter-productive in non-secure areas, as anti-government elements would likely oppose high-priority Government programmes. Recruitment of cluster supervisors and volunteers for SIAs was described as haphazard, inefficient, inappropriate for the prevailing culture and a means for friends to earn money; selection of vaccinators needed to reflect cultural and political realities. Female vaccinators were only appropriate in some areas and there was an inability to conduct adequate supervision, monitoring and data validation, possibly due to problems in accessing insecure areas and lack of trained supervisory staff. Health facilities, especially sub-centres, were poorly resourced and there was a heavy

reliance on vaccinators in both countries, as nurses and midwives were not expected to provide vaccinations in their absence. The engagement of NGOs responsible for implementing the Basic Package of Health Services in SIAs was inconsistent and there was scepticism among middle-level health managers who were not part of the PEI, in addition to a lack of involvement of private practitioners, together with a perceived fear of service providers, which was not always fully addressed.

There was no functional referral system for polio and there was a lack of flexibility in accessing children safely in some provinces. There was little evidence of resistance and low refusal rates. Furthermore, the changing policies of the International Security Assistance Force and Taliban provided access to service providers but there was a “*risk of direct service provision by combatants*”, which was inconsistent with neutrality and impartiality. Some foreign governments had both military forces and aid programmes, some of which support the PEI, so immunization activities were perceived as intertwined with military operations. There were also technical barriers as children who had not travelled or been in contact with children from endemic zones became infected through contact with older children or young adults who had returned from **Pakistan**.

Between and within **Pakistan** and **Afghanistan** movement of large populations was a problem. In both countries, human resource management factors constrained routine immunization and polio SIAs, including low salaries of vaccinators, fatigue related to difficulties in delivering quality EPI and SIAs in dangerous environments, high frequency of SIAs, and proliferation of vertical donor initiatives.

Recommendations

For Pakistan and Afghanistan

There should be an appropriate balance between SIAs and routine EPI.

For Pakistan

- The role of Lady Health Workers (LHWs) should be strengthened in the provision of EPIs.
- The deteriorating surveillance in Baluchistan should be addressed immediately.
- Post-campaign coverage assessments should be conducted using finger marking at Union Council, not district level, through independent teams, not those involved in NIDs or sub-national immunization days (SNIDs).
- Goals and objectives for SIAs should be reviewed.
- Local language speaking (especially Pashtun) female health staff and LHWs should be recruited for immunization teams and post-campaign reviews.
- The current level of high political and financial commitment should be maintained.

For Afghanistan

- They should conduct detailed district-by-district, cluster-by-cluster planning of SNIDs with flexible dates and flexible approaches to accessing communities.
- Donor initiatives should be harmonized to strengthen routine outreach.
- Cases for referral for rehabilitation should be clarified.
- Discrete negotiations should be started with intermediaries including NGOs district staff, hired negotiators, mullahs, tribal elders and district veterinarians to gain access to contested areas.
- Procedures for selecting cluster supervisors, volunteer vaccinator teams, mobilisers etc. should be tightened
- Innovative methods of community involvement should continue to be piloted and evaluated.
- Community mobilization, such as “women’s courtyards”, should be explored, although may only be acceptable in narrow geographic areas

- High-profile endorsement by political, international and military figures might no longer be necessary and might be counter-productive in non-secure areas. The neutrality of the programme should be promoted.
- Operational research should clarify polio infection in children with high number of OPV doses; possible infection of some children by older children or adults returning from Pakistan; high male:female ratio of reported acute flaccid paralysis (AFP) cases.

For the border area of Pakistan and Afghanistan

Intensive border immunization should be maintained with close coordination of PEI activities. Human resource constraints should be addressed in both countries including clarifying roles and responsibilities of all health facilities, health personnel and other stakeholders.

Nigeria

Findings

While much needed to be done to achieve eradication, the basic infrastructure was sound. Management issues, however, were critical to success. Many health issues required addressing simultaneously, while the importance of polio eradication was not recognized at the central level. The importance given to polio eradication differed widely, being well supported in some areas and weak in others. The routine immunization programme was weak.

The Declaration of Abuja was signed by Prof Osotimehin, Minister of Health, but oversight was not strong in states and local areas. Two local Governments had not established task forces and one had not started operations. Vaccination teams were poorly equipped with knowledge and interpersonal skills and there were no established training programmes for staff.

There was a large number of donors but no coherent plan, nor the mechanisms for developing such a plan. Inadequate funding was a problem for many local governments with polio funds being released late, leading to ineffective planning and the considerable resource mobilization required for SIA was not available. Community perceptions on the safety of vaccines presented a major barrier and issues with the vaccine were couched in religious terms by the community. There was inadequate mobilization of community groups such as women's groups and polio eradication was not highest priority for child survival. Significant deficiencies were also found in cold chain maintenance.

Recommendations

- A longer-term funding solution for local government has to be identified.
- The quality of monitoring data needs to be improved.
- Performance-based rewards on implementation of PEI should be planned and implemented at all levels.
- Donor partners should be involved in monitoring and analysis through a strategic framework and accountability to suggested focal points at presidential, governor and local government levels should be considered.
- State governments should play a major role in leadership in programme management and social mobilization.
- Stakeholders at all levels should be involved in good accountability practices.
- Communities should demand services.
- Good operational financial and logistical programme management practices.
- Increased commitment and oversight should lead to improved quality and accountability by ensuring close monitoring and follow up at the President and Governors' office level.
- Civil servants should also play an active role, in particular the education sector.
- All aspects of the Abuja Declaration should be implemented with regular reporting.

- There should be a more focused strategy to reach missed children and reaching the hard-to-reach should be addressed.
- Social mobilization should involve community women's organizations and religious and traditional leaders.
- Training programmes for developing appropriate communication skills should be developed, together with a strong communication campaign.
- Campaigns should have more emphasis on social mobilization.
- Routine vaccinations should take place in border districts.
- Travellers should be vaccinated, as appropriate at land crossing points.

International

The international spread of polio from Nigeria and India had been controlled in countries with strong health systems and high routine coverage, while virus persisted in those with underdeveloped health systems and low routine coverage – **South Sudan, Angola, Chad**. The lack of infrastructure also affected AFP surveillance. Repeated campaigns in **Angola** and **South Sudan** had led to fatigue in health services. There had been clear political commitment in **Angola** and strong functioning communications among PEI partners. The national health ministry had many competing demands including malaria control, pneumonia and diarrhoea. Significant numbers of children were missed there. Social mobilization was largely successful there, but in **South Sudan** there had been difficulties in release and use of funds. Primary concerns were census results, border demarcation, disarmament, demobilization and reintegration. Issues related to climatic flooding in Luanda and other areas in **Angola** meant that house-to-house campaigns had to be changed to fixed-point. In **South Sudan** the rainy season limited activities as there were no sealed roads outside the capital. Live mines were present in some places in both countries. Currently monovalent vaccine was used in NIDs and SIAs.

Recommendations

- In re-infected countries, basis guidelines should be followed with more emphasis on social mobilization.
- Coordination of WHO, UNICEF, national EPI programmes and other GPEI should be improved at the country level.
- Additional human resources, technical guidance and financial resources should be devoted to social mobilization.
- Capacity in planning, management and monitoring should be strengthened with a particular emphasis on district level activities.

India

Findings

The high coverage observed in both UP and Bihar *“reflected the most thorough, well managed vaccination effort that team members had ever seen”*. Missing only 1 percent of the very large under-5 population in UP or Bihar could quickly lead to a substantial unvaccinated newborn cohort. Examination of nail markings in remote Kosi in Bihar found four children who were not immunized (all four were in transit but did not pass any transit site stations). 12 percent of the vaccine was given in a SIA in Bihar at a transit point. Despite recent improvements, EPI programmes in UP and Bihar were still weak and felt threatened by the polio programme.

Environmental conditions optimized transmission, e.g. indiscriminate defecation; contaminated water supplies; extreme crowding in areas that flood in the monsoon; high prevalence of malnutrition; unclean supplementary food and extremely high birth rate with intervals of only one year; vulnerability of the young to polio and other enterovirus infections.

Sixty-second WHA. Progress reports on technical and health matters. Report by the Secretariat. A. Poliomyelitis: mechanism for management of potential risks to eradication. (A62/23), 9 April 2009⁴¹

At the outset, the progress report for the 62nd WHA referred to the *intensified eradication effort* as included in the GPEI Strategic Plan and the resolution that was passed by the 2008 WHA. It also reported on the activities of the high-level task force in Nigeria (see above, GPEI Strategic Plan), which had already undertaken two activities in northern Nigeria, which was the only place in the world in which all three types of WPV were circulating and from where infections had spread to Benin, Burkina Faso, Chad, Côte d'Ivoire, Ghana, Mali, Niger and Togo.

While indigenous WPV1 had not been detected in UP for 12 months, there was a new outbreak in the western part, imported from Bihar state. There were mopping-up activities on average every six weeks in both western UP and central Bihar. The type 1 WPV originating in western UP was also found in a sewage sample in Cairo in December 2008. The numbers of cases in Pakistan, and to a lesser extent in Afghanistan, surged in the latter half of 2008 because of a deterioration in security which led to outbreaks in polio-free areas, including in the Punjab in Pakistan, because of large-scale movements of populations. However, by early 2009 polio was restricted to insecure parts of the NWFP in Pakistan and three provinces in the Southern Region of Afghanistan. Two doctors and their driver working for WHO on polio eradication were killed in Kandahar province, Afghanistan in 2008. Out of 16 countries where there had been imported cases of polio in 2008 and early 2009, 12 had become re-infected since mid-2008 and outbreaks in Angola, Chad, Ethiopia and the border areas of southern Sudan had continued for more than 12 months.

To reduce the risk of international spread, the ACPE urged WHO *“to amend its recommendations on immunization against polio in ‘International Travel and Health’ to ensure that all travellers to and from countries affected by poliomyelitis are fully immunized”*. Travellers living in affected countries should receive an additional dose of vaccine *“between one and 12 months prior to each international journey”*.

Resource mobilization activities had been enhanced to sustain the *intensified eradication effort* in 2009-2010, including new multi-year commitments by Rotary International, BMGF and several Group of Eight (G8) countries. Against its budget of US\$ 1,340 million, as at 27 February 2009, the GPEI had a funding gap of US\$ 340 million for 2009-2010.

The report highlighted the GPEI Strategic Plan as the basis for a *“renewed fight”* for 2009-2013. It also noted that the independent evaluation, after consultation with GPEI, would *“focus on the principal affected areas, giving particular attention to the primary challenges identified in each”* and that a common roadmap should be established for the actions needed to achieve the 2009 and 2010 milestones of the GPEI Strategic Plan 2009-2013.⁴²

Sixty-third WHA. Progress reports. Report by the Secretariat. A. Poliomyelitis: mechanism for management of potential risks to eradication (resolution WHA61.1). (A63/27), 15 April 2010⁴³

It was reported that in **India**, new tactics increased OPV campaign coverage, including among migrant and mobile population, and there were enhanced campaign operations in central Bihar and western UP. In **Nigeria**, after State Governments signed the Abuja Commitments to Polio Eradication and traditional healers formed a polio eradication committee in June 2009, the proportion of never-immunized children in the 10 endemic northern states fell from 19.5 percent to 9.5 percent. The Prime Minister of **Pakistan** launched a Polio Action Plan, which enhanced multilateral support for OPV, although coverage remained less than 80 percent in NWFP, the Federally Administered Tribal Areas (FATA), Balochistan and the greater Karachi area in Sindh. In Kandahar and Helmand in

Afghanistan, access to children improved through the use of new tactics, including an enhanced role for NGOs, recruitment of local ‘access negotiators’ and negotiations with the International Security Force and Taliban for ‘days of tranquillity’. Bivalent OPV was used for the first time in the GPEI initiative in Afghanistan in December 2009 and in the first quarter of 2010 in India, Nigeria and Pakistan.

In February 2010, a total of 1,595 polio cases were reported from 23 countries for 2009, including 1,247 from Afghanistan, India, Nigeria and Pakistan and 142 from Angola, Chad, DRC, and Sudan, where poliovirus transmission was known or suspected to have been re-established. By late 2009 no new case had been reported for more than three months in the Horn of Africa.

The results and impact of the GPEI’s Programme of Work 2009 were reviewed by the SAGE, and by the ACPE at a special consultation in November 2009, which recommended that the GPEI’s major indicators be internationally monitored with influential oversight by senior management in partner agencies and polio-affected countries. However, challenges faced by the GPEI in 2009 should not be allowed to overshadow significant achievements, particularly in Afghanistan, India and Nigeria.

Based on the independent evaluation’s progress report⁴⁴ (see above), the 126th EB strongly supported a proposal for a **three-year strategic plan** to interrupt all remaining WPV transmission globally, building on the main outcomes of the programme of work for 2009, including the rapid expansion of use of the new bivalent OPV; district-specific plans for security-compromised and other high-risk areas; strengthening of immunization systems in areas at highest risk of outbreaks; and, potentially, enhanced vaccination of travellers in order to limit the international spread of poliovirus. Clear milestones should be established and progress monitored to ensure increased accountability for implementation of the new plan at national and international levels.

This new strategic plan for 2010–2012 was formulated by the GPEI with a corresponding budget for the 63rd WHA. It proposed fundamental changes, in particular in the strategy to achieve the population-immunity thresholds needed to stop WPV transmission in the remaining poliovirus-affected areas of Africa and Asia and to reduce the risks of international spread of poliovirus and re-infection in poliovirus-free areas.

Sixty-fourth WHA. Progress reports. Report by the Secretariat. A. Poliomyelitis: mechanism for management of potential risks to eradication (resolution WHA61.1). (A64/26), 21 April 2011⁴⁵

At its 128th session the EB considered the impact of the new Strategic Plan 2010–2012, in particular the progress achieved in India and Nigeria, while expressing concern at the ongoing transmission of some re-established polioviruses, the continued international spread of WPV and, in particular, the GPEI’s gap in financing, which threatened to undermine recent progress. It also welcomed the establishment of the **Independent Monitoring Board (IMB)**, which held its inaugural meeting on 21–22 December 2010 and which would meet quarterly to monitor the implementation and impact of the new Strategic Plan against milestones and process indicators and would advise countries and partner agencies on corrective actions as appropriate. The IMB created a new dynamic for polio eradication, while calling for additional resources to ensure full implementation of the Strategic Plan.

At 1 March 2011, the status of the three major milestones of the Strategic Plan 2010–2012 was:

- Countries with new outbreaks of poliomyelitis due to an imported poliovirus: since mid-2010, no polio cases had been detected due to the original importation in any of the 15 countries that had reported new outbreaks in 2009. In the 11 countries with

- new outbreaks in 2010, none had persisted for longer than six months
- Countries with re-established poliovirus transmission: the re-established WPV1 in South Sudan had not been detected since 27 June 2009. Countries with ongoing transmission of their re-established poliovirus were Chad, DRC and Angola
 - Countries with endemic transmission of poliovirus: overall, in the four remaining countries, cases of poliomyelitis had declined by 82 percent in 2010 compared to the same period in 2009. In India cases had declined by 95 percent (42 cases compared with 740 cases); in Nigeria, by 95 percent (21 compared with 388 cases); and in Afghanistan by 35 percent (25 compared with 38 cases). In Pakistan, cases had increased by 61 percent (144 cases in 2010, compared with 89 in 2009)

Although progress towards the first and third milestones of the Strategic Plan was broadly on track, serious obstacles remained particularly in countries in Africa, including the cross-border spread into Congo and DRC. In Pakistan, continued operational difficulties affected SIA activities with further complications because of insecurity and conflict in the FATA and severe flooding in mid-2010. In keeping with the provisions of the Strategic Plan 2010–2012, Angola, DRC and Pakistan established or updated their emergency plans to intensify eradication activities, under the authority of their respective heads of state. These plans were presented to the IMB on 21–22 December 2010, with implementation beginning in January 2011. Chad was also invited to present its emergency plan to the IMB at its end-March 2011 meeting.

At the launch of the Strategic Plan 2010–2012, the results of a new study on the economics of the GPEI were also released.⁴⁶ They indicated that the incremental net benefits of completing poliomyelitis eradication, aggregated over the period 1988–2035, would be at least US\$ 40-50 billion (for further information see Chapter 6.2.2). However, shortfalls in the financing of the GPEI had continued to result in a scaling back of supplementary immunization and surveillance activities in some areas, delays in implementing outbreak response activities in others, and reductions in the long-term technical assistance provided by the WHO Secretariat to some Member States. As at March 2011, 38 percent of the 2011–2012 budget of US\$ 1860 million remained unfunded.

Sixty-fifth WHA. Poliomyelitis: intensification of the global eradication initiative. Report by the Secretariat. (A65/20), 20 April 2012⁴⁷

India “met its end-2011 milestone of stopping virus circulation, its most recent case having onset of paralysis on 13 January 2011”. In addition, as one of the countries with ‘re-established’ poliovirus transmission, South Sudan had not had a case since June 2009 and there was a substantial decrease in Angola. In Afghanistan, Nigeria and Pakistan, however there was a significant increase in new cases in 2011, in comparison with 2010 and Nigeria and Pakistan were the only countries with confirmed WPV type 3.

During its meetings the IMB had stated that “*completing the eradication of polio is a global health emergency*” and that it “*can – and must – be eradicated*”, highlighting particularly the need for accountability at all levels of the programme.

A Global Polio Emergency Action Plan 2012-2013 was developed to support Afghanistan, Nigeria and Pakistan in interrupting transmission in the remaining infected areas. Partner agencies were committed to additional surge support. This emergency approach was also highlighted in the February 2012 IMB report.

Meanwhile the GPEI continued to engage with the international development community to close the financing gap for 2012 – 2013, which was US\$ 1,090 million, the total budget being US\$ 2,230 million.

A new, more efficient medium-term strategy was also being examined, aimed at combining the eradication of residual WPV with the polio endgame strategy.

Sixty-fifth WHA. Poliomyelitis: intensification of the global eradication initiative. Resolution. (WHA65.5), 26 May 2012⁴⁸

This resolution noted the IMB statement in its report that *“polio simply will not be eradicated unless it receives a higher priority – in many of the polio-affected countries, and across the world”* and the IMB’s recommendation in its April 2011 report that the WHA *“considers a resolution to declare the persistence of polio a global health emergency”*; and that the SAGE had stated that the *“risk of failure to finish global polio eradication constitutes a programmatic emergency of global proportions for public health and is not acceptable under any circumstances”*.

It therefore declared that the completion of polio eradication was a programmatic emergency for global public health and that affected Member States should also declare such transmission a *“national public health emergency”*. In addition, Member States should eliminate unimmunized areas; maintain vigilance; make available urgently the financial resources; and engage in multilateral and bilateral cooperation. Moreover, the DG should plan for *“renewed implementation through 2013 of the approaches to eradicating wild polioviruses outlined in the GPEI Strategic Plan 2010–2012 and any new tactics that are deemed necessary to complete eradication”* and take other measures including strengthening accountability mechanisms.

3. PROGRESS IN THE POLIO ENDGAME 2013-2015

3.1 Introduction

GPEI status reports 2012- 2015^{49,50,51,52,53}

These five reports, published between October 2012 and April 2015, were jointly compiled by WHO, Rotary International, CDC and UNICEF. They provide useful information on issues related to the work carried out globally in the implementation of the Global Emergency Action Plan and subsequently the Global Polio Eradication and Endgame Strategic Plan.

They are comprehensive documents, particularly after the end of 2012, and can be used for measuring progress in various areas from environmental surveillance to insecurity and polio sanctuaries to trends in missed children. Also some of the reports are of interest in moving towards the endgame and identifying strategies that could be useful. These include, for example, the trends in the gender profiles of frontline health workers in countries such as Pakistan, Afghanistan and Nigeria. Also of interest are the amounts earned by the vaccinators working in the areas at high risk. For example in the report of 29 April 2013, a vaccinator's daily pay was the equivalent of US\$ 2.50 (having been increased from \$1.00). In the 2015 report, while the amount has risen to US\$ 3.04 for North and South Waziristan, it had gone up to US\$ 8.24 in Khyber.

3.2 Polio Eradication and Endgame Strategic Plan 2013-2018⁵⁴

Many of the issues that were to be addressed in the Polio Eradication and Endgame Strategic Plan 2013-2018 were highlighted in the independent evaluation of major barriers to interrupting poliovirus transmission⁵⁵ that took place in 2009 (see chapter 2.4). This Strategic Plan was set out as the basis for the final phase and activities for polio eradication from 2013. It was developed at a critical point in time and added urgency as well as changing the focus of the programme.

There had been successes. The global incidence of polio had been reduced by more than 99 percent; the number of endemic countries had gone from 125 to three; more than 10 million people were able to walk who would otherwise have been paralysed; and over 10 billion doses of OPV had been administered to more than 2.5 billion children. On the other hand, in May 2012 the WHA declared that ending polio as a 'programmatically emergency for global public health'. There had been success in India, but Afghanistan, Nigeria and Pakistan were still endemic. The DG had therefore been requested to "*develop and finalize a comprehensive polio endgame strategy*".

Polio situation in 2012

India had been polio free for one year in 2012 and the total number of polio cases had fallen over the previous year by 66 percent to 223. Angola, DRC and Sudan, which had previously been re-infected, had no cases and Chad had not reported a case since June 2012. More affordable IPV options had been developed and the SAGE recommended withdrawal of OPV type 2 as soon as possible from routine vaccination programmes in all countries.

The UN Secretary General hosted a high-level meeting on the polio eradication emergency at the 67th session of the UN General Assembly. Government leaders in both endemic and donor countries joined him in declaring the ending of polio a top priority in September 2012.

Yet, in **Afghanistan** approximately 15,000 children remained unreachable. In **Nigeria**, although there was an overall increase in infections, case numbers had stabilized by the last quarter of 2012. But, there were targeted killings of health workers in late 2012 and early 2013 in Nigeria and Pakistan. In all three countries, National Emergency Action Plans (NEAPs) had been established, with the oversight bodies reporting to the Head of State, thereby strengthening links from the national to subnational levels to intensify political and administrative accountability for the quality of key eradication activities. There was also a “*massive surge of technical assistance*” to the highest risk areas.

Viruses from endemic areas, particularly Nigeria, regularly re-infected polio-free areas and, for the first time, in 2012 more countries suffered a polio outbreak due to a cVDPV than due to a WPV, reinforcing the importance of rapidly addressing this risk.

Planning for the end of all polio

In developing the plan for the end of polio, it was recognized that “*one size does not fit all*” and tactics for the remaining countries must be tailored accordingly. More of the same, even if intensified, was not going to be the answer. Furthermore technological innovation could not overcome gaps in programme management and community engagement in endemic reservoirs. Nigeria and Pakistan continued to have widespread transmission. Technological solutions were not enough and basic management and community engagement also had to be addressed. What was needed was a combination of innovations tailored to the country context that could deliver success in even the most challenging conditions.

The GPEI should therefore develop more effective tactics and tools to reach the remaining missed children, including those living in extremely poor sanitary conditions, who had to be identified more systematically with appropriate strategies developed for vaccinating them. Other strategies should include universal finger-marking; migrant and transit strategies; and independent monitoring. The case of India showed that appropriate approaches applied more systematically worked – 95 percent of children were being reached in OPV campaigns and it was recognized that missed children came from underserved populations outside the usual health systems, such as nomads, slum dwellers, children of construction and brick kiln workers, or other mobile and migrant groups.

Developing the Polio Eradication and Endgame Strategic Plan 2013-2018

The Plan was developed in consultation with national health authorities, scientific experts, global health initiatives (e.g. GAVI – the Vaccine Alliance), donors and other stakeholders, as well as national and international technical advisory groups (TAGs) and the IMB. It was also reviewed by the SAGE. The final Plan included a number of elements that were different from previous GPEI strategic plans, such as strategic approaches to end all polio disease (wild and vaccine-related);

- urgent emphasis on improving immunization systems in key geographies;
- introduction of new, affordable IPV options for managing long-term poliovirus risks and potentially accelerating WPV eradication;
- risk mitigation strategies to address new threats, particularly insecurity in some endemic areas, and contingency plans should there be a delay in interrupting transmission in such reservoirs;
- concrete timeline to complete the programme.

It also outlined a **legacy planning process** to harness the GPEI lessons and infrastructure “to deliver other critical health and development resources and, ultimately, complete the GPEI programme”.

Four main objectives of the Plan

The Plan’s four major objectives were not intended to be sequential but to run in parallel, with a high-level Monitoring Framework tracking progress against the working targets.

1 Poliovirus detection and interruption

The Plan's primary geographic focus was on the three endemic countries, the countries at highest risk of importation in Africa and countries with persistent cVDPV or a history of cVDPV emergence. Its focus was enhancing global poliovirus surveillance; improving OPV campaign quality to reach children in both remaining endemic countries and persistent cVDPV countries and ensuring rapid outbreak. Risks, particularly those related to insecurity that emerged during the latter part of 2012, were also to be addressed.

2 Immunization systems strengthening and OPV withdrawal

All 145 countries that currently used OPV in their routine immunization programmes should be engaged, as well as GAVI and immunization partners. It was essential to strengthen immunization systems, with GPEI focusing on the 10 countries that closely aligned with GAVI's focus countries (Afghanistan, Nigeria, Pakistan; plus Angola, Chad, DRC, Ethiopia, India, Somalia, South Sudan). At least 50% of the GPEI field personnel's time should be committed to strengthen immunization systems by the end of 2014 in these countries and it should contribute at least a 10 percent improvement in coverage rates in worst-performing districts annually.

3 Containment and certification

This would involve all WHO Member States in certifying all regions as polio free and ensuring that all poliovirus stocks are safely contained by 2018. All six WHO regions would need to have Regional Certification Commissions.

4 Legacy planning

Legacy planning would ensure that the world remains permanently polio-free and that investment in polio eradication would provide public health dividends in the future. It would mainstream, for example, IPV immunization, containment and surveillance; lessons into other major health initiatives; and transition the polio infrastructure, as appropriate. It recognized the potential of the polio eradication staff which *"comprise the single largest source of external technical assistance for immunization and surveillance in low income countries"*. In addition, personnel funding through the polio Initiative should help countries not only to vaccinate hundreds of millions of vulnerable children but also to provide them with other health interventions including measles vaccines and anti-malarial bednets. Lessons learnt should be *"transitioned responsibly to benefit other development goals and global health priorities"*, involving consultation with other stakeholder groups. In addition, a comprehensive legacy plan would be developed by the end of 2015.

Implementing the Plan

The Plan recognized the importance of inclusion of the right checks and balances to ensure that its milestones were met, any corrective actions implemented and its administration conducted with the "greatest efficient and effectiveness". Moreover, a Monitoring Framework would be used.

The role of the WHA was recognized as providing the highest level of governance of the GPEI, with the WHO Regional Committees allowing for more detailed discussion. Inputs could be made through the EB and WHA. Nevertheless, the primary responsibility should be at all levels of government in-country. The roles of the independent bodies that monitor activities are set out Box 3.1.

Box 3.1: Objectives of the GPEI Polio Eradication and Endgame Strategic Plan 2013-2018 and advisory and monitoring bodies

1	Poliovirus detection and interruption	IMB
2	Immunization systems strengthening and OPV withdrawal	SAGE
3	Containment and certification	Global Commission for the Certification of Poliomyelitis Eradication
4	Legacy planning	WHO regional committees and WHA

Source Ref 54, p6, Table 1

The Polio Eradication and Endgame Strategic Plan 2013-2018 then sets out in comprehensive detail the activities, financing, monitoring, measuring progress, etc to guide its work during the next five years.

3.3 Moving the process forward to 2018 and beyond

Sixty-sixth WHA. Poliomyelitis: intensification of the global eradication initiative. Report by the Secretariat. (A66/18), 28 March 2013⁵⁶

The main foci of the Secretariat report for the 66th WHA were the Global Emergency Action Plan 2012-2013 and the Polio Eradication and Endgame Strategic Plan 2013-2018.

Global Emergency Action Plan 2012-2013

A **Polio Emergency Steering Committee** had been set up by the five core agencies working on the Global Emergency Action Plan 2012-2013 that had been adopted during the previous WHA, to “*manage risks and guide operations*”. This Committee reports to its Agency Heads that in turn constitute the membership of the Polio Oversight Board (POB), which meets quarterly.⁵⁷ In particular, the report noted that **emergency operations centres (EOCs)** and/or procedures “*have been activated across core partner agencies, and WHO recruited 2,500 additional workers to support government efforts against poliomyelitis in areas of Afghanistan, Nigeria and Pakistan affected by the disease or where the outbreak risk was greatest*”. In addition, UNICEF engaged an additional 5,000 community mobilizers for these areas.

In the three endemic countries, the Head of State or Government appointed a focal point to oversee national polio eradication efforts, also engaging with other government sectors and public administration. A Presidential task force was set up in Nigeria and a Prime Ministerial Task Force in Pakistan to assess progress and ensure the accountability of local authorities. Also, a national EOC was established in Abuja, with a subnational centre in Kano state, their remit being to enhance further operations planning, oversight and accountability. New performance monitoring systems were also put in place to track SIAs and to guide rapid corrective action. Notably, vaccine coverage reached an estimated target threshold in high-risk areas of 80 percent (up from 70 percent the previous year) in Nigeria and 74 percent (up from 59 percent) in Pakistan. In the 11 districts of southern Afghanistan at highest risk, the numbers of inaccessible children declined from more than 80,000 at the end of 2011 to 15,000 a year later. In general in 2012, 222 cases, a 66 percent decline, from five as opposed to 16 countries were reported. There was, however, a 95 percent increase in the number of cases in Nigeria, demonstrating the volatility of the situation. The one case in Niger was linked to the virus originating in Nigeria; and wild poliovirus, imported from

Pakistan, was detected in sewage samples in two areas of greater Cairo, although no case was reported.

Of major concern were the attacks in Pakistan in December 2012 in KP and Karachi which resulted in the murder of nine vaccinators. Ten polio workers were also killed in Kano state, Nigeria in February 2013. These attacks compromised vaccine coverage in subsequent SIAs and a multi-prong approach was used to respond including lowering the profile of campaigns; provincial/state security coordination mechanisms; and district-specific risk assessments. Also broad-based initiatives were introduced for stronger societal support, particularly among Muslim populations and Islamic leaders and institutions.

Polio Eradication and Endgame Strategic Plan 2013-2018

The Polio Eradication and Endgame Strategic Plan 2013-2018, (see 3.2 above) was included in the Secretariat report, stating that the SAGE had endorse the four major objectives and describing actions that had already been taken in the three endemic countries. It described in detail the three main goals for legacy planning and that a consultation process was beginning in 2013 which would report to the WHA in 2014. In addition an independent evaluation of the human resources infrastructure, funded by the GPEI, would be undertaken to inform long-term planning.

The budget for the Plan was US\$ 5,525 million, peaking in 2013 at US\$ 1,054 million in 2013, then declining each year to US\$ 760 million in 2018. In February 2013 the gap was US\$ 660 million.

Sixty-seventh WHA. Poliomyelitis: intensification of the global eradication initiative. Report by the Secretariat. (A67/38), 21 March 2014⁵⁸

The report summarised progress on the four main objectives of the Polio Eradication Strategic Plan 2013-2018.

Objective 1: Poliovirus detection and interruption

It was noted that the reported number of WPV cases increased in 2013 by 82 percent from 223 to 405 cases, in eight countries as opposed to five the previous year. The main increase occurred in Pakistan (by 60 percent) and a spread from Nigeria into the Horn of Africa (193 cases in Somalia, 14 in Kenya and nine in Ethiopia) as well as 38 from Pakistan in the Syrian Arab Republic). Four imported cases were also reported in Cameroon. Sixty of the Pakistan cases occurred in FATA and KP. For the first time they were all WPV type 1. The increase in the number clearly demonstrated the potential volatility of infection unless the virus is eradicated.

Again during 2013, insecurity, attacks on health workers and/or a ban on immunization by local authorities meant that access had deteriorated in FATA and KP in Pakistan as well as in Borno state in Nigeria. Poor implementation also affected other areas such as Kano and Balochistan and Karachi and it was estimated that some 530,000 children remained inaccessible in polio-affected areas in the two countries. At the same time over 500,000 children were inaccessible in the re-infected part of Somalia.

Because of the potential risks of further international spread of the virus, the DG had convened the SAGE Polio Working Group in February 2014 to update WHO's vaccination recommendations for travellers from polio-infected countries. The Emergency Committee under the 2005 IHR was planned in advance of the WHA to advise on measures to limit WPV international spread.

Objective 2: Strengthening immunization systems and withdrawal of oral polio vaccine

The main concern was the preparations for the withdrawal globally, as early as 2016. In addition a joint programme of work was initiated with GAVI to support the strengthening of routine immunization in the 10 priority countries identified in the Endgame Plan. It capitalized on GAVI's investments in health systems strengthening and the GPEI's substantial technical assistance. Immunization plans for Chad, DRC, Ethiopia, India, Nigeria and Pakistan were reviewed and revised to align these resources in 2013. In addition the SAGE finalized its policy recommendations for the administration of IPV in routine immunization schedules, and endorsed the strategy that was developed for the financing, supply and introduction of inactivated poliovirus vaccine globally. Funding through GAVI of expedited processes for the 73 countries eligible for its support with volume purchasing were combined in the strategy with UNICEF-assisted procurement for other countries to obtain the lowest possible prices for inactivated poliovirus vaccine.

Objective 3: Containment and certification

The focus was on ensuring phase 1 activities were completed by 2015, including establishing an inventory of all facilities holding infectious and/or potentially-infectious WPV materials and the implementation of measures to ensure the safe handling of all residual WPVs, especially type 2.

Objective 4: Legacy planning

A consultative process was initiated in 2013 outlining three possible legacy scenarios, with a growing consensus emerging that *“assets, lessons and resources of the polio Initiative should eventually be transitioned, primarily through national governments, to benefit other existing health priorities”*.

An independent study on the GPEI 22,000 employees, including 7,000 contracted by WHO. Senior government, donor and other representatives cited surveillance (86 percent), laboratory (50 percent) and social mobilization (46 percent) functions as of most value for other health initiatives. Two-thirds also said that the *“future administration of this human resources infrastructure should be the responsibility of national governments”*.

Further consultations were scheduled for 2014 with greater documentation of GPEI assets and capabilities, as well as knowledge gathered and lessons learnt, to form the basis of legacy planning at national and international levels, with a draft framework being considered regionally and at the 68th WHA.

Financing and resource management

Pledged contributions at the Global Vaccine Summit (Abu Dhabi, 24-25 April 2013) totalled US\$ 4,040 million towards the US\$ 5,530 million Endgame Plan. Subsequently a further US\$ 490 million was pledged, leaving a US\$ 1,000 million gap. In January 2014 the cash gap for the year was still US\$ 497.52 million, against a total budget of US\$ 1,033 million.

Major risks and programme priorities for 2014

Among the major risks to eradication, the following were listed: bans on immunization campaigns in North Waziristan in Pakistan, as well as in parts of southern and central Somalia; the continued targeting of vaccinators in KP and Karachi; ongoing military operations in the Khyber Agency (within FATA); insecurity in Eastern Region, Afghanistan and Borno state, Nigeria; active conflict in the Syrian Arab Republic; and gaps in programme performance in Kano state, Nigeria and in response in Cameroon. To address them, it would be necessary to ensure full national ownership, engagement and accountability of the eradication programme in all infected countries; and engagement of relevant international bodies, religious leaders and humanitarian actors to access and vaccinate children in insecure and conflict-affected areas, adapting approaches in line with local contexts.

The report also noted the work of the POB (See Chapter 4.1.2c) and that a comprehensive, independent management review of the eradication Initiative would be held later in the year to improve programmatic decision-making across the Initiative. In addition, the WHO DG established a cross-cluster Polio Endgame Management Team to enhance organizational support.

Sixty-eighth WHA. Poliomyelitis. Report of the Secretariat (A68/21), 1 May 2015⁵⁹

Interruption of wild poliovirus transmission

A meeting of the Emergency Committee under the IHR in April 2014, convened by the DG, advised that global eradication would fail if the spread of the virus in the first three months were to be left unchecked. On 5 May 2014 she declared the WPV's international spread a '**public health emergency of international concern**' (PHEIC) and issued temporary recommendations on "*declaring and managing the event as a national public health emergency and vaccinating travellers from affected countries*". Acting on the advice of the Emergency Committee, she also extended other temporary recommendations. Urgent action was also advised regionally because of the large-scale population movements across borders.^{60,61}

The number of WPV cases reduced from 416 to 359, with 85 percent occurring in Pakistan. There were 28 cases in Afghanistan and only six cases in Nigeria as of July 2014. There were five cases of transmission up to August in Somalia, one in Ethiopia in January and five cases each in central Africa, Cameroon and Equatorial Guinea. Iraq reported two cases and the Syrian Arab Republic one case, in both of which countries the immunization systems had deteriorated as a result of conflict and the security situation. In Africa intensified surveillance was necessary in countries such as Cameroon, Central African Republic, Equatorial Guinea, Gabon, Somalia and South Sudan, as well as innovative efforts to try to reach all children in northern Nigeria. Surveillance was also important in countries in the Middle East, including Iraq, Lebanon, Syrian Arab Republic and Turkey.

Pakistan was clearly of critical importance in interrupting WPV transmission, the problems being the difficulties in access in FATA, KP, Balochistan and Karachi due to ongoing conflict, threats and attacks on health workers. Success would depend on "*full implementation in all areas of Pakistan*". The remaining priorities for Afghanistan remained in the Southern Region and cross-border importations from Pakistan.

Withdrawal of the Type 2 component in oral poliovirus vaccine

Global withdrawal of type 2 of the oral vaccine remained scheduled for April 2016. Meanwhile, by February 2015, every Member State except one had introduced or developed a plan to introduce IPV by the end of 2015. Withdrawal of type 2 OPV would involve replacement of trivalent with a bivalent (types 1 and 3) formulation in countries using OPV. Moreover, the SAGE reinforced its previous recommendation on stockpiles of OPV type 2 vaccines and also endorsed the strategic approach and plan for fully aligning the containment of polioviruses with the milestones and timelines of the Polio Eradication and Endgame Strategic Plan 2013-2018, also noted by the EB. Member States should also submit for certification to their relevant regional commissions.

Legacy planning

The report further developed plans for legacy planning against a background of the successful use of the polio eradication infrastructure in response to the Ebola outbreak in West Africa, by "*providing staff for surge support and conducting surveillance, contact tracing, data management, logistics and supply distribution, and outbreak management*". It was particularly successful in Nigeria. There were further consultations involving Member

States, major partners and stakeholders and detailed legacy planning missions conducted with the DRC and Nepal.

At the end of 2013 the WHO Regional Committees had concluded that *“legacy planning should benefit existing health priorities and be driven and led by countries, and that its success would require a formal process to be established in all countries where substantial assets for polio eradication were financed through external resources”*. The POB had drawn up and approved a draft framework and transitional guidelines were being prepared as guidance for legacy planning at country level through a three-phase approach comprising planning and decision-making, preparation and execution. Specific roles and responsibilities were yet to be defined, *“with national governments providing overall leadership of the process, a donor consortium facilitating the transitioning of resources, and other partners or new entities providing project management expertise and technical assistance”*.

Finalizing the global legacy framework in 2015 would also facilitate the work for transitioning the polio eradication infrastructure to other priorities. There would be support for legacy planning in specific countries that had already begun it and those with substantial resources. The plans would need to ensure that essential polio eradication functions continued beyond the conclusion of the GPEI.

Finance

By the end of 2014, the GPEI had received US\$ 2,230 million in contributions, with a further US\$ 2,850 million pledged, against an overall budget 2013-2018 of US\$ 5,500 million, with a funding gap of US\$ 451 million.

On the recommendation of the IMB, at the end of 2014 the POB commissioned a comprehensive management review of the Initiative, adopting several recommendations to make eradication more rapid and effective, including establishing a new finance and accountability committee. By mid-2015 the GPEI should carry out a mid-term review of the Polio Eradication and Endgame Strategic Plan 2013-2018, to assess progress and identify adjustments, including for the budget.

Sixty-eighth WHA. Poliomyelitis. Resolution (A68/3), 26 May 2015⁶²

The 68th WHA passed a resolution that took into account the ‘state of play’, in the context of the Director-General’s declaration of the spread of WPV as a PHEIC and with more than 85 percent of cases in one country, Pakistan. It urged Member States to implement the Strategic Plan 2013-2018, as well as national emergency plans and to take necessary measures to ensure the safety of health workers. In addition the temporary recommendations under 2005 IHR should be implemented and cross-border collaboration intensified.

Member States should prepare for the global withdrawal of the type 2 component of the vaccine by April 2016 and maintain surveillance, and put in place national public health emergency measures, if required. Countries experiencing transmission should also be supported and potential gaps in population immunity monitored. Furthermore, the financial resources should be made available and the full realization of potential legacy ensured.

The DG should continue to collaborate with all relevant actors and stakeholders to support national efforts for polio eradication, as well as coordinating with all relevant partners for a globally-coordinated removal of OPVs from all immunization programmes. She should also support Member States, partners and stakeholders in ensuring that the legacy is realized. Annual reports should continue to be made up to the 72nd WHA.

3.4 Current situation at the beginning of 2016⁶³

“This year, the Global Polio Eradication Initiative celebrated several major milestones that have brought the world closer than ever to stopping polio. Fewer cases have been reported so far through the year than in any other year on record. This progress would not have been possible without the many polio workers who have dedicated their lives to stopping polio in some of the most challenging and remote communities... Pakistan and Afghanistan, the only two countries that have never stopped polio transmission, have also been able to make significant progress toward eradication.”

Global Polio Eradication Initiative, Newsletter December 2015. See Ref 63

138th Session WHO EB. Poliomyelitis. Report of the Secretariat (EB138/25), 11 December 2015⁶⁴

At time of writing, this was the most-up-to-date EB report, reflecting progress as at November 2015, on the four objectives of the Polio Eradication and Endgame Strategic Plan 2013–2018. However, where more up to date information is available, e.g. numbers of IPV cases, this has been used and referenced.

The declaration of the international spread of WPV as a PHEIC and the temporary recommendations under the 2005 IHR were still in effect. POB reviewed progress at its meeting in September 2015 and concluded that interruption of WPV transmission would more likely occur in 2016 than in 2015, which would change the target date for certification of global polio eradication to 2019, with an increase in cost for completion of US\$ 1,500 million.

The SAGE confirmed that the withdrawal of type 2 OPVs should occur between 16 April and 1 May 2016 and preparations were underway for the switch from trivalent to bivalent oral polio vaccine (tOPV and bOPV) in April 2016, involving national ‘switch plans’ in every country, communication and training materials, inventories of tOPV stocks and micro-plans for bOPV distribution.

Interruption of wild poliovirus transmission

As at 15 December 2015, the numbers of cases of wild poliovirus was 66, down from 332 in 2014 and they were all WPV1, with no cases of WPV3. In addition they have occurred in only two countries: Afghanistan with 17 cases (25 cases in 2014) and Pakistan with 49 cases (282 cases the previous year). Vaccine derived poliovirus type 1, however, had gone up from two cases to 17 cases of which five occurred in the Lao PDR (no cases in 2014); 10 (two in 2014) in Madagascar and two in the Ukraine. Vaccine derived poliovirus type 2 had decreased from 45 in 2014 to six in 2015, with one in Guinea (same as in 2014); two in Myanmar, where there had been no cases in 2014; one in Nigeria, (24 in 2014); and two in Pakistan (20 the previous year).⁶⁵

Endemic countries – Afghanistan and Pakistan

Up to 20 October 2015, 38 cases had been reported in Pakistan, as opposed to 209 cases for the same period in 2014, but it still accounted for 80 percent of all WPV cases worldwide. Thirteen cases, as opposed to 12 in the same period the previous year, were reported in Afghanistan. In both countries WPV interruption now depended on being able to fill the gaps in strategy implementation and on being able to vaccinate children in the insecure areas, which were still infected.

The Prime Minister’s Office in **Pakistan** was directly overseeing the national polio emergency plan, which focused on the chronically missed children and on implementing area-specific approaches to reach them. In addition it also addressed real-time monitoring of activities, implementing corrective action and increased accountability and ownership at all

levels. While access to previously inaccessible areas had improved and operational deficits were being addressed, vaccination gaps remained in Peshawar in KP, FATA, the Khyber Agency, North and South Waziristan, Karachi, northern Sindh and parts of Balochistan.

Children were missed in **Afghanistan** because of inaccessibility and operational deficits in accessible areas. When local leaders temporarily suspended vaccination activities in some areas in the Southern Region, the matter was resolved by “*highlighting the importance of maintaining the neutrality of public health efforts*”. (This was a lesson learned from the ‘Independent evaluation of major barriers to interruption polio virus transmission’ under the leadership of Ali Jaffer Mohamed in 2009.) A NEAP has been developed but it was not being fully implemented and there should be stronger coordination through a better-functioning EOC for better monitoring, timely corrective action and accountability to reach the children that had constantly been missed.

Recently-endemic countries

No case of polio had occurred in **Nigeria** since 24 July 2014 and therefore Nigeria was officially removed from the list of endemic countries on 25 September 2015.

International spread of wild poliovirus

Afghanistan and Pakistan had continued to export polio across their border. It was therefore important that there be full implementation of eradication strategies in infected areas; full application of the temporary recommendations issued by the DG under the 2005 IHR; and heightened surveillance. The report stressed the concern expressed by the IHR Emergency Committee at this point in the Polio Endgame about the current circulating vaccine-derived poliovirus type 1 and 2 and the emergence of such strains in three WHO regions in 2015. It recommended extending the temporary recommendations to countries affected by such outbreaks. (Previously recommendations were limited to countries affected by WPV.)

Circulating vaccine-derived polioviruses type 1

In 2015, nine new cases of cVDPV1 were reported in **Madagascar**, linked to the same strain detected in 2014; two cases in **Ukraine** in June and July; and two cases in the **Laos People’s Democratic Republic** in October. Responses were instigated or intensified in each of the countries, although there was a delay of several weeks in Ukraine.⁶⁶ The Ukraine Government then took a number of unprecedented steps:

- 1 The Minister of Health of Ukraine held a press briefing to announce the outbreak and the need for a full and comprehensive emergency response.
- 2 The National Security Council was briefed on the occurrence to ensure an all-government, all-civil society approach to the outbreak.
- 3 The health committee in the affected area convened an extraordinary session to begin emergency outbreak response planning; an intensive surveillance plan was initiated through active searches and the collection of specimens from healthy contacts across the community.
- 4 A joint Ministry of Health-WHO-UNICEF national task force was established to prepare the outbreak response plan, oversee implementation and conduct monitoring.
- 5 A national/international team of experts conducted an in-depth investigation in the affected area.

Circulating vaccine-derived polioviruses type 2

All cVDPV2 outbreaks must be stopped before the withdrawal of OPV2 in April 2016. One case was reported in May 2015 in **Nigeria**, related to a strain first isolated in August 2014 and was responded to as part of the NEAP. One case was also detected in **Guinea** in July, related to a strain last detected there in August 2014, with an outbreak response in the country and on the border with Mali within two weeks of the outbreak. A strain that was detected in April 2015 in South Sudan was considered a cVDPV2 strain, but had not subsequently been detected. The emergence of these cases highlighted the importance of

strengthening routine immunization systems.

The report to the EB also referred to the GPEI midterm review of progress towards the implementation of the Endgame Plan, which concluded that *“the key strategic elements required to reach polio eradication are in place”*. However, there were *“gaps that need a refocusing of priorities, in particular on filling gaps in surveillance, reaching missed children and enhancing outbreak preparedness and response in high-risk areas”*. A comprehensive plan was being developed to operationalize the review’s recommendations.

Withdrawal of the type 2 component in oral polio vaccine

The Global Commission for the Certification of Poliomyelitis Eradication (GCC) declared the eradication of WPV type 2 on 20 September 2015, with the last detected case in 1999. On 20 October the SAGE reviewed the situation of type 2 vaccine-derived polioviruses and stated that the switch from trivalent oral polio vaccine to bivalent (types 1 and 3) OPV should take place between 17 April and 1 May 2016 in all countries still using tOPV.

Global vaccine supply to prepare for the trivalent to bivalent oral polio vaccine switch

In preparation for the switch, all countries had committed to introducing IPV in their routine immunization programmes. According to the report the level of their commitment *“has been exceptional”*. Noting that the supply had been reduced due to technical difficulties in scaling-up encountered by manufacturers, the SAGE advised the use of IPV in higher risk tier 1 and 2 countries before the switch. Catch-up vaccination should take place once sufficient supplies were available. In addition, a stockpile of monovalent OPV type 2 should be established and maintained to be able to respond should an outbreak occur.

Strengthening routine immunization

The GPEI initiated a joint programme of work with GAVI and other partners to strengthen routine immunization in 10 ‘focus’ countries with significant polio resources, among which Chad, DRC, Ethiopia, India, Nigeria and Pakistan had developed annual national immunization plans, resulting in up to a 22 percent reduction in unimmunized children in some areas on 2014 figures. Some 50 percent of the time of polio staff was spent on broader immunization and public health issues.

Containment

In 2015 the GCC and the SAGE urged the acceleration of implementation of the WHO Global Action to minimize poliovirus facility-associated risk after type-specific eradication of WPV, setting out specific measures to be completed by Member States with support from the Secretariat.

Legacy planning

Legacy planning was accelerated in 2015, aimed at ensuring that functions needed to maintain a polio-free world after eradication (e.g. immunization, surveillance, outbreak preparedness and response, and facility containment of polioviruses) would be mainstreamed in continuing national public health programmes; knowledge generated and lessons learnt from polio eradication activities would be shared with other health initiatives; and where feasible and appropriate, that capabilities, assets and processes would be transferred to support other health priorities.

Polio legacy planning should occur primarily at national level, under the leadership of Member States. *“...investments in polio eradication will benefit other development goals in the long term”* as GPEI-funded human resources, facilities and processes were already substantially involved in non-polio eradication actions such as immunization, surveillance and emergency response. Successful legacy planning would contribute to ensuring these essential functions are sustained after polio eradication funding ceases. To support Member States the GPEI had developed guidelines for preparing a transition plan.⁶⁷

Finance and management of the GPEI

By June 2015 GPEI had received US\$ 2,682 million in contributions, with pledges of US\$ 2,185 million against the overall, original budget for 2013–2018 of US\$ 5,500 million. The midterm review evaluated future financial needs of the GPEI, in response to which the POB endorsed a revised financial scenario. The postponement of the date for achieving certification of WPV interruption until 2019 increased budgetary requirements by US\$ 1,500 million. Even with full and rapid realization of all existing pledges, a funding gap of US\$ 1,996 million remained against the new budgetary requirements through 2019. The GPEI had begun financial planning for the period 2016–2019 for POB endorsement in February 2016.

4. KEY ACTORS AND THEIR ROLES IN GLOBAL POLIO ERADICATION

4.1 The movers and shakers

Throughout the history of the GPEI, since the programme was first initiated in 1988, there have been a number of key actors, whose roles are overviewed here.

4.1.1 Global governance: WHA, EB and WHO

The WHA provides the “highest level of governance of the GPEI” and therefore for global polio eradication in general. The WHO Regional Committees, particularly those with countries where infection still occurs, also allow for more detailed discussion. Meanwhile, each year there is an agenda item on some aspect of polio or polio eradication for both for the WHA and also for the EB. The discussions are based on reports from the Secretariat or the Director-General. (See chapters 2 and 3). Based on the context of these reports, where appropriate and particularly where there is a change of direction or specific problems that need to be addressed in the work of the GPEI (see below), the EB recommends that a resolution be passed by the WHA.

The roles of the WHA and EB are extremely important in the governance of the global eradication of polio, as both bodies provide a broader perspective and framework. This is acknowledged by the GPEI in the description of its governance.⁶⁸ The WHA, for example, had to approve the Polio Eradication and Endgame Strategic Plan 2013-2018. The recognition of their importance was also highlighted in the slide presentation prepared by Paul Rutter for the Partners, which said that legacy planning would be highlighted in both the EB and WHA in 2016.⁶⁹

WHO is a key player, insofar as it looks beyond the immediate remit of the GPEI, calling on the work of the SAGE (see below) and also the GCC. It also has responsibility for the 2005 IHR, which formed the basis for the declaration of the international spread of WPV as a PHEIC.

The DG is frequently called on to act through WHA resolutions, for example to support national level implementation, coordinate with relevant partners, provide technical expertise and assist in mobilizing funding. She was also asked in 2014 to support Member States, partners and stakeholders in ensuring that the legacy is realized. Further, the DG can play a catalytic role, as was the case in 2007 when she convened the Urgent Stakeholder Consultation on interrupting WPV transmission, which had a significant impact on the process.

4.1.2 Global Polio Eradication Initiative

The process for polio eradication was originally instigated in 1988 through the GPEI, which has subsequently been responsible for implementing the programme. The GPEI is a public-private partnership, comprising initially WHO, UNICEF, CDC and Rotary International and with BMGF joining later. While WHO (dealing with health issues) and UNICEF (main concern being children) are expected partners from within the UN system, the combination with the other partners is notable.

Rotary International⁷⁰

Rotary International had worked since 1985 to help control polio worldwide. Indeed, as early as 1979 the then President of Rotary, Clem Renouf, John Sever of the US National Institutes of Health and Dr Albert Sabin, the developer of the oral polio vaccine, among others urged

Rotary to work on polio eradication.⁷¹ It was therefore involved in the GPEI from the outset and more recently in 2007 and subsequently entered into a partnership with BMGF, in promotions in which BMGF matched and supported Rotary's contributions. Given Rotary's worldwide membership of those involved in business and the professions and its fund-raising capacities, in addition to its commitment to polio eradication, it has been a very constructive civil society partner. At the same time, it is surprising that a civil society organization was one of the partners from the outset. It also begs the question for Rotary International of "*what next?*" after 2019.

US Centers for Disease Control and Prevention⁷²

CDC is a strategic partner in the overall effort to eradicate polio worldwide. It provides scientific expertise to many polio eradication programs and activities. This includes:

- Staff members of the CDC's Global Immunization Division work jointly with WHO and national ministries of health to plan and monitor polio surveillance and immunization activities in multiple countries worldwide.
- The Global Immunization Division supports other eradication projects such as conducting epidemiologic and vaccine efficacy studies and performing operational research for supplemental immunization activities.
- The Polio and Picornavirus Laboratory in CDC's Division of Viral Diseases serves as a WHO Global Specialized Laboratory and provides technical and programmatic assistance to the global polio laboratory network overall. CDC's labs provide critical diagnostic services and genomic sequencing of polioviruses to help guide disease control efforts in many countries. In 2014, this included support for implementation of improved laboratory procedures that have increased sensitivity to detect and confirm new polio infection. Other new laboratory procedures help countries overcome specific operational challenges, enable more rapid detection of WPV and allow for faster response to importations or spread of virus. Additional efforts include technical assistance to laboratories implementing environmental surveillance for polio detection.
- **Stop Transmission of Polio (STOP)** team members have participated in three- and five-month assignments in 66 countries, providing 100-300 person-years of support at the national and sub-national levels. In 2013 alone, the STOP programme assigned 342 professionals to 66 countries to improve surveillance for acute flaccid paralysis and to help plan, implement and evaluate vaccination campaigns in partnership with WHO.
- CDC provides country support through deployment of personnel and other resources.

Bill & Melinda Gates Foundation (BMGF)⁷³

Polio eradication is a top BMGF priority and as a major supporter of the GPEI it contributes technical and financial resources to its GPEI partners to accelerate efforts to eradicate polio. Areas supported include targeted vaccination campaigns, community mobilization, stronger routine immunization efforts, innovative ways to enhance polio surveillance and outbreak response, accelerating the development and use of safer and more effective polio vaccines, and galvanizing financial and political support for polio eradication efforts from both donor and polio-affected countries. As a private foundation, BMGF has the flexibility to take big risks and to making non-traditional investments that can lead to valuable programme improvements. Examples include BMGF funding for Geographic Information System mapping to replace hand-drawn maps for campaign planning, GPS tracking to monitor the movement of vaccination campaign teams, and investments in polio vaccine research.

Other partners

As listed on the GPEI website,⁷⁴ there are many other partners, contributing in different ways to the work of the GPEI to eradicating polio. They include:

- UNF and other private foundations
- development banks (e.g. the World Bank)

- donor governments
- European Commission (EC)
- humanitarian and nongovernmental organizations (e.g. the International Red Cross and Red Crescent societies)
- corporate partners (e.g. Aventis Pasteur, De Beers)
- volunteers in developing countries.

GPEI as viewed by members of the Independent Monitoring Board

P.D. Rutter, L.J. Donaldson. Oversight Role of the Independent Monitoring Board of the Global Polio Eradication Initiative. Journal of Infectious Diseases, (2014) 210 (suppl 1): S16-S22⁷⁵

“Stopping transmission in over 100 countries is no small feat. We deeply respect this. But this is not the aim. The aim is to reach 100%, and on that count the programme has not been fit for purpose.” (June 2012)

Looking back at the work of the GPEI, Dr Paul Rutter and Sir Liam Donaldson, Chair of the IMB, noted that it had been very successful in reducing the numbers of children paralyzed by polio, with a 99 percent decrease from the 1988 baseline and only nine affected countries as opposed to 125 in 2000. Nevertheless, polio had not been eradicated and the work would be much more difficult in the next decade, as signalled by an actual increase from 489 cases in 15 countries to 1,300 cases in 20 countries in 2010. Meanwhile the programme was spending between US\$ 500 million and US\$ 1 billion each year and delivering millions of doses of vaccine.

From early 2011, the IMB was of the opinion that the GPEI needed to alter its approach fundamentally; that it would not stop polio transmission by the end of 2012 (the then target date); and that change was needed. While the GPEI is a complex partnership between governments and multiple agencies, it has been possible for changes to be made with the heads of the core partner agencies becoming more closely involved in the programme’s management. Bodies such as the POB and the global Polio Partners Group (PPG) were created, which now had a strong influence and oversight.

These changes aimed to improve the capacity of the GPEI to carry out its work during the final phase – the Polio Eradication and Endgame Strategic Plan 2013–2018. The task, however, would not be easy as can be seen by the IMB assessment in its 12th report⁷⁶ in October 2015, “Now is the Time for Peak Performance”:

“As the finishing line draws tantalizingly nearer, the potential cost of any mistake is magnified. The programme must mobilise every ounce of skill, capacity, imagination and energy to meet the challenging goal that has been set.

“Any misalignment or inefficient use of resources, any acceptance of substandard performance, any lapse of leadership attention or organizational concentration could set the programme back a year. Aside from the terrible cost of this in human terms, the price tag attached to it would be \$1 billion.”

GPEI Polio Oversight Board

As stated in their terms of reference, the POB, which comprises the heads of agencies of core GPEI partners (WHO, UNICEF, CDC, Rotary International and BMGF), provides close oversight of the GPEI and programme management, and ensures high-level accountability across the GPEI partnership. The POB receives and reviews input from the various advisory and monitoring bodies (IMB, SAGE, GCC) and operational information from the Strategy Committee (SC). The POB’s directives are implemented by the SC through the various programme management bodies, whereas the Finance Accountability Committee provides

financial oversight and transparency. The POB meets quarterly. Its deliberations are also informed by the PPG.⁷⁷

The origins of the POB were telephone calls that were initiated to discuss the reports of the IMB and the programme in general, subsequently being formalized into a proper meeting structure in 2012.⁷⁸

A momentous decision by the POB Finance and Accountability Committee

According to its terms of reference the POB's structure includes a Finance and Accountability Committee. This Committee, as reported in the 12th IMB report, was responsible for recommending that the date for the global interruption and certification be changed, suggesting optimistic, intermediate and pessimistic options ranging from 2015 to 2017 and 2018 to 2020 respectively (Box 4.1). The GPEI believed that data confirmed that scenario 2 was the most likely.⁷⁹

Box 4.1: Scenarios presented in the June 2015 POB Finance and Accountability Committee

Scenario:	1	2	3	4
	Optimistic	Intermediate (A)	Intermediate (B)	Pessimistic
Nigeria interrupts:	• 2014	• 2014	• 2014	• 2015
Pak/Afg. interrupt:	• 2015	• 2016	• 2017	• 2017
All other assumptions:	• Optimistic	• Intermediate	• Intermediate	• Pessimistic
Global interruption:	• 2015	• 2016	• 2017	• 2017
Global certification:	• 2018	• 2019	• 2020	• 2020
Post-certification costs:	• 2019-2025	• 2020-2026	• 2021-2027	• 2021-2027
	'13 – cert.	'13 – cert.	'13 – cert.	'13 – cert.
	Post-cert.	Post-cert.	Post-cert.	Post-cert.
	\$5.7B	\$7.0B	\$7.8B	\$8.8B
	\$0.9B	\$0.9B	\$0.9B	\$1.2B

Source: Ref 79, p15

At its meeting on 25 September 2015 in New York, the POB made the strategic decision to change the dates for WPV interruption and Certification to 2016 and 2019 respectively, with major budgetary implications as forwarded to the EB (see chapter 4.2).⁸⁰ This decision shows the potential power of the POB, which brings together the heads of the key agencies for the GPEI. This decision was reported to the January 2016 EB.

As explained to the present author by the Chair of the Finance and Accountability Committee,⁸¹ “two aspects of the decision by the POB, [as the oversight body], were of interest to the EB and WHA – first, the change in the expected date of certification of global polio eradication in the 2013-2018 strategic plan from 2018 to 2019, and second, the associated increase in overall budget of the GPEI strategic plan from \$5500 million to \$7000 million”. The strategic plan which had been developed by the GPEI had been noted by the EB and the WHA in January and May of 2013, respectively. As the strategic plan was a GPEI plan and not a WHA plan, it did not require a resolution for its extension. As he pointed out “the extension of the strategic plan by one year was a direct strategic response to delays in full implementation of the plan by two Member States”. As far as the second

aspect of this decision related to the financial implications of the modified plan dates, as he further explained: *“in consideration of its special nature, polio eradication is one of several programs in WHO for which the WHA resolution 68.1 (2015)⁸² on the programme budget 2016-17 provides flexibilities to WHO that obviate the need for additional WHA resolution if there is an increase in expenditures”*. The resolution authorizes the DG *“where necessary, to incur expenditures in the polio, tropical disease research, and research in human reproduction components of the budget beyond the amount allocated for those components, as a result of additional governance and resource mobilization mechanisms, as well as their budget cycle, which inform the annual/biennial budgets for these special programmes, subject to availability of resources, and requests the Director-General to report to the governing bodies on availability of resources and expenditures in these components”*.

Commenting on the additional US\$ 1.5 billion that would be required, the IMB report noted that, should transmission not be interrupted by 2016, *“a further at least \$ 800 million per year would be needed to deal with the consequences. This figure could easily be \$1 billion per year”*. It also stated that the POB decision in choosing 2016 *“sets a new deadline to follow the sequence of earlier missed deadlines”*, then going on to add what needed to be done to *“create a realistic chance for this new timescale to be achieved”*. The IMB’s warnings were further expanded to say that a *“new demanding timetable for the completion of the task”* would be required and concluded that this *“bold target”* was possible, but required an improvement on current performance.

While these IMB comments on the POB decision signalled its concerns as to whether the new deadline could be met, greater optimism was shown by others. For example Dr William Moss, head of epidemiology at the International Vaccine Access Center at Johns Hopkins University, said⁸³ that it will be the *“big public health story of 2016”*.

The Rutter and Donaldson paper and 12th report of the IMB give insight into the need for the POB and the impact, or possible repercussions, of its decisions. Most important, however, is the fact that an outside and independent body was in a position to identify the need for better leadership in the GPEI and that this was responded to effectively.

Other documents reviewed which support the picture above include a POB statement⁸⁴ and letters^{85,86} from its Chair.

Global Polio Partners Group

The PPG has been meeting since late 2012 and serves as the stakeholder voice for the GPEI. Its membership is inclusive and comprises the Polio Emergency Steering Committee agencies (WHO, UNICEF, Rotary International, CDC and BMGF), donors/prospective donors, polio-affected countries and key NGOs/foundations working in polio eradication. It meets at least twice a year at ambassadorial/senior-officials level, with additional conference calls or meetings, with results of its deliberations reported to the POB. In its terms of reference it has powers to set up working groups as required.⁸⁷

4.1.3 Independent Monitoring Board

P.D. Rutter and L.J. Donaldson. Oversight Role of the Independent Monitoring Board of the Global Polio Eradication Initiative. P.4. Journal of Infectious Diseases, (2014) 210 (suppl 1): S16-S2⁸⁸

The paper emphasised the uniqueness of the IMB, which was established without precedent in either the GPEI or other health programmes. The IMB’s power derived from its complete independence from the agencies and countries that were delivering the programme, which meant that it could raise difficult issues that others could not. The IMB also set high levels of

expectation, saying “we will demand excellence, because nothing short of this will complete polio eradication”.

It consists of eight (originally nine) members who are either public health or communications experts, with Sir Liam Donaldson as Chair. The majority of the members appointed had no previous knowledge of GPEI. Its secretariat is small and also independent of the GPEI agencies and its terms of reference ask it to monitor and guide the work of the GPEI. Originally established for three years and beginning in November 2010, it has subsequently been extended.

The IMB meets every 3-6 months with ministers or senior officials from polio-affected countries who present progress reports and plans in open and then private meetings. It “seeks and triangulates information from a range of sources” about affected countries, as well as the global programme. Partner agencies may provide written reports in advance of meetings as well as making formal presentations. The IMB also hears from other experts and partners. Board and secretariat members visit affected countries to observe programme activities. Its reports analyse situations in individual polio-affected countries. Within three weeks of a meeting, its findings are produced in a written report, which is first sent to heads of GPEI core partner agencies and then “without alteration” made public.

Its recommendations have been wide ranging, including:

- Escalating the level of priority through declaring polio eradication a programmatic emergency in 2012.
- Placing greater emphasis on people in programme delivery.
- Encouraging innovation.
- Promoting ‘Every Missed Child’ (a dig at the GPEI’s slogan ‘Every Last Child’) with continuous quality improvement to reach every missed child with vaccination.
- Strengthening effort on ‘poliovirus sanctuaries’ which confined the virus to just 39 districts within the four remaining endemic countries by mid-2012, giving greater focus to key places with concentrated resources and a tailored approach to the locality.
- Highlighting the growing relevance of insecurity and the programme’s need to build expertise on it rapidly.
- Drawing attention to chronic under-emphasis on communications and social mobilization.
- Spreading best practices from places that have succeeded, with particular focus on India.
- Promoting the achievement of so-called political alignment within the country, not only to secure high-level political commitment to eradication, but also to establish means of translating this into committed local level action.
- Recommending introduction of a vaccination requirement for those travelling from polio-infected countries.

N. Bristol and C. Millard The Power of Straight Talk. The Independent Monitoring Board of the Global Polio Eradication Initiative. A Report of the CSIS Global Health Policy Center, September 2015⁸⁹

The work of the IMB has been reviewed by Bristol and Millard at the Center for Strategic and International Studies. They pointed out the reliance of the IMB on its individual members, particularly its Chair and noted that, while there was originally concern about the IMB’s lack of specific polio eradication expertise, its broad range of global health knowledge has allowed it to address issues that are generally outside the GPEI’s epidemiological approach. The authors also referred to the IMB reports as being well informed, well written and relevant to the programme’s challenges; and considered them as “a constructive balance between stern and supportive”.

At the same time they pointed out areas for improvement including lack of connection to in-country context, citing for example the fact that both Nigeria and Pakistan had to deal with deadly attacks on their polio personnel. It would appear that the IMB took notice and addressed this in its 12th report, insofar as they made specific comments and recommendations on the security aspect, although it might be said that they did not fully take into account the cultural environments in which programmes were taking place in Pakistan and Afghanistan.

The IMB's assessments were sometimes seen as off the mark and *"unrealistic and superfluous"* – for example, the recommendation to broadcast a continual live audio-visual feed from the Nigerian EOC.⁹⁰ The IMB also recommended that *"GPEI plan its activities based on programme needs, financial constraints notwithstanding"*.⁹¹ This was not seen as realistic by those under strict budget constraints. The IMB also suggested a global summit on missed children, which was deemed to be an unnecessary distraction by the GPEI leadership *"since issues facing vaccinators in hard-to-reach areas are context specific and not readily addressed by more global solutions"*. The lack of hard data to back up their assessments has also been criticized.

Nevertheless, Bristol and Millard concluded positively that *"the IMB has been a solid contributor to many of these successes. As global partnerships increasingly become the norm for large-scale health initiatives monitoring mechanisms modelled after the IMB could, under the right circumstances, improve the effectiveness and efficiency of global health management"*.

4.1.4 WHO bodies

Within WHO, a number of bodies have an important role in the world of the GPEI and polio eradication. They include the SAGE, which is WHO's principal advisory group for vaccines and immunization. It advises WHO on global policies and strategies, ranging from vaccines and technology, research and development, to delivery of immunization and its linkages with other health interventions. The SAGE is concerned with all vaccine-preventable diseases.

There are also TAGs that review at the national level the status of polio eradication in the country concerned and make recommendations on local strategy, priorities and programme operations. Currently, countries have different titles for their TAGs. There are also advisory groups covering multiple countries, namely one for central Africa and one for the Horn of Africa, WHICH review the status of polio eradication in countries of their region and makes recommendations on actions for achieving eradication.

The GCC oversees the certification process for polio eradication and also receives and reviews reports from the Regional Certification Commissions if and when appropriate. It issues a report to the DG to certify that the circulation of wild polioviruses has been interrupted globally.

Until 2010, when it was disbanded ahead of the formation of the IMB, the ACPE was the GPEI's global technical advisory body.⁹²

4.2 Financing of the GPEI

GPEI. Budgetary implications of the GPEI Strategic Plan and Financial resources requirements. 2009 – 2013. As of January 2009. WHO/POLIO/09.01⁹³

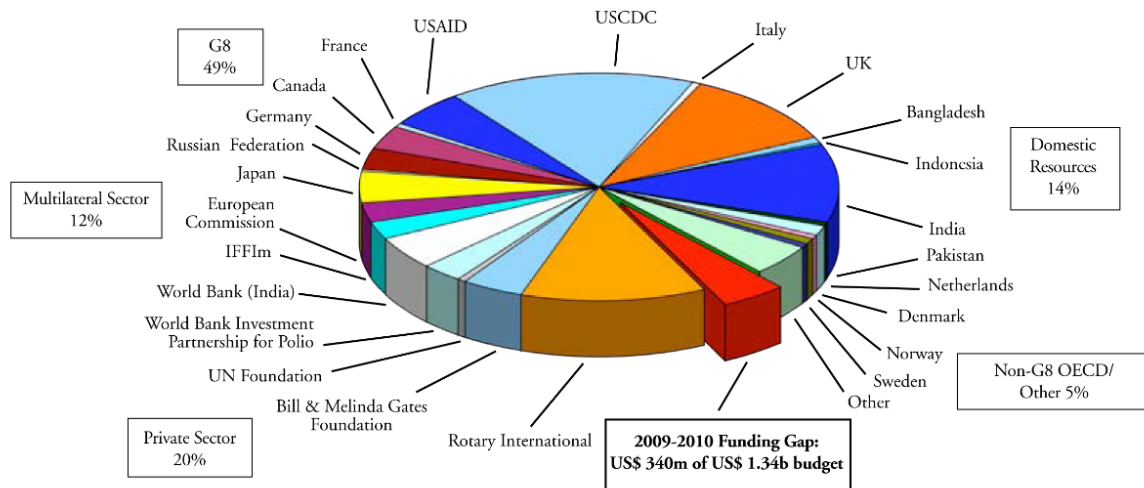
The GPEI report sets out the financial requirements for this period of time and the available funding sources. Overall, GPEI had raised over US\$ 7 billion since 1988, with 47 public and

private sector donors contributing over US\$ 1 million each and 29 donors contributing US\$5 million or more (Box 4.2).

Box 4.2 Global Polio Eradication Initiative financing

1988 to 2010: US\$ 7.13 billion

1988 to 2008: US\$ 6.13 billion expenditure; US\$ 1 billion contributions



The 24 funders shown in the Chart have each contributed more than US\$ 25 million to global polio eradication.

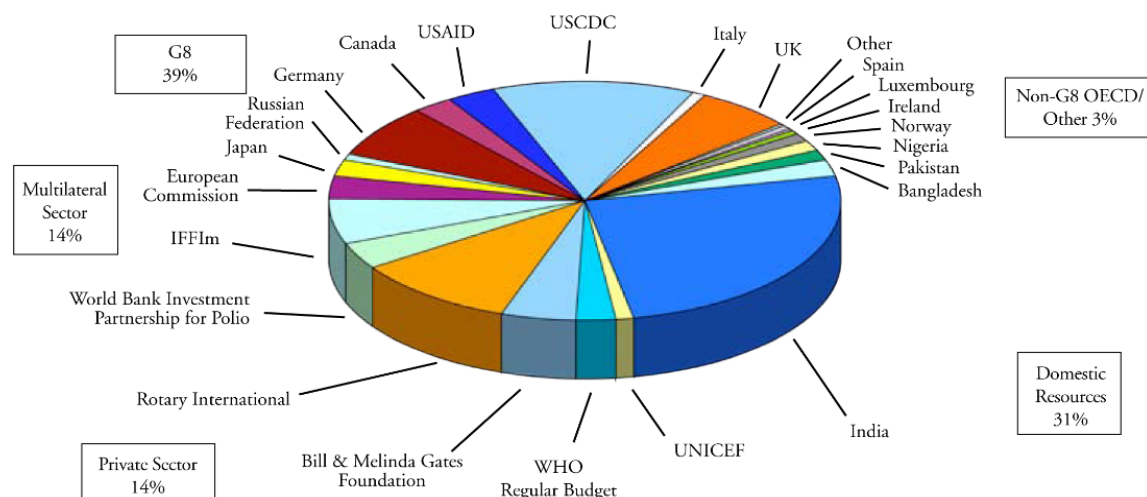
'Other' includes: Angola, Australia, Austria, Azerbaijan, Belgium, Brunei Darussalam, Cyprus, Czech Republic, Finland, Hungary, Iceland, Ireland, Kuwait, Liechtenstein, Luxembourg, Malaysia, Malta, Monaco, Namibia, New Zealand, Nigeria, Oman, Portugal, Qatar, Republic of Korea, Saudi Arabia, Singapore, Spain, Switzerland, Turkey, United Arab Emirates, African Development Bank, AG Fund, American Red Cross, De Beers, Inter-American Development Bank, Central Emergency Response Fund, International Federation of Red Cross and Red Crescent Societies, Oil For Food Programme, OPEC Fund, Sanofi Pasteur, Saudi Arabian Red Crescent Society, Smith Kline Biologicals, UNICEF National Committees, UNICEF Regular and Other Sources, United Arab Emirates Red Crescent Society, Shynnyo-en, WHO Regular Budget and Wyeth.

Source: Ref 93

Funding was also raised in-country for the *intensified polio eradication effort* for 2007-2008 on 28 February 2007, with India committing US\$ 280 million for its 2007-2008 national efforts; Nigeria pledging US\$ 32 million in 2007; and Pakistan committing US\$35 million in 2008 (Box 4.3).

Box 4.3 Financial contributions for 2007-8 intensified eradication effort

Total contribution: US\$ 1.47 billion



'Other' includes: the Governments of Angola, Australia, Austria, Azerbaijan, Brunei Darussalam, Czech Republic, Hungary, Iceland, Kuwait, Liechtenstein, Malaysia, Monaco, Namibia, Netherlands, New Zealand, Portugal, Qatar, Republic of Korea, Turkey, United Arab Emirates, Oil For Food Programme, UN Foundation, OPEC Fund for International Development, World Bank grant to Afghanistan.

Source: Ref 93

GPEI Strategic Plan 2009-2013 budgetary implications

As described in the Strategic Plan for 2009-2013, the work of the GPEI is guided by “*multi-year strategic plans which outline strategies, major activities and milestones*”. In this case, it included “*a combination of time-tested eradication strategies, recently-developed tools and tactics and bold new country-specific initiatives recommended by the ACPE and SAGE, based on five major objectives*”. The budget addressed the costs of achieving these, with the primary cost driver being the continuation of the *intensified polio eradication effort*, which accounted for 58 percent of the five-year budget.

The Strategic Plan also addressed the budget implications of persistent poliovirus transmission and the financial implications for a 12-month delay in any of the remaining areas of indigenous transmission:

- **India:** a 12-month delay in interrupting transmission in this reservoir area would require continuing intensified polio campaigns in both India and Nepal, with further financial cost of up to US\$ 225 million.
- **Nigeria:** a 12-month delay interrupting indigenous poliovirus transmission in northern Nigeria would require continuing intensified polio campaigns in at least Nigeria, Niger, Chad, Benin, northern Cameroon, Sudan and Somalia, with further financial cost of up to US\$ 143 million.
- **Pakistan/Afghanistan:** a 12-month delay in interrupting indigenous poliovirus transmission in either of these countries would require continuing intensified polio campaigns in both countries due to the large-scale population movements between them, with further financial cost of up to US\$ 92 million.

The budget also addressed planning for the post-2013 period, by which time WPV transmission was intended to have been interrupted globally. It was estimated that the annual financial resources would be significantly lower than the costs associated with the

intensified polio eradication effort. These costs would be associated with “laboratory surveillance capacity globally to detect and respond to emerging cVDPVs, especially in the three years following OPV cessation”.

Supporting the GPEI Strategic Plan 2013-18

Strategic planning and priority setting

The GPEI partners together with the BMGF provide the overall technical direction and strategic planning for the management and coordination of the GPEI, including the accompanying budgets. National governments develop the global strategic plans together with the partner and donor community to ensure that both national and stakeholder priorities are reflected. The GPEI partners and the BMGF then work to ensure that all parts of the strategic plans are implemented. Capacity gaps are filled by technical assistance if the national health system cannot provide the relevant skills.

Over time the GPEI has been responsible for changing plans and cancelling immunization campaigns if there are funding gaps. For the years 2013 and 2014 the following priorities were determined to be used if sufficient funding was not available to support the GPEI budget:

- Priority 1 core staff (12 months of funding)
- Priority 2 Surveillance and Laboratory Network (6 months)
- Priority 3 endemic country SIAs (6 months)
- Priority 4 outbreak response (3 months)
- Priority 5 high-risk/other country SIAs

Resource allocation was to be updated from 2015 onwards to reflect greater emphasis on Objective 2 (immunization systems strengthening and OPV withdrawal) and Objective 3 (containment and certification), in preparation for IPV introduction.

Resource mobilization and advocacy

The GPEI's partners and the BMGF developed a strategy for long-term, predictable funding for the 2013-2018 period, to ensure that lack of funding would not act as a barrier to the Plan's implementation and thus to polio eradication. Integrating resource mobilization, advocacy and communications strategy the aim was for:

- traditional donors to maintain or increase their commitments;
- new and non-traditional donors to be activated;
- polio-affected countries to increase their domestic financial contributions;
- innovative financing mechanisms to be identified and exploited.

For sustainable financing, governments and development partners would need to make renewed commitments, together with additional country support. Civil society participation, moreover, would be critical, as well as individual and private-sector giving, such as that of Rotary International. Significant support has come from polio-affected countries themselves, but this should be strengthened. Identifying resource needs and sources of self-financing should be carried out by national governments in coordination with immunization partners to track their effective and efficient use. Advocacy and communications activities have increasingly been used to ensure donor confidence in the GPEI to deliver and in the benefits of a polio-free world. It was important to ensure *“ongoing confidence from partners, influencers and the engaged public”* and the GPEI had begun to work with other advocacy partners such as the Global Poverty Project, which reaches younger audiences and new markets. They had also begun to reach out to a wider group of influential people including former politicians, technical and scientific and business leaders and academia.

Advocacy efforts would address oversight and accountability in high-risk countries for the full

implementation of their NEAPs and to allocate domestic financing; consistent commitment and ownership by subnational governments, e.g. provincial and state as well as lower levels as relevant; and securing the support of “donor governments, multilateral organizations, private-sector organizations, civil society partners, the media and relevant religious institutions, to advocate with polio-affected governments and communities”, engaging for example with the African Union, the Organisation of Islamic Cooperation, the Commonwealth, the United Nations General Assembly, the Economic Community of West African States, the BRICS (Brazil, Russia, India, China and South Africa), and the Gulf Cooperation Council.

Among initiatives already undertaken, leading Islamic scholars and Muslim technical experts, under the aegis of Al-Azhar University, had formed an “Islamic Advisory Group to leverage the historically strong role played by Islamic leaders in global eradication”. Periodically they would assess the remaining and emerging socio-religious and political challenges to polio eradication in the remaining polio-affected parts of the Islamic world and propose solutions. They would also “advocate within their constituencies and provide guidance on the social and religious responsibilities to protect children from vaccine-preventable disease and to eradicate polio”, as well as informing the efforts of relevant actors, such as the Organization of Islamic Cooperation, the Gulf Cooperation Council, the Islamic Development Bank, senior Islamic religious scholars and GPEI partner agencies and stakeholders. Advocacy would also be required to ensure the coordinated the switch from tOPV to bOPV in the routine immunization programmes of WHO Member States

Financial resources and management

The finances requirement, projected by global, regional and country stakeholders, for the activities contained in the Plan was US\$ 5.5 billion for 2013-2018. This figure excluded approximately US \$ 1.23 billion Government of India funding and any other national or in-kind contributions, but took into account various scenarios.⁹⁴ To help mobilize funding commitments for 2013-2018, an “interagency resource mobilization strategy is being implemented with rigorous weekly follow-up“. This strategy was to be reviewed and revised after the Global Vaccine Summit (see below) to ensure the continued coordination of advocacy and resource mobilization activities. The US\$ 5.5 billion cost model included the following key assumptions:

- interruption of residual WPV transmission by the end of 2014
- complementary OPV campaigns to boost type 2 immunity before the tOPV-bOPV switch and additional coverage as needed between 2014 and 2015, declining post-interruption
- introduction of at least one dose of IPV in routine immunization prior to the tOPV-bOPV switch
- human resource surge capacity to support eradication efforts in remaining polio-endemic and high-risk countries
- maintenance of outbreak response capacity through 2018
- maintenance of 2013 levels of technical assistance, social mobilization, global laboratory requirements, and research and product development through 2018
- maintenance of environmental surveillance through 2018
- stockpile projections for 2014 and 2016 based upon existing contracts

It was noted that OPV campaign activities would remain high through 2015, after which they would gradually decline. While technical assistance and surveillance costs would remain relatively stable, some costs, e.g. innovation and campaign quality improvement, would decrease following the interruption of transmission. Other costs, however, e.g. use of stand-alone IPV in routine immunization, would continue well after interruption of WPV globally.

It was recognized that “*reduced levels of continued funding will be needed beyond polio eradication certification in 2018, including limited OPV campaigns and technical assistance continuing into 2020 as bOPV is withdrawn globally*”. The GPEI also expected certain costs associated with containment, surveillance and lab expenses to continue for up to five years post-certification.

As part of its evaluation of costs throughout the implementation of polio eradication activities, the GPEI commissioned an independent Value for Money study that was conducted from mid-2012 to early 2013. Its findings included:

- near-term opportunities to improve OPV buffer management and vaccinator training quality/frequency over the next 12 months
- medium-term opportunities to adjust the scale of operations as areas become polio-free (improving target population estimates and optimizing SIA frequency) over the next one to two years
- long-term opportunities to be captured in the legacy planning process and implementation of the legacy plan over the next two to six years
- best-practice opportunities where there is already good value for money that could be capitalized upon and expanded (i.e. cost-sharing, reaching the hard-to-reach, leveraging new technology).

The near-term opportunities, as well as medium-term savings in the area of SIA campaigns and long-term opportunities highlighted significant savings.

The issue of value for money was discussed in the Project Completion Review for the support by the UK Department for International Development (DFID) for the GPEI (2008-2013),⁹⁵ noting the good examples that it had identified in the areas of innovative and tailored approaches for reaching inaccessible population segments, new technologies for improving the programmes execution effectiveness and the improved micro-plans. The report clearly resonated with DFID, which put great emphasis on value for money.

The GPEI Eradication and Endgame Strategic Plan was endorsed by more than 400 scientists and global health experts on 11 April 2013 in a Scientific Declaration on Polio Eradication.⁹⁶ At the Global Vaccine Summit in Abu Dhabi shortly afterwards, global leaders and individual philanthropists pledged three-quarters of the Plan’s projected US\$ 5.5 billion costs over six years.⁹⁷ Adding to the effort of BMGF,⁹⁸ commitments were also made by the Albert L. Ueltschi Foundation, Alwaleed Bin Talal Foundation-Global, Bloomberg Philanthropies, Carlos Slim Foundation, Dalio Foundation, The Foundation for a Greater Opportunity established by Carl C. Icahn, and The Tahir Foundation.

GPEI: Financial resource requirements 2013-2018 (as of December 2014)⁹⁹

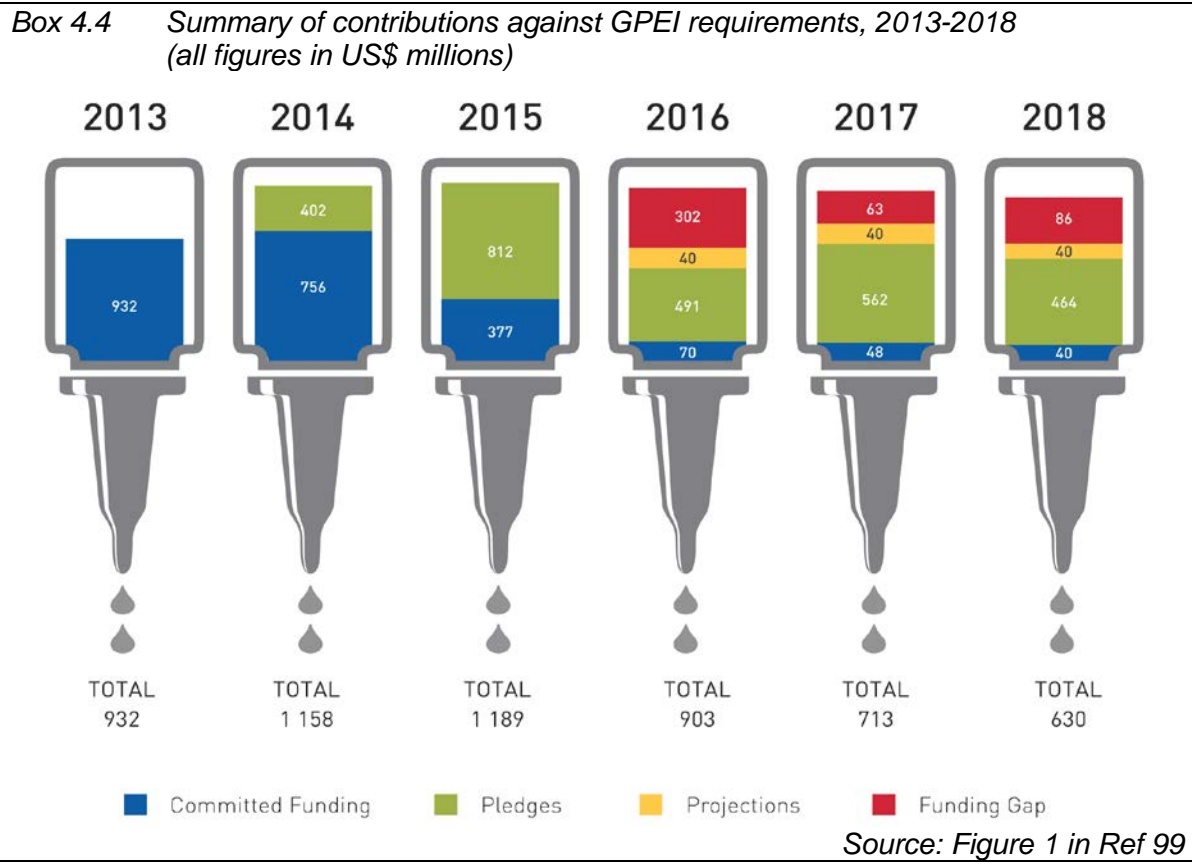
The financial requirements for the period were presented in a Financial Resource Requirements document that accompanied the Polio Eradication & Endgame Strategic Plan 2013-2018, with corresponding costs and underlying assumptions for each major budget category. The financial requirements are reviewed and updated quarterly and the proportion of requirements under key budget categories adjusted as progress against key milestones is evaluated. They do not include estimations of costs incurred directly by national governments.

A summary of contributions against GPEI requirements for the Plan period is given in Box 4.4

The document recognized the major epidemiological priority of halting the virus in Pakistan and Afghanistan and that Pakistan was now the greatest risk to “*achieving a polio-free world,*

as too many children remain under-immunized (due to operational challenges, insecurity, targeted attacks on health workers and hampered access)”.

In addition to setting out the external resource requirements, the report provided the Plan budget by major budget category, as well as the status of pledges and funding commitments following the 2013 Global Vaccine Summit. In total, committed funds at the April 2013 Global Vaccine Summit amounted to US\$ 4.041 billion, while confirmed funding against the GPEI Financial Resource Requirements, as of 1 December 2014, totalled US\$ 1.995 billion.



PART 2

5. DOWN TO THE WIRE: WILL TRANSMISSION BE INTERRUPTED in 2016?

At the beginning of 2016, there were signs of optimism from the POB and others that polio transmission would be interrupted by the end of the year, leading to eradication officially being certified in 2019. There were of course caveats, as voiced by the IMB in their 12th report.¹⁰⁰ In many ways the omens appeared good, in terms of conquering the virus:

- The number of cases of polio in 2015 was the lowest ever and there were only two endemic countries remaining.
- No WPV type 3 had been reported anywhere in the world since November 2012. There had been no WPV type 2 since 1999 and no WPV type 1 found in Africa since August 2014 in Somalia.
- The date for withdrawal of the type 2 component in oral polio vaccine had been set, with the switch from trivalent oral polio vaccine to bivalent (types 1 and 3) OPV to take place between 17 April and 1 May 2016 in all countries still using tOPV.

But another violent attack on the immunization programme, this one a bomb outside a vaccination centre in the south-western Pakistani city of Quetta in Balochistan on 13 January 2016 as polio workers and security staff were reporting for duty before heading out on their vaccination rounds, was a tragic reminder of the vulnerability of the programme.¹⁰¹ The Tehreek-i-Taliban (TTP) Pakistan claimed responsibility for the attack, which killed more than a dozen people.^{102,103}

5.1 Making GPEI 'fit for purpose'

GPEI. Meeting of the Polio Oversight Board. Geneva 12 December 2014. Meeting minutes¹⁰⁴

At the POB meeting in December 2014, the chair presented a summary of the GPEI management review findings and consensus POB positions. A report had been prepared by PricewaterhouseCoopers (PwC) that considered two different scenarios: a restructuring of GPEI or a reorientation of the existing structure. POB members unanimously decided to focus on the 'reorient' solution, a decision that was shared by many donors during the 8 December PPG meeting.

The Chair summarized the key POB consensus decisions taken from this review in the minutes, categorizing them as governance and management solutions and noting whether each recommendation was adopted without changes or adopted with modifications made by the POB. The full text of these recommendations can be found in Appendix A of the document.¹⁰⁵

The DG announced in the context of a 'GPEI Leader' that the WHO Polio Director, Dr. Hamid Jafari, would report directly to her. PwC, moreover, should draw up a proposed timeline for implementation by the end of the year.

The subsequent improvements in the GPEI as a result of the review were noted in the 12th IMB report, which said that *"decision-making, partnership working, overall leadership, financing transparency, and the cohesiveness of the programme have steadily improved"*. They observed, however, that the *"level of coordination across partners necessary to assure high within-country performance remains problematic"*.¹⁰⁶ Nevertheless, the real action would have to take place at the national level in the countries concerned.

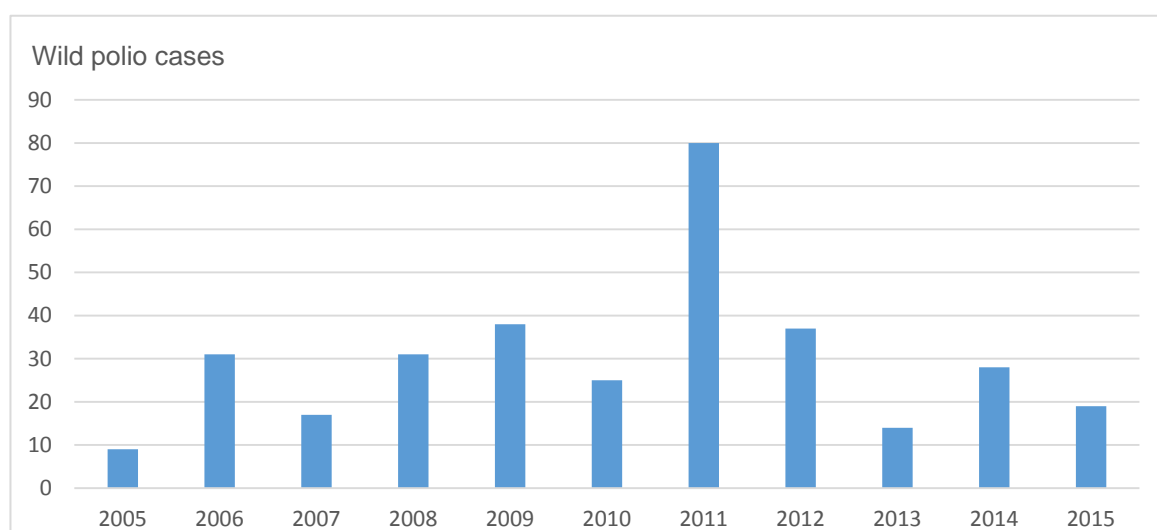
5.2 The remaining endemic countries

5.2.1 Afghanistan

Current situation in general

The most up-to-date information at time of writing, as included on the GPEI website at the end of January 2016,¹⁰⁷ gave the number of cases in Afghanistan in 2015 as 19. While this was lower than the 28 cases reported for 2014, it was not evidence of a simple downward trend, as annual case numbers have fluctuated over the last decade (Box 5.1).^{108,109}

Box 5.1 Wild polio cases, Afghanistan 2005-2015



Drawn from data from GPEI, Refs 108, 109

In-depth assessment of progress

C. Mbaeyi et al. Progress towards poliomyelitis eradication: Afghanistan, January 2014-August 2015. WHO Weekly epidemiological record. 23 October 2015, No 43 2015, 90, pp577-588¹¹⁰

This article provided an overall view of polio eradication in Afghanistan in 2014-2015, including information on cross-border transmission and the state of the health and immunization systems. It addressed specific problems such as missed children, both in conflict and no-conflict areas, providing key information for the strategies needing to be achieved to interrupt transmission in the coming year.

Confirmed cases and cross-border transmission

Cross-border transmission remained a continuing problem, as can be seen in the three cases that occurred among children who were displaced from North Waziristan in Pakistan. In addition, 26 of the 28 WPV1 cases in 2014 belonged to the genetic cluster R4B, which was known to be circulated in neighbouring areas of Pakistan. In 2015, of the first nine cases, the two cases from Nangarhar appeared to be linked to cross-border importation from Pakistan.

Weak health and immunization systems

The country's routine immunization system continued to be weak and the national PEI was mainly relying on targeting children under-5 with SIAs of OPV.

However, it was reported in lot quality assurance surveys that improvements in the quality of campaigns had slightly declined from 2014 to 2015 and that SIAs in about a third of the assessed districts were "*deemed unsatisfactory*". In addition, routine immunization continued to be at a very low coverage level in both the Southern and Western Regions.

Missed children, conflict and no-conflict areas

House-to-house SIAs, targeted at children under five years of age, were used in Afghanistan in the 15 months from January 2014 to August 2015, using different OPV formulations including trivalent, bivalent (types 1 and 3) and monovalent (type 1) OPV. A total of 41 SIAs took place, including seven NIDs, six NIDs/ SNIDs and 28 small 'short-interval additional dose' campaigns. In addition, vaccination campaigns with IPV were conducted in November 2014 and February and August 2015 in selected parts of high-risk districts of the Southern and Eastern Regions, once it was possible to again access to these areas (see below in EB document). Campaigns also took place at transit points and the border crossings with Pakistan, as well as in camps for displaced persons.

Nevertheless, the on-going conflict and insecurity, particularly in Southern and Eastern Regions, as well as in Farah, meant that access to children remained limited during SIAs. In the NIDs completed in 2015, it was estimated that out of the approximately 9 million children targeted for the NID, 1-3 percent were living in temporarily inaccessible areas. Temporary bans imposed in Helmand (March - July 2014 and December 2014 - January 2015) and in Kandahar (June – early August 2015) also had an influence on SIAs. However, this did not seem to be the major problem in that, as reported in the article, the post-SIA evaluation of NIDs and SNIDs in 2015 had shown that "***the great majority of children not reached during the SIA continued to be missed in accessible areas***". Indeed, according to data from NIDs in March 2015 "*538,412 (7 percent) of 7,607,067 remained unvaccinated, of which only 109,017 (20 percent) were children living in areas inaccessible during the SIA*". In NIDs in May and August, the proportions of children missed were 32 percent and 14 percent respectively and the reality was that approximately 400,000-500,000 of the missed children lived in accessible areas. The reason therefore could only be attributed to the "*failure to plan, implement and supervise efficient SIAs*".

In general 2014 saw a significant setback in progress in the eradication of polio for Afghanistan, as a resurgence of polio transmission occurred and the number of poliomyelitis cases doubled from levels reported in the previous year. In 2015, however, there was no case reported from Kandahar during the period under review, and only a single case from Helmand province, the previous main polio-endemic area of the Southern Region. Farah province of the Western Region accounted for half of the polio cases reported from Afghanistan in 2015, frequently involving unvaccinated children.

138th session, WHO Executive Board. Poliomyelitis. Report by Secretariat. (EB138/25), 11 December 2015. EB138/25 11 December 2015¹¹¹

The report to the EB in January 2016 made specific reference to the children missed not only because of inaccessibility, but also because of the "*operational deficits in accessible areas*". It also shed light on the solution that broke the temporary suspension of vaccination activities by local leaders in some of the areas in the Southern Region, "*by highlighting the importance of maintaining the neutrality of public health efforts*". This echoed back to the 'truce days' and 'days of tranquillity' in the early years of polio eradication, as well as the concerns previously expressed, in an independent evaluation of the interruption of polio virus transmission, about high-profile endorsement by political, international and military figures as

being unnecessary and possibly counter-productive in non-secure areas.¹¹²

The report also highlighted that, for Afghanistan, *“although a national emergency action plan has been established, its implementation is incomplete”* and that there should be stronger coordination through a better-functioning EOC *“to enable monitoring, timely corrective action and accountability to reach persistently-missed children”*.

During the discussions of the report in the EB in January 2016, many of the countries present congratulated Nigeria on its removal from the list of endemic countries. They also welcomed the progress that had been made in Afghanistan and Pakistan, expressing the hope that the virus would be interrupted in both of them during 2016. Both Pakistan and Afghanistan referred to their cross-border collaboration during their interventions. Some countries also commented on the need to ensure that vulnerable populations, including migrants, received full protection from the virus.

The importance of political commitment was referred to by a number of countries, including France on behalf of the European Member States. Namibia, on behalf of the 14 African member countries drew attention to the declaration for eradication in Africa at the African Union Summit in 2015, taking note of report and stressing their commitment.

Egypt warned against the deterioration of the situation in EMRO, while Jordan referred to the problem of neighbouring countries that constituted a threat, e.g. Syria, noting that they had set up a centre financed by limited funds.

A number of countries addressed aspects of legacy, including Japan in the context of other infectious diseases and transition plans by Canada. Monaco also highlighted planning for legacy including strengthening health systems.

Several commented on the planned withdrawal of type 2 OPVs in the later part of April 2016. This was addressed in the response from Dr Hamid Jafari, who said that there was a shortage of IPV because of technical difficulties. GPEI and partners were working closely with manufacturers and regulatory authorities. The Chair of POB had written to all to increase the supply. The SAGE had considered a risk-based approach with IPV introduced in tier 1 and tier 2 countries before the switch, as well as some of the tier 3 countries. Dr Jafari also said that vaccination should be reinstated in Liberia and Sierra Leone.

The issue of funding was raised by some countries including France, who urged donors and countries to provide resources; Kuwait, on behalf of countries in EMRO; Japan, which would continue to provide financial and technical assistance and was supporting Pakistan through a new mechanism; the Russian Federation, which would look at trying to step up its contribution; the UK as a major contributor, which would be making a further commitment; and the USA, pointing out that it had increased its financial support.

The attacks on health workers and security officers – particularly the recent attack in Quetta in Pakistan – were strongly condemned by a number of countries including France, the UK, Monaco and Turkey. Pakistan said it was a stark reminder of the war against terror.

Vaccination before travel was also referred to, including in connection with the Hajj. India was also imposing travel advisories following WHO guidelines.

Afghanistan: IMB comments in 12th Report¹¹³

Among the measures that the IMB considered to be realistic to meet the new 2016 timescale, for Afghanistan (and also Pakistan) high quality campaigns should take place in the low season, the last before the deadline. There should also be *“rigorous application, and*

careful targeting, of combined IPV/OPV in a more consistent way than hitherto in both Afghanistan and Pakistan”, together with major and rapid expansion of environmental surveillance.

Specifically for Afghanistan, the IMB highlighted the weak social mobilization and vaccination team performance in the southern part of the country, with 62 percent of missed children and an additional 17 percent of parental refusal. The IMB saw these as *“a clear indicator of poor programme performance”*. In Kandahar and Helmand there have been chronic inaccessibility issues, because of intermittent local access bans. The IMB noted the differences behind the 64 percent of missed children in the eastern provinces because of the insecurity, which was worsening with some factions *“overtly anti-polio vaccine”*. It also referred to the fragmentation of anti-governmental elements that make it more difficult to negotiate access. Furthermore, relationships between the Afghanistan Government and the WHO and UNICEF country offices were not well aligned and were *“frankly ineffective”* and despite a previous request from the IMB an EOC, which was successful in Nigeria and was becoming more so in Pakistan, had not yet been established.

The political and security situation and its impact on vaccination programmes

During the last weeks of 2015, the political situation in parts of Afghanistan seriously deteriorated with the Taliban taking control of key areas in Helmand Province. In addition there had been major security problems occurring in Nangahar province, involving both Taliban and Daesh/ISIS, particularly in the Achin District.

Three articles from three different newspapers showed the complexities of the problems, some of which are discussed further in Chapter 6.

The first article, from the Afghan Times,¹¹⁴ related to problems in recruiting female health workers. Their involvement is critically important insofar as male health workers will not have the same access to homes in some areas. It also highlighted the role that these women can play in raising public awareness of the importance of polio vaccination as well as in vaccination programmes themselves. The second article, from the International Business Times¹¹⁵ and the third, from CatchNews,¹¹⁶ clearly showed the difficulties of working in Nangahar province, the importance of security for those involved with polio vaccination and the need for a coherent policy for addressing the problems related to the Taliban and Daesh/ISIS. While it was possible to vaccinate in the Southern Region during a brief improvement in the political situation, it is less likely that this will be the case in Nangarhar. In the context of polio eradication, it is important to note the Daesh/ISIS presence in Nangarhar and Helmand. Nangarhar reached to the border with Pakistan and is where there were outbreaks of the WPV in the Eastern province in 2014 and 2015 (see below).¹¹⁷

Polio Eradication Initiative, Afghanistan. National Emergency Action Plan (NEAP), July 2013-June 2014¹¹⁸

The aim of the NEAP, which had been revised from an initial plan developed in 2012,¹¹⁹ was to ensure the achievement of the ultimate goal of *“interrupting wild polio virus transmission in Afghanistan by the end of 2013”*. It identified six key intervention areas including low performing districts (LPDs), special focus on missed children and communication directed to increased community demand and ownership. The LPDs, of which there were then 30, were located in the Southern and Eastern regions.

In the first half of 2014, only three cases had been reported in three districts in the two Eastern provinces of Nangahar and Kunar. Two of these cases were from *“partially inaccessible clusters due to insecurity”* which had been the situation for a long period of time. The third was from an accessible area.

The NEAP pointed to the numbers of missed children in both the Southern and Eastern

Regions. The immunity gap on the Southern Region was *“due to consistent compromised quality of campaigns with very low routine EPI coverage”*. Most of the missed children were in areas where the teams had access. This indicated improving the gaps in planning, management and accountability and low community awareness and demand as being the main challenge.

In the Eastern Region, however, the sole reason for the missed children was *“inaccessibility in some districts either totally or partially”*. Cross-border population movements contributed to *“increased risk of virus circulation as well as missing children in one or other country”*. The increased numbers of cVDPV cases in North Waziristan, on the other side of the border also posed a threat in the South Eastern Region. In addition mobile populations such as nomads, gypsies and returnees, together with the deterioration of security and cross border tensions in 2014, were also further risks.

The NEAP noted that political commitment remained strong at the national level, although turning it into action at provincial and regional level required extra efforts. While the Inter Ministerial Task Force had met, the *“level of participation and regularity [needed] improvement”*. A formal meeting of Provincial Governors of high-risk provinces had yet to take place. Consequently the potential impact of such meetings had been lost. Regional and provincial level ownership seemed to be improving but more regular reporting was required. In LPDs, ownership was gradually improving. The Plan also noted that *“using globally developed questionnaires... indicated a huge potential to obtain ownership by communities at households and by religious and elders in the communities”*, although the sampling was small and only in a district in Nangarhar. Nevertheless they recognized that *“increased ownership and creating demand by communities and parents are essential”*. Other measures taken included training of Ministry of Public Health, NGOs, UNICEF and WHO staff at all levels and the introduction of an accountability framework, including key monitoring indicators. The NEAP also noted the challenge of motivating campaign personnel.

Engaging the International Committee of the Red Cross (ICRC) was part of the strategy from August 2012 to January 2013, as a means of accessing security compromised areas during the first half of 2013. This contributed to a decrease in numbers of missed children in the Southern Region, although not in the Eastern Region. Mapping of children by clusters/villages had been carried out as well as the use of questionnaires that contributed to understanding *“the dynamics of the inaccessibility due to security”* with the realization that *“one size does not fit all”* and that a strategy that worked in the Southern Region had *“little or no chances to be implemented in the East”*.

The new polio campaign with the motto ‘Ending Polio is MY RESPONSIBILITY’ was launched using both radio and TV with an eight-fold increase in airtime over previous campaigns. Community sensitization with mullah imams, ulema-i-shura and community elders was also used in the Southern Region, as well as sporting events, including football tournaments. Routine EPI was also strengthened, including plans to review the performance of NGOs. Two major vaccination campaigns for measles and tetanus toxoid were carried out, as well as other strategies. WHO recruited additional District Polio Officers for high-risk areas and UNICEF also recruited additional staff. Meanwhile the Polio/Immunization communication network was restructured.

Half the children in the Southern Region were missed because they were not at home and the other half because the team did not visit or there were all kinds of refusals. In the Eastern Region 90 percent of the children were missed because they were not at home and only 2 percent because the team did not visit, with 2 percent because of refusals. Once again it was the same conclusion that *“one size does not fit all”* and that tailored approaches were required. New tactics were therefore proposed for LPDs, which contributed to the lowering of the numbers of cases in the first half of 2013.

Among the strategies adopted was the use of the existing structures of Community Health Workers, as well as updating micro plans, training plans and mapping using digital software, which was being expanded to the Eastern and South-Eastern Regions by the end of 2013. Both poor management and insecurity were cited as reasons for the missed children and the question was raised as to where the children were who had been missed. Transit teams were also deployed to market places and bus stations to vaccinate in-transit children. On the issue of refusals, it was noted that, in addition to 'open' refusals, there were also 'hidden' refusals such as *"sick, sleep and new born"*, which together contributed to the 20-25 percent of all missed children. Messages on vaccinating newborns were also going to be disseminated through religious leaders, Community Health Workers and Skilled Birth Attendants. Volunteers selected should come from the area concerned and be at least 18 years old and special emphasis should be given to the *"no team visited areas"*.

National Rapid Response Teams should, in addition to conducting detailed case investigations as and when a WPV/cVDPV case was confirmed, undertake special investigations of missed children using a global questionnaire. Specific guidance was given for reaching missed children due to insecurity, including negotiating access through the ICRC and engaging with community and religious leaders. Flexibility was recognized as important as well as transit teams in entry and exit points of the inaccessible areas. Neutrality of the programme was a ground rule.

Activities beyond just polio vaccinations were included such as house-to-house interpersonal communication with parent/caregivers between campaigns focusing on missed children, refusals, identification of new-borns and messaging on routine immunization and hand-washing; engaging with local religious leaders, school teachers and community-based organizations in meetings and events; and ensuring that parents and caregivers seek services through gate keepers at the community level. Mass media and mobile technology were also used before and during campaigns. A 'polio info database', a digital platform, also provided a hub for different data.

Cross-border transit teams would also function at border gates around the clock on a permanent basis, with regular cross-border meetings to share plans before each campaign. Negative propaganda and rumours in the media across borders would also be monitored closely.

The NEAP should be flexible *"to adapt according to the changing environment no matter whether the changes are epidemiological and health related or socio economic or both"*.

Polio Eradication Initiative, Afghanistan. National Emergency Action Plan for Polio Eradication, July 2015-June 2016¹²⁰

The most recent NEAP was published in 2015. It built on the 2013-2014 NEAP but was much more focused on the key areas, although it fell short in lack of emphasis on the problems that were arising in the Eastern Region, particularly in Nangahar Province as far as security is concerned. Nevertheless the approach was much more strategic than that previously and more in line with that of Pakistan, emphasizing the importance of cross-border collaboration.

The NEAP updated that of the previous year (see above), stressing the scale of the Initiative in Afghanistan with *"thousands of health care workers operating in every corner of Afghanistan to engage in one of the largest public health undertakings in the country: the vaccination of millions of children against polio"*. It articulated how they *"intend to reverse setbacks, measure results, create an enabling environment, learn from past mistakes... [while] the largest challenges remain in identifying and vaccinating missing children"*. While

the numbers of missing children had decreased slightly, they still remained too high, resulting in too many immunity gaps.

The NEAP outlined the programme's neutrality as a *"cornerstone to successful polio eradication"*, noting that the virus has always found 'sanctuaries' to replicate and survive and that the *"focus should be on infected locations in order to interrupt virus transmission by mid-2016 at the latest"*. With this as its goal, its objectives included, on the one hand, ending the circulation of indigenous WPV in the Southern Region by the end of June 2016 and, on the other, interrupting the circulation of WPV1 in Southern, Eastern and South-Eastern Regions and Farah Province in the Western Region during the same time frame, as well as responding to its cross-border importation, while maintaining the polio-free status of non-infected areas.

Also of note is the full commitment of the Afghanistan President, the Chief Executive Officer as well as lead role of the Ministry of Health. As had been done in both Pakistan and Nigeria, the PEI was establishing a National EOC. The Plan also included a Polio High Council, bringing together other line Ministries and chaired by the Presidential Focal Person for Polio Eradication, who would communicate with Provincial Governors. This brought the Afghanistan NEAP closer into line with that of Pakistan.

A regional EOC would be established in Jalalabad in Nangarhar Province for the Eastern Region, as well as one in Kandahar and one in Herat for the Southern and Western Regions respectively. The establishment and functioning of Polio Control Rooms would also be reviewed.

The focus would continue to be on LPDs as the main 'sanctuaries' for WPV. Activities included pre-campaign coordination, microplan updating in the Eastern Region and improving the selection and capacity of front-line workers. In addition in the LPDs Social Mobilizers would go house-to-house before and during the campaigns providing information, also with a revisit strategy to vaccinate absent children at the end of each day, together with a fourth day revisit to catch up any remaining unvaccinated. Evening meetings of organizers would be held with surveys and assessments would be arranged post-campaign, involving universities. 'Finger-mark status' would also be used to locate missing children. Innovative technologies were introduced such as mobile phone technology to collect real-time monitoring data in selected areas, in addition to mobile phone-based 'Interactive Voice Response'.

Much more emphasis would be placed on cross-border transmission, recognizing that the border areas of Pakistan and Afghanistan not only shared a common culture and language but also had a shared reservoir of poliovirus circulation that was considered an epidemiological block. Migration at *"major border crossings provides an opportunity for OPV vaccination at target-age children"*. There were Permanent Cross-Border Teams at major checkpoints. Groups such as nomads and Afghan refugees returning home would be targeted. The programme of cross-border coordination meetings would be expanded and regularized in the NEAP, with recognition of those who cross daily and act as *"silent virus carriers"*. National and provincial level teleconferences would also be organized on a regular basis.

The importance of front-line workers was also recognized, including vaccinator volunteers and LPD Social Mobilizers, with an emphasis on selection, training and supervision. They should, for example, be selected from within communities *"based on merit"*. Issues to do with their payment were also addressed. It was also noted that communication should move to *"increasing public knowledge about polio as a disease and about the efficacy of the polio vaccine"*, emphasizing that the disease is incurable and all children have to be vaccinated every time the vaccine is offered. The media should be engaged in covering the continuing

success of polio eradication as a 'public health story'. The polio programme should speak with a consistent voice and agreements should be made with the British Broadcasting Corporation and with Voice of America "to increase coverage within Afghanistan on polio as a public health priority".

On enrolling 'new influencers', endorsements had been sought mainly from religious leaders in the context of civil society, but the NEAP recognized that they were not necessarily the leading source of trusted information, although their buy-in remained important in traditional parts of the country. Other influencers could include "cricket players, actors, comedians, doctors, poets and singers".

Steps would be taken for pre-departure vaccination of travellers to India and also all travellers to Saudi Arabia for the Hajj pilgrimage in line with the Emergency Expert Committee report to the May 2015 WHA that concluded that "both Afghanistan and Pakistan are now considered among the 'virus exporting countries', posing a major threat of re-infecting polio-free countries worldwide". It also emphasized the "importance of close and continuous cross-border coordination between Afghanistan and Pakistan".

Surveillance also remains crucial particularly in hard-to-reach and security compromised areas, given that 'orphan' viruses belonging to the previously endemic WPV1 strain were detected recently in the Southern Region.

Other literature consulted regarding the eradication Initiative in Afghanistan included a presentation¹²¹ from a TAG meeting in Islamabad on the updated NEAP in June 2014 and from the IMB meeting in London on 6 October 2015 (see above).

Afghanistan: summing up

The IMB summarised the situation as follows: Afghanistan's programme was not working properly and there was a risk that it would be "the weak link in the drive for interruption of transmission in 2016". The government must clarify roles, responsibilities and accountabilities within the complex structure that had developed. In addition the international partners needed to work better collaboratively. The rapid development of a working EOC, so long delayed, was an absolute 'must'. As the security situation remained uncertain, every possible opportunity to reach inaccessible children must be taken.

A number of issues reoccurred and must be addressed to ensure eradication in the country. First and foremost was the issue of missed children. They included both children in accessible areas and those in inaccessible and insecure areas. It was notable that some were missed because they teams did not come or because they were not at home, but it was unclear as to where they were and others were missed because they refused, either because their parents actually refused or because they were 'hidden' refusals, e.g. they were sick, asleep or new born.

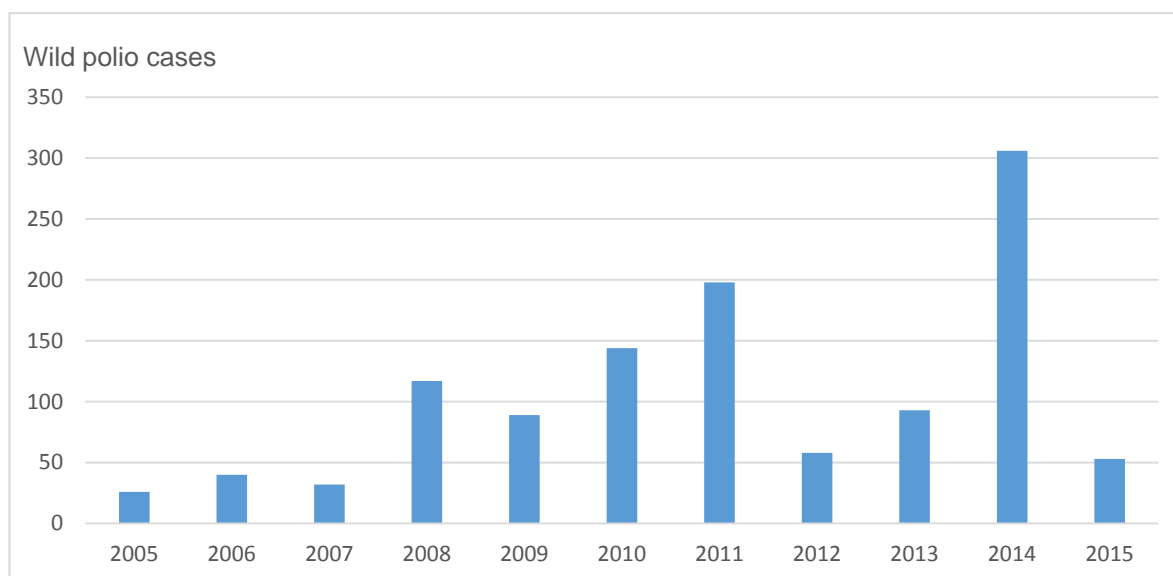
The insecurity was and would be a major problem in eradicating the last cases in Afghanistan as the area was currently particularly dangerous, with both Taliban and Daesh/ISIS active. The border was also a problem, but efforts had been made for collaboration and information sharing with meetings involving both Afghanistan and Pakistan Government officials. The experiences of the NEAP had shown that the involvement of the highest levels of Government was also important, together with involvement of officials and community leaders, including religious leaders at all levels.

The most recent NEAP did begin to move in the right direction in being more strategic and focusing on the real problematic part of the country going forward – the troublesome, porous border with Pakistan.

5.2.2 Pakistan

The most up-to-date information at time of writing, as included on the GPEI website at the end of January 2016,¹²² gave the number of cases in Pakistan in 2015 as 55, including 53 WPV. This was substantially lower than the 306 cases reported for 2014, but annual case numbers had fluctuated substantially over the previous decade (Box 5.2).

Box 5.2 Wild polio cases, Pakistan 2005-2015



Drawn from data from GPEI, Refs 108,109

Pakistan: National Emergency Action Plan for Polio Eradication 2015-16¹²³

Overall polio situation

Pakistan had 86 percent of the global case count in 2014, reporting 306 wild poliovirus (WPV) cases. In comparison Afghanistan had a total of 28 cases for 2014 and Nigeria reported none. More than 84 percent of Pakistan's cases were in children under 2 years of age and only 22 percent had received 1 to 3 doses. 94 percent were in mobile Pashto-speaking families. Intense transmission and extensive population movements (due to conflicts) meant that the virus spread to other areas.

Accessibility and impact of military operations

Military operations in North Waziristan led to a population exodus which allowed 260,000 children to be reached through Permanent Transit Points established on their outward journey. A campaign was then launched in areas that hosted these temporary displaced persons. Military operations also allowed children in previously inaccessible areas of the Khyber agency to be reached after many years. There was a resumption of house-to-house and hujra vaccinations in North and South Waziristan during the fourth quarter of 2014. Immunization activity also continued with the support of the Army all over FATA and 12 districts contiguous districts of Khyber Paktunkhwa.

“There was significant progress in accessing previously unreached children in security-compromised areas. Improved communication and joint planning with security agencies at all levels supported this endeavour.” Progress was also recorded in 2014 with a large number of children, who previously could not be reached being accessed through ‘protected

campaigns' and transit vaccinations. Nevertheless the virus continued to circulate within known endemic reservoirs and spread to other areas and outbreaks.

Government structure for polio eradication

The Polio Eradication Programme in Pakistan is a national programme for which the responsibility lies at the Federal and Provincial levels. There is renewed Government commitment and oversight headed by the Prime Minister's Focus Group with the National Task Force. There is also a Minister, a Prime Minister's Focal Person and an approach that includes district prioritization and a high-risk Union Council. Enhanced coordination is provided via the National EOC and provincial EOCs, which includes joint operational and security planning e.g. Peshawar and Karachi. There is also a major surge of polio staff especially at the field level, supported by GPEI partners. The payments system has also been improved and a systematic review of microplans instituted in the high-risk Union Council. Other innovations include joint planning with security forces in FATA, KP and Sindh (Karachi) and strategies for reaching approximately 9 million children in transit. Cross-border cooperation was also highlighted as well as Ulema Conference and Religious Support Persons.

Among the lessons learned were that significant pockets of missed children remained; payment mechanisms were still not efficient; and front line workers were often poorly selected, supervised and supported. In future, the programme would include a focus on missed children and an enhanced transit strategy combining polio vaccination with other interventions such as measles vaccination or other routine immunizations. Regarding SIAs in security-compromised areas, most casualties were incurred during door-to-door campaigns and security escorts had been specifically targeted while they directly escorted polio workers or travelling to/from polio escort duties. There were fewer incidents when they secured an area by creating a cordon and/or patrols. Involvement with community influencers helped with successful implementation, while all areas were potentially insecure and required "a *systematic and thorough security assessment before each campaign*".

Challenges for 2015-16

The programme for 2015-16 included ensuring adequate protection for all polio activities; increased efforts to vaccinate inaccessible, underserved or mobile populations and ensuring close communication, situational awareness, coordination and integration at all levels.

The NEAP was guided by a number of principles including increasing programmatic access and reach for continuously missed children as well as enhanced/real time monitoring and accountability. Clearing the 11 remaining core reservoirs by finding and vaccinating chronically missed subpopulations and reducing the number of missed children to zero by December 2015 were priorities, as well as detecting, containing and eliminating the virus from newly-infected areas.

On reaching continuously missed children, the NEAP noted that while the proportion may be small among those targeted for SIAs, the number was high enough to sustain virus circulation and that a paradigm shift away from 'covered children' towards 'continuously missed children' was now required. A list of missed children based on child/household locations across Pakistan should be consolidated.

Micro-planning was also considered important and must be a collaborative effort between all departments in the Union Council, calling on the revenue department, education, local law enforcement, religious leaders, civil society organizations, the health department and others. An acceptable micro-plan needed to include certain elements such as vaccine and logistics map of refusal clusters and high risk and migrant populations; a security plan; lists of religious leaders and key community influencers; identification of all nursery schools and

madrassas in the area; and mapping of transit points and transit team deployment and supervision plans.

With up to 200,000 front-line workers involved in national vaccination campaigns across Pakistan, the NEAP recognized that each vaccination campaign relied on a single, critical touch-point, namely a short, personal interaction with one person and that they must be empowered and motivated by, for example, recruiting them at the community level, enhancing the quality and duration of training and ensuring that they were paid within a week of campaign completion.

The National EOC would continue to spearhead an Emergency Response Team to be on call seven days a week, comprised of professionals with expertise in managing outbreak/importation with associated case response activity targeting multiple districts. It should be able to move as quickly as possible to targeted areas. While recognizing that those who rejected vaccinations for their children were the minority, rejecters could be influential community leaders as well as parents. With this in mind, success indicators would include vaccination coverage of continuously missed children, vaccinator contact efficiency and repeat success. Strengthened media communications would include engaging editors of religious publications in social mobilization and advocacy for polio vaccination in high-risk areas. Other activities included putting polio eradication in the hands of the community with prominent civil society actors in the driver's seat.

To strengthen security, the Prime Minister nominated a cabinet committee of three Federal Ministers (Defence, Interior and National Health Services) to assist provinces with security gaps. There were also Provincial Security Coordination Committees, headed by the Home Secretary/Inspector General of Police to oversee security. There were also specialists to coordinate security issues at lower levels, as well as a Federal Security Advisor at the National EOC.

'PolioPlus' was a strategy to reach underserved communities in inaccessible or security-compromised areas. It included the use of basic one-day health camps to build credibility and trust. It was supported by UNICEF and BMGF through the Aga Khan University, with additional support for the office from Rotary International. The health camps provided treatment for common ailments; preventive health care; prenatal care and hygiene family kits. The partnership coordination and alignment on the health camps was seen as being *"critical to ensure synergy, avoid duplication and achieve the highest impact"*. Special strategies were also being used to reach high-risk mobile populations including mapping and tracking them and developing a well-planned transit strategy, to *"firewall FATA-KP bordering districts through strengthening vaccination at Permanent Transit Points"* with adequate supervision and monitoring.

As part of the Endgame Strategy the PEI-EPI had been started in 16 districts, selected by provincial governments in coordination with WHO and UNICEF, and based on the availability of the polio assets. In key reservoir districts the programme planned to decrease the number of children unimmunized with DTP3 by 10 percent by December 2015 compared to January 2015 through enhanced community engagement, expanded outreach/mobile sessions, boosted health camps and child-health days.

The challenge ahead

W. Yusafzai. End of polio in the year 2016, a big challenge for KP & Fata. The Frontier Post, Pakistan 27 December 2015¹²⁴

The Frontier Post reported that some 16,000 children were not vaccinated in North and South Waziristan, Khyber Agency and areas of the Frontier Regions in FATA in the recent

anti-polio campaign and there were also around 1,905 refusal cases. Nevertheless, health officials were still hopeful that they would be able to overcome the disease in FATA and KP in 2016. In 2014 there were 179 polio cases, while 16 had been reported to date in 2015. The impact of travel between Peshawar and FATA on the spread of polio was also noted.

The answer for FATA was seen to be a better communication strategy, as part of the National Action Plan, since polio vaccinators were now having access to every place in FATA. Steps had also been taken to improve the strategy for polio vaccination, but challenges existed such as missed children and refusal cases.

The killing on 29 November 2015 of Dr. Yaqoob, an EPI coordinator at Swabi. (see below) led to the postponement of the polio campaign in Swabi, The Frontier Post reported that the campaign would now kick-off on 28 December 2015 to vaccinate more than 200,000 children.

Low pay rates of RS 500 per day was another big challenge for polio eradication, particularly given the danger of working in such a challenging environment, requiring police guards. Likewise, there was a problem of refusals if demands of the parents on other issues were not met, and also similar demands from LHWs.

M. Naeem, et al. Coverage and Causes of Non Immunization in National Immunization Days for Polio; A Consumer and Provider Perspective Study in Peshawar. J Postgrad Med Inst 2012; 26(1): 48-54¹²⁵

This study was carried out in Peshawar in 2010 to estimate the coverage of polio vaccine during NIDs and to determine the factors associated with lack of immunization. Parents of 600 under-5 children were asked about immunization during NIDs in the previous five months, including knowledge about immunization. Forty health personnel who were involved in the NIDs were also interviewed.

The results showed that 83.7 percent children were fully vaccinated; while 94.7 percent had been vaccinated at least once, 5.3 percent had not been vaccinated at all. The reasons given for not vaccinating included that the vaccinator was absent/not visiting home/vaccine was not available (63.36 percent); no awareness 17.4 percent; child ill (5.8 percent); family problem/mother busy (3.3 percent). Lack of awareness among people and low accessibility to vaccine were considered as the main hurdles to immunization, along with poor salaries and incentives for many health personnel (32.5 percent). The study showed the importance for polio eradication of reaching missed children and pointed to what needed to be done to reach them, including increasing awareness and improving incentives.

Impact of adverse events on the polio eradication endgame in Pakistan

T. Khan, B.H. Abbasi, M.A. Khan, A. Nadhman. Editorial. Why is Pakistan a threat to “The Polio Eradication and Endgame Strategic Plan 2013-2018”? A look into the past decade. International Journal of Infectious Diseases 2016, 42, 4-6¹²⁶

This editorial noted that Pakistan had been unable to cope with the objective of WPV interruption by the end of 2014 and had the highest number of cases of the past decade, (306 in 2014) (see Box 5.2). The authors pointed to the adverse events that had plagued Pakistan in the past decade, including the huge earthquake in 2005; the fight against terrorism and prevailing militancy; the floods in 2010 and again in 2013; and the victimization of anti-polio workers that created panic among the vaccinators and a further damaging earthquake. Looking at the numbers of cases each year in Pakistan up to 2015, which was 38 at the time of writing in 2015 (53 the end of the year) the authors concluded that Pakistan was “*lagging well behind the target set in the Endgame plan, despite the fact that the polio case count is the lowest ever*”. The country should strengthen its disaster management

system, with vaccination as a main pillar. In addition the *“focus should be given to improvement of the health system in order to avoid the late-year upsurge in polio cases”*.

The editorial was helpful in underscoring issues related to Pakistan’s ability to achieve polio eradication within the context of the Endgame Strategic Plan, insofar as it included the adverse and catastrophic events that had affected health care delivery in the previous decade. It did not, however, include references to the decentralization that took place during this period, nor did it differentiate in detail what was happening in different provinces. In addition, while stating that *“the need of the hour is to contain the virus by revisiting the strategies and devising an uncompromising and consistent policy for anti-polio immunization”*, there was no mention of the government’s NEAP.¹²⁷

Failures within the PEI and the impact of weaknesses in the health system

National Emergency Operations Centre and reaching missing children

N. H. Farag ,et al. Progress Towards Polio Eradication – Pakistan, January 2014-September 2015. CDC Morbidity and Mortality Weekly Report 20 November 2015 / 64(45), 1271-1275¹²⁸

This article recognized the improvement in the quality and scope of polio eradication activities after the establishment of a National EOC, with activities being carried out in line with the NEAP including a rigorous action plan for the polio low-transmission season (Jan-Apr). The focus going forward would be to close the remaining immunity gaps by locating, tracking, and vaccinating continually missed children and improving coverage with OPV through the routine vaccination programme. Injectable IPV was used in 11 SIAs conducted at fixed immunization posts since November 2014, covering 1.7 million children in security-compromised areas of FATA, in high-risk Union Councils of Karachi and among internally displaced high-risk populations from FATA temporarily residing in areas surrounding FATA.

Between June 2012 and October 2014, FATA was mostly inaccessible during SIAs because of a ban on vaccinations by militant groups in North and South Waziristan. Previously inaccessible children, however, were vaccinated in strategically placed transit-area vaccination posts, when they left North Waziristan after military operations were launched there in June 2014.

Further initiatives to improve coverage in high-risk areas in 2015 included establishing a network of Female Community Volunteers in Karachi and North Sindh; adopting Continuous Community Protected Vaccinations (recruiting and training volunteers to provide house-to-house vaccinations continually throughout the year); conducting health camps that provided a range of public health services in addition to vaccinations in 12 districts where poliovirus continues to circulate (Tier 1 districts); and expanding vaccination by permanent teams placed in key transit points to vaccinate children as they entered and left reservoir areas (permanent transit points). A total of 2,000 health camps were conducted in the highest risk areas of FATA, Karachi and KP, during which more than 500,000 children (including 10,000 zero-dose children) received OPV.

In 2015, WPV1 persisted in known sanctuaries (Quetta and Karachi) and was also shared across these sanctuaries and across the borders with Afghanistan. The last WPV3 case in Pakistan was reported from FATA in 2012. WPV1 transmission during 2015 was restricted to high-risk areas of KP (Peshawar).

Impact of weak health system and socio-economic determinants on polio eradication in Pakistan

S. Nishtar. Pakistan, politics and polio. Bulletin of the WHO 2010, 88, 159-60¹²⁹

Nishtar focused on the geopolitical and socioeconomic challenges that could jeopardize programmes aimed at eradicating polio. Since 2000 the PEI had been carrying out huge countrywide polio eradication campaigns several times a year. In the previous nine years, moreover, 88 rounds of SIA had been conducted with nationwide coverage, with funding from the GPEI. It had been very successful initially, with a decline from 1,155 cases in 1997 to 28 in 2005.

Despite a very sensitive nationwide reporting system that had been built up to assure the detection of all remaining polio cases, there was a marked resurgence after 2007, (box 5.2), with eight cases even being reported in 2008 in the Punjab, which is home to 60 percent of the population.

According to Nishtar, the failure to achieve polio eradication demonstrated the *“importance of determinants outside the health sector in influencing health status”*. Resurgence of polio in Punjab province, for example, pointed to weaknesses in services delivery and issues related to health systems governance, which she called *“a triad of insufficient public-sector funding, a poorly regulated private sector and lack of transparency in governance [acting] together to compromise the quality and equity of public services”*. While the PEI was well funded, the public infrastructure remained under-financed, with serious staffing problems and service delivery being *“undermined both qualitatively and quantitatively”* and costs even being levied for free services. She also points to examples of petty theft among vaccinators; preferential treatment in staff deployment and rapid turnover of programme managers, which contributed to the resurgence of polio from 2008.

Failure in achieving polio eradication highlights key non-health sector issues such as access to war and conflict zones; parental refusal; and cross-border problems with Afghanistan. Twelve per cent of FATA was under conflict with Pakistan's armed forces fighting an insurgency. ‘Talibanization’ (introduction of practices from the Islamic Taliban movement) and misinterpretation of religion meant over 90 percent of the clergy in conflict-ridden zones were campaigning against vaccination, increasing parental refusal on the mistaken grounds that vaccination is *haram* (forbidden by the religion). Given the general political situation, polio could have spread further.

Weaknesses in other government services could also affect polio control efforts, e.g. poor sanitation and lack of clean water and cuts in electricity. Broad-based reform was needed to address systemic weaknesses, but this was not a current priority as the country struggled on many diplomatic and security fronts.

Using China's example in polio eradication, Nishtar said Pakistan should develop plans for grand NIDs reaching beyond traditional vaccinators to actors that could deliver services in disaster zones. Maximum resources should ensure a seamless supply chain including airlifting vaccines; access to areas on horseback; and possible military curfews during the campaign. Furthermore, through creative quotes from the Quran, polio eradication could be presented as a ‘right to life’ issue. Improved understanding of the religion might assist in negotiating access to areas where refusal was an issue and in soliciting ceasefires for vaccination campaigns.

International Crisis Group. Winning the War on Polio in Pakistan. Asia Report no 273, Brussels, Belgium 23 October 2015¹³⁰

This report pointed out that the *“key test will come in May 2016, when, at the end of the current low-transmission, relatively cool season, the temperature begins to rise and with it the risk of the virus spreading”*. Although the report commented that it would be possible to see whether the vaccination teams were indeed reaching every under-5 child, it would also be the time during which transmission would have to be interrupted for Pakistan to be in line with the endgame as then defined.

The International Crisis Group also said that countrywide success will depend on government’s willingness to partner with civil society and local and international NGOs to protect children from polio. It included in its recommendations that *“NGOs, local and international, are not restricted in their ability to access vulnerable populations”*. This strong emphasis on the role that NGOs can play is not seen elsewhere in relevant literature, in which there are indeed caveats about the role of international NGOs. Its other recommendations, however, were much in line with those included in other publications.

The porous border

T.M. Khan. The Tribal Areas of Pakistan: A Contemporary Profile. Lahore: Sang-E-Meel Publications 2008, pp376¹³¹

The book gives a general introduction to Khyber Agency and includes a wide range of issues pertaining to the Agency, including its administration, its peoples and its history. It includes the tribal areas of FATA, the Frontier Regions and Peshawar and the tribes of Balochistan, Sindh and Punjab and it attempts to capture the overall profile and essential facts of these areas.¹³²

In the context of polio eradication in Pakistan, the author gives the history of the border between Pakistan and Afghanistan. The precise demarcation was agreed by the Amir of Afghanistan in 1893 during a mission to Kabul, led by Sir Mortimer Durand, for this purpose. The agreement was signed fixing *“the line which the Government of India and the Amir have agreed as the frontier of Afghanistan from Chandak in the valley of the Kunar River and 12 miles north of Asmar, to the Persian border”*. The boundary was then marked out, although there was no demarcation south of Nawa Kotal at that time as the Amir was *“unwilling to admit the boundary fixed by the Durand Agreement in the Mohmand country”*. This demarcation was agreed between the Pakistan and Afghanistan governments in 2004. There was no demarcation between the Kabul River and Sikaram, but boundary stones were set up on the Kurram border and in 1895 the boundary was set between the Kurram to the Gomal river. The Durand Line Border Agreement was a political expediency more than anything else. Technically it had problems, for example it divided the Mohmand tribe into two. It was nevertheless validated by successive Afghan governments.

When Pakistan applied to become a member of the United Nations, the only country to vote against admission was Afghanistan, but the validity of the Durand line was not questioned, which was fully recognized as being the border when Afghanistan withdrew its negative vote.

The main point about the border, which was stressed by Khan in a conversation on 16 December 2015 (see below) is that it is part of the problem. The normal expectation is that a border is a wall, a fence or some other physical barrier. In this case it has neither been fenced nor walled. It was the result of intense haggling in the run up to the Durand treaty and subsequently members of local tribes have gone backwards and forwards at will. Therefore, stopping cross-border transmission is not an easy task.

D. Tiefengraber. Non-State Actors and Global Health. Eradicating Polio in Pakistan. Case Study 15. Barcelona: IS Global Institute for Global Health / ESADEgeo-Center for Global Economy and Geopolitics, November 2013¹³³

The premise of this case study was that the difficulties in polio eradication in Pakistan were rooted in four main areas: the weak state and health system, particularly in tribal areas; ongoing conflict in the region, including drone strikes; prejudices against the polio vaccine; and backlash against the instrumentalisation of health campaigns by security and intelligence agencies. It also highlighted the positive and negative roles that non-state actors can play.

The author stressed that the poliovirus can reappear via international travellers, migrant populations and population sub-groups that refuse immunization. He referred to the case of strains circulating in Pakistan being detected in the Cairo sewers in 2013.

At the end of 2012 and in 2013, the killing of polio workers was a serious blow to eradication efforts, as were the US drone attacks and Tiefengraber pointed to their impact on local militant leaders who reacted by opposing vaccination activities. In discussing the weak health systems, he added to the life-threatening conditions the problems of low salaries for health workers, leading to a decline in available vaccinators.

Looking at issues related to political will, he cited the damage that is done when the concerns of the people were hijacked by parties involved to serve their own political agenda, or to use the health sector for military or intelligence-gathering purposes. Donor fatigue also had an impact. The limitations of FATA, which was directly governed by the Federal Government as the most 'rural administrative unit' as well as the most impoverished part of Pakistan were noted, together with the unchecked movements of the Pathans who, while being the second-largest ethnic group in Pakistan, in reality lived on both sides of the border. Regarding the Taliban, he pointed out that not only had they prohibited vaccination campaigns for children, schooling for girls and women working outside the home, but that they viewed foreign NGOs, particularly those working in the social or health sector, as suspect. The Taliban pointed to NGOs as having a reputation of working for donor rather than Pakistani national interests.

In response to the targeting of health workers, Tiefengraber said that the GPEI met with Islamic scholars in Cairo, 6-7 March 2013 to brainstorm on strategies *"to demonstrate solidarity across the Islamic world in order to ensure the protection of Muslim children against polio"*. An agreement was reached that the vaccine was *"safe, effective and in accordance with Islamic law, and that immunization is a religious and social responsibility for everyone. Indeed, preventing immunization is forbidden by Islam"*.¹³⁴ This declaration *"lent counterweight"* to the actions of the Taliban.

Regarding the May 2011 fake hepatitis vaccination programme in Abbottabad to obtain DNA from Osama bin Laden's family and for which Dr Afridi was still in jail, Tiefengraber said that US Defence Secretary Leon Panetta acknowledged the move and said that it *"helped provide intelligence that was very helpful with regard to this operation"*. He cited it as an example of humanitarian relief or health effort being used for military intelligence, with impact of undermining the *"neutrality of those operating by the accepted rules of humanitarian assistance"*.

The case study concluded with the observation that national security and counter-terrorism would seem to be more important than public health, especially for the USA. Whether or not this was indeed the case, it can be seen that security and counter-terrorism have had an enormous impact on polio vaccination on both sides of the Pakistan-Afghanistan border.

Security and combatting extremism and religious and cultural implications for polio eradication

Of major importance in the fight to eradicate polio in Pakistan have been issues related to terrorism and insecurity in areas such as FATA and parts of KP. Underlying myths and beliefs among people living in these areas have been fuelled by the Taliban and religious leaders. They have also been exacerbated by activities on the part of the USA, particularly the US Central Intelligence Agency (CIA), such as using fake vaccination programmes and drone strikes in the area.

Unfortunately a tangible consequence of this activity has been the deaths of numerous health workers and security officers, many of whom have been women and some of whom have been tortured – and only because they were giving out polio drops.

The following articles and reports from a variety of sources are quoted in detail in order to illustrate the complexity of the problems that need to be tackled as part of the strategy to reach the last missing children. Insofar as the issues are inter-twined, they have not been fully separated out into the various categories.

Taliban, religious leaders and their impact on polio eradication

A. Roul. The Pakistani Taliban's Campaign Against Polio Vaccination. West Point USA: Combatting Terrorism Center 27 August 2014¹³⁵

One of the reasons behind the continued incidences of polio in Pakistan has been the Pakistani Taliban's propaganda campaign against receiving polio vaccinations, as well as their direct attacks on polio vaccination workers. This article by Roul provided a detailed review of the Pakistani Taliban's offensives against the polio immunization programme in Pakistan, especially in FATA and KP. It demonstrated the complexity of the problem due to the different factions of the Pakistan Taliban and the roles played by their various leaders. It also showed the inconsistencies of their positions at various times, built on myths about the vaccine and other factors.

The Pakistani Taliban's Propaganda Campaign 2006 - 2012

Islamist-led propaganda campaigns against government-backed health projects, especially polio vaccination programmes, began in Swat and Malakand regions in 2006, with Maulana Fazlullah, a radical cleric and the present TTP leader, spearheading the effort. At the time, he was leading another banned organization, Tehreek Nifaz-e-Shariat-e-Muhammadi (Movement for the Enforcement of Islamic Law, TNSM), which carried out a propaganda campaign encouraging people to adopt an ultra-conservative lifestyle and speaking out against female education. He criticized the polio vaccination programme in KP (then NWFP) through his illegal FM radio sermons and Friday prayers at local mosques, alleging that it was part of a *"conspiracy of Jews and Christians to make Muslims impotent and stunt the growth of Muslims"*.

A Pakistani Taliban fatwa was made against female health workers in Swat and Malakand, with one decree calling the presence of women in public spaces a form of indecency, and giving instruction that it *"was a Muslim man's duty to kidnap the women health workers when they paid home visits, to marry them forcibly even if they were already married women, or to use them as sexual slaves"*. Another Taliban decree declared that it was morally illegal for Muslim women to work for wages.

The situation briefly improved when the NWFP provincial government signed a peace deal with Fazlullah's TNSM, which agreed to support the polio vaccination campaign and education for girls, as well as government efforts to establish law and order. Fazlullah then joined the TTP by merging the TNSM into the larger Pakistani Taliban grouping, and signing

a 16-point peace deal with the NWFP government, by which the Taliban in Swat and Malakand agreed not to oppose vaccinations including immunizing children against polio, and not to obstruct women's education.

The situation deteriorated, however, following a continuous army offensive against the Pakistani Taliban in the region. By early 2009, the TTP reverted to its original campaign against women's education and vaccination, also criticizing NGOs. The TTP spokesman Muslim Khan reportedly said to the media that *"the TTP is against polio vaccination because it causes infertility"*. He also reportedly said that the vaccine could not be trusted since it was imported; the vaccination programme was a US tool to reduce the Muslim population; and that it was un-Islamic to *"take a medicine before the disease [is contracted]"*.

Fazlullah and his faction were promoting beliefs that anti-polio campaigns were part of Western espionage well before the CIA was reported to have used a hepatitis vaccination programme to track down and kill Osama bin Laden at his hideout in Abbottabad, in May 2011. This activity increased suspicions against vaccination programmes among the Taliban leadership in Pakistan and contributed to a renewed armed backlash against polio immunization workers in the country. According to a Taliban fatwa issued in June 2012, polio agents could also be spies, as found in the case of the Pakistani doctor Shakil Afridi, who was sentenced to a 33-year prison term.

Attacks on Vaccination Workers June 2012 - 2014

The Pakistan Taliban therefore stopped supporting polio vaccination, leading to increased attacks on anti-polio campaign volunteers and vaccination teams. They began issuing religious edicts (fatwas) against government vaccination programme workers and against female health volunteers who make up the core workforce for health care programmes. At least 56 individuals, mostly female health workers and security personnel, were reportedly killed in attacks between June 2012 and the time of writing. In mid-December 2012, Pakistani Taliban militants carried out attacks in Karachi, Peshawar, Charsadda and Nowshera, disrupting a three-day national polio vaccination campaign and killing at least nine anti-polio health workers, including five female volunteers.

A major assault took place on 7 October 2013, with Islamic militants targeting a medical distribution camp in the Suleman Khel area in Peshawar and killing at least seven people, including four security personnel. In 2014, six police officers and a child were killed in a bomb blast in Charsadda Town in KP on 21 January and 11 Khyber Khasadar Force personnel (government-backed local tribal militias) were killed in two separate blasts in the Lashora area of Jamrud on 1 March. They were all providing security to polio teams. Meanwhile, intermittent attacks targeting polio vaccination programmes continued, together with increasingly frequent intimidation and abduction of health workers and officials, with a female polio vaccinator, Salma Farooqi, being abducted, tortured and killed by armed militants on 24 March.

In April 2013 the TTP, which had claimed responsibility for most of these attacks, announced that it would support anti-polio vaccination drives on the guarantee that they were not being used by the USA as a cover for espionage and that proof could be provided that orally-administered polio vaccination drops were in accordance with Islamic tenets. TTP spokesman Ehsanullah Ehsan said if the *"...polio drops are Islamic and the spy agencies are not using it to kill our fighters, we would have no objection to any vaccination drive which is in the public interest"*. Nevertheless, the Pakistani Taliban continued its violence against polio vaccinators in the following months.

Impact of the US drone offensive

Anti-polio efforts continued despite fierce opposition from the Pakistani Taliban in Swat and Malakand, with a fresh setback when a new fatwa was issued against the vaccinations in

June 2012. Hafiz Gul Bahadur, the Taliban commander in North Waziristan, announced a ban on polio vaccinations some days after the radical Islamic cleric Maulvi Ibrahim Chisti declared the polio campaign 'un-Islamic' in the rural Khan Pur Bagga Sher area of Muzaffargarh in south western Punjab Province and announced at the local mosque that jihad should be carried out against the visiting polio vaccination team.

The Taliban added a new reason for the fatwa, that the vaccination campaign should be suspended until the USA ceased drone strikes in the Waziristan region. This was set out in a fatwa pamphlet by Gul Bahadur, printed in Urdu and distributed on 16 June in Miranshah, the capital of North Waziristan and threatening anyone involved in the polio vaccination campaign in that region. According to the pamphlet, until the continuous drone attacks were stopped in Waziristan, the restriction on polio drops would remain imposed. Their rationale was that they had *"nothing to gain from the sympathy of such well-wishers (the Americans) who spent billions of rupees on polio drops for eradicating a disease that affects one or two in a million people"*. In addition, *"the well-wishers (the Americans), with the help of their slaves (Pakistanis), were carrying out drone attacks in Waziristan as a result of which hundreds of innocent children, senior citizens and women have died. And the continuous (day and night) drone flying has driven the people of Waziristan mentally ill or imbalanced and such cases are on the rise. The condition is even worse than polio"*.

This call meant Taliban leaders in KP and South Waziristan also imposed bans, with a similar pamphlet distributed in Wana, South Waziristan Agency, by the Mullah Nazir faction of the Pakistani Taliban a week later. Meanwhile, US drone attacks intensified on Taliban targets in North and South Waziristan, successfully killing many militant leaders including top al-Qa`ida operative Abu Yahya al-Libi in early June 2012. There was also collateral damage, reportedly with civilian casualties, giving the Taliban a further excuse to link the two issues.

Support for the anti-polio campaign from Islamic religious leaders

Many influential Islamic clerics, however, opposed the ban and in late October 2013, Maulana Sami-ul-Haq, the head of the Dar-ul-Uloom-Haqqania Islamic seminary and chief of Jamiat-i-Ulama-i-Islam-Sami (JUI-S), who was considered to be a spiritual leader of the Taliban, issued a counter fatwa urging parents to immunize their children against polio and other fatal diseases such as measles, tetanus and tuberculosis. He added that the vaccinations comply with Islamic Shari`a. A small Taliban off-shoot, Ansar-ul-Mujahidin, was quick to threaten both Sami-ul-Haq and politician Imran Khan for supporting the polio vaccination campaign.

Possibly as a result of Sami-ul-Haq's contentions, public support for immunization drives and sustained government efforts for the vaccination and health programmes, the TTP leadership decided to change their position, in January 2014 distancing themselves from some of the violent attacks on anti-polio health workers in Mansehra and Karachi. The TTP said subsequently that in principle they were not targeting polio workers, even though they had strong reservations against polio vaccines because they were un-Islamic and bad for health. They had, moreover, been holding detailed deliberations on the polio issue for some time, consulting trustworthy Muslim medical experts and some of their doubts had been removed. Nevertheless attacks continue against anti-polio personnel.

Killing of Dr Yaqoob, polio district coordinator in Swabi

Swabi polio district coordinator shot dead. Express Tribune 30 November 2015¹³⁶

The Express Tribune reported that the district Head of EPI, Dr Mohammad Yaqoob, was shot dead and his driver injured when unidentified assailants opened fired on his car in KP's Swabi district. While no group claimed responsibility, police officials believed Taliban militants could be involved in the attack.

The article noted that over the last few years, polio workers, doctors and security forces had been involved in an anti-polio drive but were faced with many challenges as they had become the target of militants. In an attack the previous month, a lady health worker engaged in polio vaccination campaigns was attacked by two unidentified motorcyclists in the province's Shagai Hindkyan village. They threatened to kill her if she did not quit polio vaccinations.

M. Khan. Coordinator EPI shot dead in Swabi. Frontier Post 1 December 2015¹³⁷

The Frontier Post also reported the death of Dr Yaqoob, noting that officials admitted that the killing of Dr Yaqoob had "*shaken those who run the anti-polio campaign in the district*". While the district police officer said that it was too early to determine anything about Dr Yaqoob's killing, it seemed "*that it was an incident related with the menace of terrorism*", although no group had claimed responsibility. A policeman, a teacher and a worker of the health department had previously been killed during the anti-polio vaccination campaign in the district.

A suggested solution for strengthening public health and religious messages in support of polio eradication in Pakistan

Q.A. Ahmed, S. Nishtar, Z.A. Memish. Poliomyelitis in Pakistan: time for the Muslim world to step in. The Lancet 2013, 381, 1521-3¹³⁸

The authors stressed that action was urgently needed to dispel public misperceptions about polio eradication and to deter on-going violence and suggested as a solution that Saudi Arabia and its health authorities were uniquely placed to bring about change in Pakistan for two reasons. First, as the site of Mecca and Medina and host to the Hajj, Saudi Arabia wielded enormous influence in Pakistan. Second, Saudi Arabia had experience in introducing new public health recommendations and strengthening public health outreach by legitimising new public health measures with both formal Islamic authority, in the form of fatwas and, informally, through public opinion.

While Pakistan's Taliban viewed vaccination programmes as not being Islamic, Saudi Arabia's clerics had shown the opposite view. Given Saudi Arabia's strong interest in controlling the spread of the poliovirus in Pakistan, as annually more than 10 percent of all pilgrims, some 200 000, travelling to the Hajj are Pakistanis, they are aware of the potential risk for new polio outbreaks in the Hajj cohort. Saudi Arabia had therefore enforced strict public health interventions for the millions of people who travel to Mecca each year, linking the issue of a visa to documented vaccinations and deploying thermal cameras to quarantine pilgrims with fever. It currently required two doses of oral polio vaccine for all pilgrims coming from countries with active circulation of poliovirus, one dose 6 weeks before arrival (tied to Hajj visa issue) and a second dose on arrival.

Saudi Arabia's experience could therefore inform the debate about eradication of poliomyelitis in Pakistan with similar approaches to management of public opinion through officially sanctioned public health and religious messaging, supported by the international religious theocracy and by the Saudi monarch, the apical authority for Islam in Saudi Arabia.

Commonalities and problems

A. Chang, E. Chavez, S. Hameed, R.D. Lamb, K. Mixon. Eradicating Polio in Afghanistan and Pakistan. Washington DC: CSIS Global Health Policy Center, August 2012¹³⁹

This CSIS report referred specifically to three of the main problems related to polio eradication in Pakistan and Afghanistan: the long, generally uncontrolled border; the weak governments and poor health infrastructure; and the cross-border activity including the movements of refugees fleeing conflict.

In Afghanistan, it highlighted that the virus had proved most resilient in Helmand and Kandahar, near the border with Pakistan and the sites of persistent conflict; and that 80-90 percent of the cases over the previous three years had occurred in 'high risk' districts in the southern provinces. In Pakistan, it particularly noted what might be called the erratic behaviour of the virus, with cases jumping in number from 2007 to 2008 and again in 2010-2011 (see Box 5.2), possibly as a result of the floods that affected more than a fifth of the country.

The main challenges raised by the report were the lack of oversight and accountability at all levels of government that affected programming; the security environment that put polio workers lives at risk and made areas inaccessible; the natural disasters and persistent conflict that compromised health infrastructure and exposed large groups to unhygienic conditions, the related movements of internally displaced persons, which hampered efforts to quarantine the virus; and the refusal rates in some Muslim communities with some religious and political leaders denouncing vaccination efforts as a Western conspiracy or that the vaccines caused infertility.

Among the strategies to which they referred was the coordination by GPEI members of their work with international (and Afghan in Afghanistan) security forces to ensure the safety of local staff to address the problems of security and disasters, while maintaining strict neutrality. They had also engaged 'non-traditional actors' including community leaders, and occasionally armed insurgents, such as the Quetta Shura Taliban, to reach children in unstable areas. This Taliban support was an *"unprecedented, albeit unofficial, example of their cooperation with branches of the Afghan government and the international community. Mullah Omar, the Taliban's leader, wrote and signed letters approving several campaigns"*. Vaccination teams had also taken advantage of lulls in violence for short interval additional dose campaigns and also in places where people might gather such as at shrines or picnic areas. Furthermore, attention had been focused on vaccinating children at the border in response to seasonal migration and refugees crossing to escape conflict.

Regarding oversight and accountability, the report referred to the Pakistan Prime Minister's task force to coordinate activities across the provinces, including microplans for monitoring high-risk districts using *"locally tailored, innovative strategies for social mobilization"*. Such plans included cooperation between public and private sectors, the armed forces and civil leaders in conflict-affected areas and renewed engagement with religious leaders.

As a strategy for dealing with refusals, UNICEF had *"teamed up with religious scholars, clerics, and local doctors to conduct house-to-house visits, coordinate dialogues, and conduct mass media campaigns"*. The report noted that female health workers played an important role in this communications strategy as Muslim homes were inaccessible to men when the husband was not present.

The report succinctly demonstrated the strategies as well as the challenges. Despite being some three years old, the problems remain relevant, although some had been exacerbated

by the conflict and levels of violence, particularly against the vaccinators and health care workers. The comment in its final paragraph was particularly telling and needed to be fully integrated into forward planning: *“Neither country has fully put in place the mechanisms needed to ensure that stakeholders, especially at the local level, are resourced, committed and accountable”*.

Concluding comments

The problems needing to be addressed in Pakistan to eradicate polio are wide-ranging. They are well known, particularly by those who will need to ensure that the correct policies are carried out. They relate to the border with Afghanistan; security issues; problems with service delivery including missed children; the weak health systems in both KP and the FATA and so on.

The following summaries of **meetings of the present author¹⁴⁰ with senior federal and provincial government officials and others in December 2015** show that the problem is not lack of awareness, but more how to achieve what has to be done and to what extent the necessary resources will be available.

Zaibullah Khan, Chief Security Officer to Chief Minister, Khyber Pakhtunkwa, made a special reference to what he termed *“sanctions on people travelling abroad”*, i.e. the vaccination requirements resulting from the WHO’s declaration of polio as a global health emergency. He also referred to the roles of the Special Committee with regard to security, including the involvement of the district and senior police, which meets each month and organizes special campaigns, and the fact that security was mostly provided by the Police Department and the Security Agency.

On the border he pointed out that *“cross-border movement could be almost 45,000 a day without any legal documents”*. He estimated the border at being 1,700 km and very ‘porous’. People could own properties on both sides, or the border could even go through a house. Thirty percent of the Afghans who crossed did so for medical facilities. People also crossed to work or to shop in both directions and go backwards and forwards at will. (A doctor with whom the present author spoke during her visit had pointed out that he had gone to Afghanistan recently to go hunting and no one had known.)

Khan also expressed concern about the safety of polio health workers and particularly in going after refusal cases, as well as issues related to the lack of national ID cards or passports

Dr Hammad Uwais Agha, Additional Chief Secretary, Khyber Pakhtunkwa, said that health is the second highest priority for funding in KP, identifying polio and the LHWs in particular.

He pointed out that there was insufficient funding for the LHWs programme. With the decentralized system, the Provinces have rights and the Federal Government has responsibilities, but the LHWs programme had been *“dropped on”* the provincial system.

Dr Hammad raised a number of concerns on polio eradication. He noted that WHO had designated Peshawar as Tier 1. He also stressed the commitment from the political leadership for eradication by December 2016. Migration was a frequent occurrence and had been over time. In his view the Afghan border was nebulous and he pointed out that before the Afghan war, educated Pakistanis made day trips to Kabul and businessmen and bureaucrats also went there. Kabul had a lack of skilled labour and paid higher wages for less work. Now in this ‘rehabilitation phase’ skilled labour again was going from Pakistan to Kabul. It was a ‘two-way road’ between Afghanistan and Pakistan. Speaking as a medical doctor he expressed concern as to the temperatures in some of the boxes of the cold chain,

which were higher than the required 7°C. (During the meeting the Chief Economist for KP was also in attendance.)

Dr Jamal Yousuf, Secretary Health, KP, had worked in the tribal areas from 2003 – 2005, where he said the most vulnerable children live. He referred to the border as being very porous and to the problem of refugees.

In discussing the problems faced by vaccinators, he spoke about the death of Dr Yaqoob, district Head of EPI and also said that some 20 other health workers have been killed during vaccination programmes. Health workers and volunteers were now extremely vulnerable in the tribal areas, a major change from the time he had been working there. The *Basic Health Units* need to be strengthened with better equipment and trained personnel, including paramedics. He supported the idea of incentives for health workers involved in polio eradication, what he called “*an attractive package*” as well as a special initiative for improving remote infrastructure. He also referred to issues related to polio eradication around sanitation and pointed out the need to involve other ministries. In the case of Peshawar, it has both the highest rate of polio cases and also poor water and sanitation.

Justice Mrs Irshad Qaisee, one of two female judges in the **Peshawar High Court**, referred to the rumour that existed concerning the polio vaccine, that hormones or enzymes had been mixed into the vaccine by westerners and that they were linked to male sterility. The rumour had gone to the High Court which ruled, after the vaccine had been sent to the laboratory, that the rumour was illegal, that there was no legal, religious or political base for it and that it had no immunity. Although not included in any official report from the court, the ruling on rumour was nevertheless competent in a court of law and could be quoted.

Teepu Mahabat Khan, Additional Secretary, Cabinet Division, had previously held positions in KP working in the tribal areas and has written extensively on them, including his books ‘The Land of Khyber’ and ‘The Tribal Areas of Pakistan’ (see above).

According to Khan, the border was a part of the problem as it was very long and not walled or fenced, with some tribes straddled across both sides. The solution to the problems with the border, including in relation to polio eradication, would be a proper physical border, which had not been erected because of the cost.

He referred to the belief of the Taliban that the vaccine included a sterilizing agent because it was manufactured in the USA, as well as the CIA’s fake vaccination programme in Abbottabad. These had reinforced the Taliban’s resistance to polio eradication programmes. He also noted that, as there were high levels of illiteracy in the population, they were likely to believe the clerics when they say that it was irreligious to have vaccinations. According to Khan, this was a “*real setback*”.

Khan also referred to the failure of governance and the need for reforms in FATA, e.g. the inability to go to the Supreme Court, only the High Court; the need for policing and the huge costs that it involved; the use of armed forces on occasions to protect the polio teams; and the impact of Taliban infiltration which meant that health workers were intimidated.

Mr Siraj, Special Secretary Home, KP was working for the Home Department with WHO and UNICEF in KP on polio eradication. He referred to 12 transitional points on the border with seven polio teams coming from the Khyber Agency and five transitional teams. Currently the most difficult area was Mansehra, because of “*movements of miscreants*”. Armed forces were being used in the targeted door-to-door campaigns. The 4-day campaign taking place at that time was targeting missed children, as part of a catch-up campaign. In working with the clerics there were special sermons at Friday prayers, involving the Deputy Commissioner and WHO. Special campaigns were also being carried out in refugee camps.

In its 12th report,¹⁴¹ the IMB provided its own recommendations as to what should be done. The governments of Pakistan and Afghanistan should “*establish a joint executive and planning board to instigate cross-border polio prevention and control*”. Top priority should be given to stopping transmission in Peshawar and the surrounding regions, including addressing the mismatch between the ‘epidemiological’ geography of polio and the ‘planning and coordination’ geography, possibly by reconfiguring the regional EOC arrangements. The CDC should conduct a special review of the pattern and genetic features of the positive environmental samples in different geographical areas of Pakistan. The most senior members of the GPEI should work with programme leaders in Pakistan and Afghanistan to plan “*a precisely targeted series of campaigns of IPV alongside OPV*”.

Other literature^{142,143,144} was also consulted in developing the background for this section.

5.3 Other countries

5.3.1 Nigeria: a success story, but...

The last case of polio in Nigeria to date occurred on 24 July 2014. At the 25th session of the African Union in Johannesburg in June 2015, Heads of State and Government noted that the “*entire African continent had not reported a single wild poliovirus case for over ten months*”. They reaffirmed their commitment to global polio eradication and that they should “*help deliver a polio-free Africa as a historic legacy to children of all future generations*”, highlighting “*the wider legacy of the polio infrastructure and resources and the critical role it can play in strengthening routine immunization, supporting broader disease surveillance and emergency health response efforts*”, noting the use of the polio infrastructure in tackling the Ebola virus as a “*living example of this legacy*”.¹⁴⁵

Following the success of India, interruption of WPV transmission in Nigeria and throughout Africa was undoubtedly the biggest achievement to date in the eradication of polio. It was not, however, an easy task and there are potentially important lessons learnt for the two remaining endemic countries, particularly Pakistan. To be removed from the list of endemic countries, Nigeria not only had to battle against the virus but also had to ensure that vaccination could take place in some very insecure areas in the northern parts of the country, where health workers could be at the mercy of terrorist groups, including Boko Haram.

N. Bristol. Polio Eradication: Nigeria Must Keep its Eye on the Prize. CSIS, Washington, 24 July 2015¹⁴⁶

Bristol was writing on the first anniversary of the last reported polio case in Nigeria, one of the countries where wild poliovirus has proven hardest to extinguish. She warned that while the success should of course be celebrated, it should also be viewed with a note of caution. Continued political attention and sufficient resources would be needed to achieve official polio-free certification by WHO after three full years with no cases.

Nigeria had nearly been successful before, when there were only 21 cases of WPV in 2010. By 2012, however, the number of cases had gone up to 122. The Chief Medical Officer for Nigeria’s National EOC explained that there had been so much jubilation that they had got carried away and lost focus. He added that “*political support is the engine that drives the process. Once you lose that, you can’t move*”.

Rather than repeat the error, the year of being polio-free was being emphasized as “*simply a step toward the ultimate goal of certified disease elimination*”. This was a message for political leaders and for donors, as continued resources and focus were essential. The IMB

had cautioned that in several areas disease surveillance was below par and as many as 62 percent of settlements remained inaccessible to vaccinators in northern Nigeria.

The President of the Nigerian Academy of Science also urged the newly elected Nigerian President Muhammadu Buhari to ask for continued US support for polio eradication at his meeting in July 2015 with President Obama. As he wrote, *“Bringing peace and stability to the northeast and instituting economic and political reforms are clearly key priorities, but it would be a mistake to overlook what could be one of President Buhari’s greatest achievements: the eradication of polio in Nigeria”*.

The programme had included a number of improvements such as the establishment of national and state level EOCs to better coordinate and track vaccination efforts; instituting health camps to provide health services beyond polio drops; paying special attention to vaccination along transient border areas; being active in refugee camps; and improving surveillance was also a priority.

As Bristol pointed out, Nigeria was working toward the political will and polio programme quality needed to become polio free officially, but this meant that improvements would be necessary and as pointed out by the IMB, Nigeria was not yet safe. It *“must build further resilience and...move its programme from good to great”*.

A Muhammad. Nigeria’s polio free gift to Africa. Devex 16 November 2015¹⁴⁷

The article cited the 2015 statement by the Expert Review Committee on Polio Eradication and Routine Immunization for Nigeria, that *“Eradicating polio will be a great victory for every Nigerian — and Nigeria’s gift to Africa and the world”*. It comments that *“Nigeria holds the ace to a polio-free Africa”* and the eradication of polio is an issue of both national and regional dimensions. Nigeria was considered a ‘pariah state’ until 2014, when the number of cases declined from 53 at the end of 2013 to only six.

The author attributed this to strong government leadership and oversight, including the establishment of a presidential task force on polio eradication and the National EOC, which *“pooled experts from government and development partners in the various components of the polio eradication programme”*. The systematic engagement of community gatekeepers and humanizing the campaign through the involvement of polio survivors in building community trust also contributed the success. But, the greatest game changer was the *“enforcement of an accountability framework by government at all levels, including partner agencies”*.

WHO’s formal pronouncement in September 2015 of the delisting of Nigeria as a polio endemic country was therefore a historic achievement, although Nigeria must remain focused on the ultimate objective of eradication. According to the author, this would be a tough task: all stakeholders would have to sustain, or increase if necessary, their support for the programme; Government at all levels should continue to provide the necessary leadership, oversight and funding; further improvements to surveillance would be required to make it more sensitive; and the quality of the polio campaign must be maintained, by sustaining and scaling up innovative strategies including health camps, ‘edutainment’, street vaccinations, using Directly Observed Polio Vaccination and deploying the polio infrastructure to strengthen routine immunization and the broader health system. This would mean sustained funding and commitment of all personnel, especially the frontline health workers, in addition to support and understanding of all Nigerians. *“This is a gift Nigerians and indeed the entire African region deserves.”*

Nigeria marks one year without recorded polio case. BBC News 24 July 2015¹⁴⁸

After a year without a recorded case of polio, Nigeria could now be taken off the list of

countries where the disease is endemic, if the WHO confirmed the results. The country had struggled to contain polio since some northern states imposed a ban on vaccinations in 2003. It would have to wait a further two years without a recorded case to be certified as polio free.

During Nigeria's battle to contain polio, a vaccination ban was imposed in 2003 in some northern states followed allegations by some state governors and religious leaders in the mainly Muslim north that vaccines were contaminated by Western powers to spread sterility and HIV among Muslims. Independent tests ordered by the Nigerian government in 2004, however, declared that the vaccines were safe. But there was still some hostility in a few areas, with violent attacks against health workers, the last of which was in February 2013 when nine polio vaccinators were shot dead at two health centres in the northern Nigerian city of Kano.¹⁴⁹

C. Santamaria. What we learned from Nigeria's polio victory. Devex 19 October 2015¹⁵⁰

While the confirmation that Nigeria had not registered a single new case of polio for a full year was a *"huge milestone"* – cited as an example of public and private development partners truly working together to achieve a common global health goal, with full local ownership – it *"definitely wasn't easy"*.

Santamaria cited some of the obstacles that vaccination teams had to overcome in Nigeria. These included fierce resistance to the vaccine drug among religious groups that claimed it caused infertility; threats from armed militias like Boko Haram; and entire shipments of vaccines spoiled because of lack of refrigeration resulting from the erratic electrical supply in remote rural areas. The main operational challenge, however, was the missed children, because vaccination campaigns did not reach them. A major reason was poor organization, with vaccinators arriving at health clinics not knowing whether they had enough vaccines or ice packs, or lacking detailed maps of the area. In comparison, in India vaccination campaigns were planned more carefully down to the last child in the most remote village, a multi-stakeholder effort which contributed to making India polio-free in 2014.

In 2011 the then President Goodluck Jonathan vowed to eradicate polio within three years and it became a whole-of-government effort that would finally tackle popular resistance to the vaccination campaigns, making polio as much of a priority as killer diseases like malaria or measles. While the push quickly achieved results at the federal and state levels, vaccinators were struggling to break through at the local level. It was realized that even with full government support, certain communities could not be reached without engaging traditional leaders. They therefore engaged with NGOs and some politicians and popular resistance to the vaccination campaigns disappeared. Engaging with the traditional rulers meant they soon became solid partners, *"ensuring that no family under their leadership would refuse to have their children vaccinated, and providing security"*. Local community ownership of the programme contributed to its success, although some communities did not fully understand the *"fuss about polio"* when their children were dying of other diseases, such as diarrhoea. The Government launched a massive television and radio advertising campaign to inform the public, with vaccinators also bringing sweets and toys to entice the children. As the chairman of the Nigeria National PolioPlus Committee and head of Rotary International's anti-polio program in the country said, *"The children would be attracted to them like they were to the Pied Piper"*.

The sweets had not originally been part of Rotary International's initial plans, and a lesson learned for the organization was that they were wrong to assume that because vaccination is a good thing, everyone would be on board. They had not prepared the ground enough and recognized that an education programme was necessary. It was also important to train local health workers and develop a rapid response network to fight polio.

The structure for polio eradication that was already in place in late 2013 helped prevent the spread of Ebola across Nigeria and it was recognized that structures that had already been created could *“help other vaccination programmes and even fight epidemics”*.

Nigeria wins the battle against polio: How Germany, through KfW, helps eradicate wild polio infections. Federal Ministry for Economic Cooperation and Development. Healthy DEvelopments 24 July 2015¹⁵¹

The German Federal Ministry of Economic Cooperation and Development (BMZ) attributed the achievement of a year since the last reported case of wild polio in Nigeria and also on the African continent to the *“coordinated efforts of donors, African governments, health workers, partners, religious and community leaders”*. In total BMZ had contributed some € 96.5 million for the fight against polio in Nigeria from 2004 to 2015 through KfW (originally founded in 1948 as the Kreditanstalt für Wiederaufbau and now serving to promote sustainable economic, social and ecological developments in Germany and worldwide) on the basis of close collaboration with the National Primary Healthcare Development Agency, WHO and UNICEF. These funds were used to procure vaccines and to finance special polio immunization campaigns, carried out by up to 300,000 local health workers, mainly temporarily recruited, in the areas at risk of polio infection.

The execution of planned polio campaigns could be difficult in some areas because of security situations. Consequently the German Financial Cooperation through KfW provided € 15 million, of which € 5 million was earmarked for security measures to make the health workers more secure in high-risk areas. The Nigerian strategy also changed to integrating immunization activities into routine health services, thereby increasing their acceptance.

Northern Nigeria: Terror hampers the fight against polio. Federal Ministry for Economic Cooperation and Development. Healthy DEvelopments 2014¹⁵²

This article showed the impact of terror on polio eradication in northern Nigeria, which meant that vaccination teams required protection against attacks. Indeed, UNICEF and WHO, with support from KfW, set up security programmes to be able to vaccinate as many under-5 children as possible.

The abduction of 200 schoolgirls by Boko Haram which took place in northern Nigeria and the continued violence from terror groups had been a threat to people there for many years. The violence affected development, health care delivery and also the fight against polio, with attacks on vaccination teams leading to the deaths of 3 Korean doctors and 13 helpers.

KfW had supported polio eradication with the help of the funds from the BMZ and in collaboration with the UNICEF and WHO in Nigeria, Afghanistan and Pakistan.

Improved security for the c. 250,000 local health aid workers was essential for vaccination campaigns to succeed. In order to reach and vaccinate the children despite the tense security situation, KfW had therefore provided € 5 million to support the UNICEF and WHO security programme, which aimed to integrate political and religious leaders from the regions to obtain greater acceptance of the vaccinations among the population. In addition, the local medical teams of three, including a vaccinator, a traditional opinion leader and a health worker, would be offering basic health care as well as administering vaccinations in house-to-house visits.

The current strategy also included a greater number of short-term vaccination campaigns, as part of a ‘hit and run’ strategy, with helpers only spending one to two days in a region secured by local authorities or security experts; vaccination protection belts around areas where security was compromised; and vaccinations administered in neighbouring regions, in

particular at bus stations, markets and border crossings.

At the time of writing KfW had provided a total of € 76.5 million to combat polio in Nigeria.

S. Desmarais. Eradicating polio in Nigeria. McKinsey & Company, February 2016¹⁵³

The publication noted that Nigeria had now passed one and a half years without any cases of wild polio virus infection, an impressive achievement given that in 2012 Nigeria was considered the worst performing of all polio-endemic countries, with a majority of new cases throughout the world; and there had been a climate of disinformation, intimidation, and violence that had peaked with the 2013 murder of 13 vaccinators by insurgents in Kano and Borno states. The measures that Nigeria had taken to overcome the barriers to eradication were reviewed, including establishment of a presidential task force to lead the country's response to the eradication of polio and the novel step of creating EOCs at the national level and in high-risk states. The role of the EOCs was discussed in detail and it was concluded that this was a particularly valuable approach that had important lessons for countries and for a range of health challenges.

12th IMB Report and resilience¹⁵⁴

In its 12th Report, the IMB gave a balanced assessment of the situation in Nigeria now that it had been removed from the list of polio endemic countries. It should be a source of pride, but not a cause for celebration, as areas of inadequate immunity remain in parts of Nigeria, as well as in other African countries. The risk of re-introduction therefore remained substantial.

The challenge for Nigeria, having stopped polio transmission for over a year, was to switch from an approach of driving cases down to zero to a programme philosophy of strengthening resilience. The IMB saw resilience as being more than vigilance, and as a *“relentless quest to identify every possible weakness and vulnerability in the country's defences against polio”*. It would require a different mind-set and a strong level of commitment, as well as a continuing strong funding stream and a focus on data. Nigeria was currently polio-free but not polio-resilient.

Building resilience would mean using broad surveillance; monitoring data on immunity and levels of missed children in the most vulnerable parts of the country; and resolving problems of inaccessibility with the same intensity as during the successful drive to get the number of cases down to zero. Resilience also required the same strong level of political and professional commitment, as well as a high level of technical and managerial performance. There must be *“an obsessive interest in having enough of the right data”* and acting on the insights it created. The IMB had taken this position based on information that communities were not being reached in SIAs; the day-to-day involvement of key local officials was waning; doubts existed about future levels of government funding; and the concept of resilience, being new, needed to be well communicated to be effective. In many cases, it would mean building on the positives already achieved, e.g. development of a highly skilled and effective team within the Nigeria EOC. In some areas, e.g. surveillance and monitoring, it required new capabilities and new approaches to synthesizing the data to look for early indicators of risk, such as starting sero-surveillance in Borno.

While there had been no polio cases in other African countries for over a year, the 'safety net' of high childhood immunity to polio in Africa remained patchy and unsatisfactory. Therefore, the IMB said, the African Regional Office of WHO and its UNICEF partners should do more.

The IMB called on Nigeria, facilitated by its GPEI partners, to conduct a strategic review to examine the range and quality of data necessary to constantly probe for weaknesses. Data

not collected or currently a minor feature of the programme may need to be greatly expanded, e.g. environmental surveillance and sero-prevalence data. A Polio Resilience Dashboard should be created as the main driver through which resilience was built. This transformation into resilience required continued engagement, political will, and national resolve to switch to a stance of readiness and response. The level of political leadership and engagement that had been seen previously must be maintained at all levels. Failure to ensure the flow of funds for resilience would lead to disaster. Communicating the message to the public would be hard but it needed to strike the right tone about the programme, something with which UNICEF might help. A Director of Polio Legacy should be appointed *“to lead agency planning and to ensure that programme staff and leaders are not distracted from the task of building resilience to keep the country and rest of Africa free of polio until official certification”*. Other specific legacy posts and structures might also be required, in addition to roles that focused directly on eradication.

A. Green. Will Nigeria’s new government fix the health system? The Lancet 2016, 387, 111-2¹⁵⁵

This article examined the demands on Nigeria’s public health system, which it said was under-resourced and overstretched. It referred to the country’s rapid and effective response to the Ebola outbreak the previous year, while stressing that health officials were uncertain whether the lessons could be transferred to other areas in its imbalanced system and that political commitment would be the key. According to the authors, the removal from the WHO’s list of polio-endemic countries in September 2015 was the country’s *“most heralded recent success”*, although immunization coverage remained low with no vaccine exceeding 65 percent of national coverage according to a study by the Institute for Health Metrics and Evaluation.

5.3.2 Others

In addition to Afghanistan, Pakistan and Nigeria, there are a number of other countries in which cases of cVDPV1 have occurred, as discussed in chapter 3. These include the Lao People’s Democratic Republic, Madagascar, and Ukraine.

The IMB 12th Report¹⁵⁶ referred to the infection in Ukraine, noting that it had warned about the poor state of children’s preventive health services there, which had been followed up with high level representations and warnings to the government from the GPEI management team, the WHO headquarters, the WHO regional office for Europe and the European Communicable Disease Centre, *“but to no avail”*. The IMB considered the response in Ukraine to be *“nothing short of shameful”* with low levels of coverage of all vaccine programmes; no budget for vaccines; and no vaccines procured. Nor had there been any public communication or social mobilization campaign of any note, which had resulted in *“false and damaging rumours about vaccine safety [having] been able to take root”*. According to the IMB, despite this background, no response was made *“within the timescale that international standards require”*.

The IMB also commented on the situation in Syria and other countries in the Middle East, noting that many of the countries that were now affected had had good levels of polio vaccine coverage before the conflicts in the region. Given the poor status of public health systems in some places, the populations were now vulnerable. The IMB noted that, since the polio outbreak in 2013 that resulted in 38 polio cases across Syria and Iraq, the GPEI has led by an outbreak response team based in EMRO, focusing on closing immunity gaps where possible. The focus has been on Syria, Iraq, Somalia, Yemen, and Libya, all countries that were in conflict or otherwise very insecure. Efforts have been made to strengthen surveillance and commission additional vaccine rounds as well as to carry out regular regional risk assessments. Nevertheless, the situation remained fragile and could result in further disruption; and political leadership and commitment to polio was not strong.

This could lead to a new importation of polio or the emergence of a vaccine-derived strain of the virus.

Attention was also being paid to the refugees coming out of North East Syria and Iraq, but it was also important to ensure that in-country services continued to serve those remaining in the countries. The large population movements across the region and into Europe provided a potential risk of resurgence of polio, particularly involving the Syrian refugees. With an estimated 3 to 4 million people being displaced to Turkey, Lebanon, Jordan and into Europe, the priorities were to vaccinate at crossing points and in refugee camps. But some refugees at different points in their journey might not want to be officially recognized or registered and those who disappeared and were living and working in the community might not have access to public health services. Large numbers of hidden 'zero-dose' families could pose a serious risk.

Detailed auditing of key processes in this turbulent region was essential. IMB sources also gave anecdotal accounts that refrigeration facilities in Yemen had been interfered with. While these may be isolated occurrences, *"the programme needs to be alert to systemic problems that are being hidden by broken routes of communication and oversight"*.

PART 3

6. WHAT NOW? THE INTERTWINING STRANDS OF LEGACY AND ENDGAME

With the end of polio in sight, the main goals for transition planning¹⁵⁷ for the GPEI are to protect a polio-free world and to ensure that the investments that have been made to eradicate polio contribute to future health goals after the completion of polio eradication. This chapter looks at literature related to the two main, interlinking strands of polio eradication, going forward:

→ **What is the legacy of polio eradication and how will it be integrated into health systems and structures at global and national levels?**

Harvesting the legacy of polio requires planning not only for what the results should look like (in terms of the knowledge, infrastructures, processes and skills developed in the eradication Initiative becoming part of global and national health systems), but how this transition can be efficiently and effectively conducted.

→ **What needs to be done differently to achieve the endgame?**

As detailed in preceding chapters, achieving eradication will most likely require much more than a continuation of previous approaches, since the last cases, the missed children and the critical need for effective surveillance in the coming decade are mainly in areas where social, political, religious, security and other factors present major barriers to be overcome.

It is evident that the processes which need to be developed and implemented to achieve the endpoint of secure eradication are therefore not independent from those that are required in the transitioning to harvest the legacy of eradication. The two strands of action intertwine and must be co-managed to achieve their goals jointly. Moreover, shifting the emphasis towards legacy as the final cases of polio dwindle poses the risk that attention and willingness to contribute resources to sustaining the eradication and the all-important years of continued vaccination, surveillance and robust preparedness for any re-appearance may be weakened.

Much attention is being given to the ways that the legacy of polio eradication can be embedded in health systems, reinforcing the argument that the eradication of polio will be of broader benefit to national health systems and structures and will contribute to achieving the universal health coverage (UHC) target within the 2030 Sustainable Development Goals (SDGs).¹⁵⁸ At the same time, a part of the potential polio legacy is its impact on the global health system and structures, including specific lessons for future disease eradication campaigns and for the architecture and governance of global health institutions. This chapter includes literature that deals with both the national and global aspects.

POB Statement, 30th November 2015¹⁵⁹

This statement from Thomas R Frieden, Director, CDC and Chair of the POB, referred specifically to the legacy transition planning which will ensure that the investments made in polio eradication continue protecting and improving health after eradication. He said that the legacy process involved the following aspects:

- continuing basic polio functions by incorporating them into ongoing health programmes after eradication
- documenting and sharing the lessons learned and knowledge generated with other health initiatives

- transitioning capabilities and processes to support other health priorities and promote sustainability

In the statement he referred specifically to India's role in legacy with its *“innovative health initiative to vaccinate every child against seven vaccine-preventable diseases”*. It built on polio eradication strategies such as microplanning and social mobilization and meant that the network of health workers and resources were now being used to fight against measles and rubella, while the communication strategies were encouraging parents to vaccinate their children against a range of diseases. Meanwhile polio assets in Nigeria were *“helping to strengthen district immunization services in partnership with the routine immunization program”* and GPEI-supported AFP surveillance in DRC was being used in other surveillance efforts, thereby strengthening other health priorities by providing technical and operational support. In Nepal and India surveillance was being expanded to include a wider range of vaccine preventable diseases.

The statement also noted that some polio functions would be still required after eradication, e.g. immunization, surveillance, outbreak response and bio-containment. Countries should therefore include them in their transition plans. Given that the polio eradication staff is the single largest source of external technical assistance for immunization and surveillance in low-income countries, and that they reached the world's most vulnerable children with other health interventions as well as vaccines, there should be careful planning *“to ensure that this infrastructure continues benefitting future global health priorities”*.

6.1 What is the legacy and how will it be integrated into health systems and structures at global and national levels?

The BMGF website¹⁶⁰ concisely summed up legacy in the context of polio eradication:

- Since its inception the GPEI had *“trained and mobilized millions of staff and volunteers, identified and reached households and communities that had been untouched by other initiatives, and established a robust global surveillance and response system”*.
- GPEI's partners had learned to *“overcome logistical, geographic, social, political, cultural, ethnic, gender, financial, and other barriers to working with people in the poorest and least accessible areas”*. And new ways of working had been developed, including political engagement, funding, planning and management strategies, and research, which have a real impact on human health in developing countries.
- The GPEI had developed a wide range of assets, including detailed knowledge of high-risk groups and migration patterns, effective planning and monitoring procedures, highly trained technical staff, local and regional technical advisory bodies, and a critical mass of political and organizational commitment based on successful partnerships between global national, religious, and local leaders. They had already been enlisted to respond to other public health threats and emergencies, including Ebola and meningitis in western and central Africa, H1N1 flu in Sub-Saharan Africa and the Asian subcontinent, and flooding and tsunami disasters in South Asia.
- Going forward, the legacy would ensure that supply chains, surveillance and laboratory systems, as well as social mobilization networks, were used to support other health initiatives and immunization programmes in the long term, particularly after polio has been successfully eradicated. The legacy may also go beyond health alone with the lessons learned impacting on other key development issues.

Contributions to date from the process

Before 2013

As can be seen in the reports of the WHO Secretariat to the WHA and EB, even before 2013 it was clear that, as stated by the DG, the polio eradication drive could have other benefits to health systems alongside and after the eradication of polio. These included, for example, contributions to the achievement of the MDGs. Moreover, interventions could be scaled up and used in other health activities because of the involvement of local communities. The GPEI was making a unique contribution as a public-private health partnership (see Chapter 2) and could also have other benefits, including for other immunization programmes, such as measles and rubella.

2013-2018 Polio Eradication and Endgame Strategic Plan

The adoption of the 2013-2018 Polio Eradication and Endgame Strategic Plan¹⁶¹ meant that legacy planning became fully integrated into the Initiative as one of the four main objectives of the Endgame Plan (see Chapter 3). Legacy planning aimed to ensure that the world remains permanently polio-free and that the investment made in polio eradication will provide public health dividends in the future. Moreover, lessons learnt should benefit other development goals and global health priorities and a target date was set for the development of a comprehensive legacy plan by the end of 2015.

Since its introduction in 2013, a number of steps have been taken that have begun to frame legacy and to form the basis for the final years of the endgame. In 2013, for example, following a consultative process in which three possible legacy scenarios were considered, a growing consensus emerged that the *“assets, lessons and resources of the polio Initiative should eventually be transitioned, primarily through national governments, to benefit other existing health priorities”* and national governments should be responsible for the future administration of the human resources infrastructure.¹⁶² Meanwhile the polio eradication infrastructure was used successfully in response to the Ebola outbreak in West Africa, particularly in Nigeria, by *“providing staff for surge support and conducting surveillance, contact tracing, data management, logistics and supply distribution, and outbreak management”*. Further consultations were also held involving Member States, major partners and stakeholders and detailed legacy planning missions were conducted in the DRC and Nepal.¹⁶³ It was recognized by the WHO Regional Committees that legacy planning should be used to benefit existing health priorities and be country-driven and country-led and that a formal process should be established in countries in which substantial assets for polio eradication were financed through external resources.

The GPEI Workforce

The polio eradication and endgame strategic plan 2013–2018 aimed to leverage the human resources infrastructure built over the previous 25 years in order to eradicate the disease and support other initiatives. In January 2013, the EB requested the Secretariat to conduct an independent study of the financial risks associated with the human resources component of the GPEI, so that they could be managed in the context of the planned completion of the polio programme in 2018. In May 2013, the EB’s Programme, Budget and Administration Committee requested that, in future, human resources reports should include an update on the situation. The report of the study on GPEI human resources was included in the Annex to the Secretariat’s report on WHO human resources for the January 2014 EB.¹⁶⁴

The WHO Secretariat’s report to the January 2014 EB on polio noted that the independent study had been conducted on the 22,000 people who were deployed by the GPEI, including the more than 7,000 contracted by WHO. This study, which was designed to determine the financial implications of eventual closure of the polio programme, also consulted senior representatives of donor agencies, other health initiatives and some national governments to

obtain their perspectives on long-term options for the polio-funded workforce. These stakeholders most frequently cited the surveillance (86 percent), laboratory (50 percent) and social mobilization (46 percent) functions performed by this workforce as of potential value for transition to other health initiatives. Two thirds of respondents stated that the future administration of this human resources infrastructure should be the responsibility of national governments.¹⁶⁵

Legacy planning

Polio legacy planning. Guidelines for preparing a transition plan. Revised 1 June 2015. GPEI, 2015¹⁶⁶

Taking into account the goal of polio transition planning of ensuring that *“the investments made to eradicate poliomyelitis contribute to future health goals, through a program of work that systematically documents and transitions the GPEI’s knowledge, lessons and assets”* and the five guiding principles (Box 6.1) that underlie this effort, the GPEI issued guidelines for preparing a transition plan. It was based on the expected outcome that in the coming years the funds for the GPEI assets established over the past 30 years for eradicating polio – namely people, resources and systems/process – would reduce and eventually stop. The process would be regional and country-specific and would require transitional plans with which this guidance was meant to assist.

Box 6.1 Polio legacy planning: Guiding Principles

The GPEI has identified five guiding principles underlying the legacy planning effort:

- Polio transition planning will benefit all countries and the global community, not only countries where polio resources are currently concentrated.
- Enabling long-term transitions to full country ownership of basic public health functions, wherever possible, is a priority.
- Under the leadership of the national government (and their subnational counterparts, where applicable), a broad range of stakeholders should be involved in the polio legacy planning process at the country level, including donors and civil society.
- Beginning the process of polio transition planning early represents the GPEI’s desire to plan carefully and responsibly for the future.
- Legacy planning should not distract from the current focus on interruption of poliovirus transmission and other objectives of the 2013-2018 Strategic Plan.

Source: Ref 166

Guidance was given on a wide range of topics including establishing plans for high priority countries and those without a WPV case for 12 months in the third quarter of 2016; the involvement of donors (both existing GPEI contributors and others) and civil society, as well as other stakeholders; and support from GPEI. The appropriate body to take the leadership in countries should be the Health Sector Coordinating Committee, where they were strong, or otherwise the Inter-agency Coordinating Committee on Immunization or possibly a technical body such as the TAG with a Coordination and Oversight Team to manage the planning and implementation. It was also recommended that a communication and advocacy strategy for the planning process be developed, aimed at, for example, government stakeholders, personnel in GPEI partner agencies, donors, civil society and other health/development agencies and the media. The actual steps that should be taken were then set out in some detail, including the discontinuation of polio programme functions and the sun-setting of assets.

These guidelines demonstrated the commitment of the GPEI to ensure that all the assets of the polio eradication activities were transferred to other areas. While they included some references to development in addition to health, it can be seen that they were focused on ensuring that the programme activities predominant benefited the health sector. In most polio-affected countries this made good sense insofar as they characteristically had weak health systems. It should also be noted that India was the country used for a case study, and that emphasis was placed on the fact that it *“began making strides towards successful transition even before the country was certified polio-free in 2014”*.

GPEI Polio Oversight Board (POB) and Polio Partners Group (PPG) actions. POB minutes 12 Dec 2014¹⁶⁷

At this POB meeting, Ambassador Lange (Chair of the PPG) stated that the GPEI should focus on *“explaining the broader (i.e. non- polio) benefits of polio eradication in external communications, particularly in messaging to donors”*, pointing out that many of these messages had been articulated in the legacy planning process. He stressed the importance of now focusing on legacy planning and reinforcing the relationship between GPEI and GAVI, *“noting that as GPEI succeeds, it is possible that donors will decrease their contributions and partners will decrease their staff with potentially serious implications for non-polio programmes (e.g. measles)”*.

In response to a request for guidance, the POB agreed that legacy planning should primarily be a country-led process, but that global level support and guidance was also important and could play a major role in ensuring the full benefit of legacy planning. They also endorsed a three-stage process for legacy planning, namely planning and decision, preparation, and execution, as well as a timeline for planning, including proceeding immediately with the first three countries, reporting to the POB at its June 2015 meeting, with the incorporation of lessons learned for transition planning for other countries. The approach to defining potential costs of legacy transition support would be reviewed by the POB in June 2015.

GPEI. Polio Legacy Planning Update. Polio Partners Group. 12 June 2015¹⁶⁸

During their deliberations the PPG noted the steps that had been taking on transitioning legacy to date. These included finalizing the transition guidelines and toolkit; the development of communications material and the adjusted planning timeline as agreed above, with a deadline of the 3rd quarter of 2016 for legacy plans; and an updated structure for the Legacy Management Group (LMG) – including increased regional representation; stakeholders beyond GPEI (e.g. GAVI, Task Force on Immunization in Africa) and formalized oversight (IMB). The legacy transition phase included **India** (transition planning underway); Sudan, **Ethiopia, Somalia, South Sudan, Angola, DRC**, Bangladesh, Indonesia, Myanmar, Egypt, **Chad** and Nepal (all other polio-free and recent outbreak); and **Nigeria, Pakistan and Afghanistan** (current epidemics). (Those in **bold** are GPEI priority countries for transition planning.) The PPG suggested ways in which donors could support transition planning, e.g. advocacy with national/state governors and key stakeholders to prioritize transition planning; contributing to global and country-level discussions; and providing funding and/or in-kind support for a *“rigorous transition planning process”*; estimating polio country personnel time; and setting out GPEI priorities.

Note: The LMG, set up by the POB and referred to above, reports to the Strategy Committee also set up by the POB.¹⁶⁹ There is also a **PPG Legacy Working Group**. The responsibilities of this Group, as described by Paul Rutter (see below), are to represent, communicate, and coordinate on legacy issues with interested PPG stakeholders; encourage PPG members to participate actively in polio legacy transition planning; provide a regular physical and virtual forum for stakeholders to share information and develop common positions; and plan how stakeholders can advocate around legacy planning. It has

up to seven members representing governments, donors and civil society groups with interests in polio and non-polio health issues, working in partnership with the PPG.

GPEI. Dr Paul Rutter. Polio legacy planning. Polio Partners Group meeting. 15 December 2015¹⁷⁰

The situation at the end of 2015 was summed up by Dr Paul Rutter in his presentation to the PPG. He showed the magnitude of the numbers of GPEI positions in some countries, with 11,186 in Nigeria, 9,761 in India, 3,198 in Afghanistan and 2,598 in Pakistan. Countries such as South Sudan, Somalia, DRC, Chad, Ethiopia, Angola and Bangladesh ranged between 390 and 121, with the other countries having fewer than 70. He also noted that there were 146 laboratories in 92 countries. Looking at the forecasted activities for 2016, he highlighted the EB and WHA. He also said that the strategy for 2016-19 would be published during the year and that there would be a legacy session at the Ministerial Conference on Immunization in Africa in February 2016. Consultants would be deployed to highest priority countries. He commented that success lay in the hands of the GPEI, countries with GPEI-funded asset, donors of GPEI, countries and related programmes, and programmes able to take over GPEI assets.

What will legacy be about? Lessons learned and strategies included

S.L. Cochi, A. Freeman, S. Guirguis, H. Jafari, B. Aylward. Global Polio Eradication Initiative: Lessons Learned and Legacy. The Journal of Infectious Diseases 2014, 210(S1):S540–6¹⁷¹

This article, by key personnel in GPEI major partners, is quoted extensively here as it clearly set out the key lessons learned during the past 27 years and that showed how this massive machinery could transition and become the legacy of the Initiative. The scope and size of the GPEI was noted, with its involvement in mobilizing and training millions of volunteers, social mobilizers and health workers; accessing households untouched by other health initiatives; mapping and bringing health interventions to chronically neglected and underserved communities; and establishing a standardized, real-time global surveillance and response capacity. The health community, moreover, had an obligation to ensure that the lessons and the knowledge generated were shared and that they contributed to real changes in the approach to global health. The authors stated what they considered as the 10 leading lessons learned from the polio eradication Initiative (Box 6.2). The paper included a caveat that the 'assets from smallpox' disappeared very quickly after its eradication. (For smallpox eradication see Chapter 7.2).

Box 6.2 *The ten most important lessons learned in the GPEI*

These cover:

- 1** Communications and community engagement: mobilizing social and community support for vaccination
- 2** Communications and community engagement: using targeted diseases initiatives as a springboard for broader health communication
- 3** The value of an advanced, state-of-the art global, regional, and national laboratory network
- 4** Real-time disease surveillance and response capacity, data analysis, and immunization programme monitoring
- 5** Addressing strategy implementation in conflict-affected areas and the risks of international spread to previously polio-free countries
- 6** Essential need for a programme of research and innovation
- 7** Partnership coordination, advocacy, and resource mobilization
- 8** Strategic planning and policy development
- 9** Oversight and independent monitoring and evaluation
- 10** Monitoring of programme accountability and performance

Source: Ref 171

The lessons learned from GPEI and its infrastructure can extend the global public good gained from polio eradication, ensuring that these investments provide public health dividends and benefits going forward. With the acceptance of the Polio Eradication and Endgame Strategic Plan 2013–2018, a time-limited opportunity opened up to ensure the best use of the capacity and resources of the GPEI.

GPEI's primary goals in legacy planning, according to the authors, were "*to protect a polio-free world and to ensure that the investments made, designed to eradicate polio, contribute to broader health goals after the completion of polio eradication*". These were supported by four guiding principles, namely that policy legacy planning will: benefit all countries, and not just those in which polio resources are currently concentrated; ensure that innovations are adapted and applied to expanded immunization and other health programmes; enable long-term transitions to country ownership of basic public health functions as a priority; and begin the process of polio legacy planning early to plan carefully and responsibly for the future.

The three principal aspects of the polio legacy work were mainstreaming essential polio eradication functions into public health programmes; ensuring that knowledge generated and lessons learned are documented and shared with other health initiatives; and as appropriate, transitioning the capacities, processes, and assets, including human resources, to support other health priorities. There was an interrelationship between the GPEI lessons learned and the transition of assets, both tangible, e.g. the global surveillance/laboratory network, and intangible e.g. accumulated knowledge, best practices, functions, processes, systems, activities, and work methods.

The authors highlighted five general categories of lessons learned:

- mobilizing political and social support
- strategic planning and policy development
- partnership management and donor coordination
- programme operations and tactics
- oversight and independent monitoring

They then summarized the ten lessons learned:

Lesson 1: Communications and community engagement: mobilizing social and community support for vaccination

This is particularly important as the success of any eradication initiative depends on social and political commitment.

Social support for vaccination was strengthened by generating mass public support for polio eradication. Then, as the focus changed to missed children, strategies were refined and targeted to reach the most vulnerable families. The GPEI, more than any other global health programme in history, accessed the chronically unreached, marginalized and most vulnerable populations in the world.¹⁷²

Mobilizing communities meant that the polio programme developed expertise in overcoming logistical, geographical, social, political, cultural, ethnic, gender and other barriers to work with *“the most-marginalized, most-deprived, and, often, most-security-compromised children and communities”*.¹⁷³ Characteristics and innovations included:

- Coordinating communications for support of a global and national public health goal as well as the missed children at the local level.
- Identifying individuals, themes, and social pillars that could unify and motivate diverse population groups around a common goal.
- Engaging with media in awareness-raising, holding stakeholders publically accountable for vaccination, and motivating leaders and communities.
- Mobilizing large-scale communities house-by-house to accept OPV with other health interventions, e.g. vitamin A supplementation, measles vaccination, anthelmintic administration and soap, bednets, and oral rehydration salts.
- Creating detailed neighbourhood vaccination team micro-plans and maps and identifying supporters to address resistance at point of care.
- Tracking and communicating with mobile and migrant groups in transit.
- Reaching families with information and vaccines, including missed children; mobilizing parents at social, cultural and religious events and festivals (melas).

Lesson 2: Communications and community engagement: using targeted diseases initiatives as a springboard for broader health communication for targeted social support for vaccination.

The collection and analysis of local level social data enabled GPEI to understand and engage effectively with the population it served. Evidence-based communication insights had enabled GPEI to direct limited resources to the most-vulnerable areas and families, focus on critical messages, and understand remaining barriers preventing OPV from reaching children. Community demands for additional services had sometimes been addressed with vaccination activities, e.g. promotion and delivery of routine immunization, zinc, oral rehydration salts, and sanitation services in UP and Bihar in India. Likewise in Pakistan and Nigeria, similar strategies enhanced access to hesitant or refusing households and even communities. Promising additional health and water services had meant additional children, invisible to other social services, were vaccinated.

Communications for polio vaccination *“served as a spring-board for broader public health outcomes”* by:

- Investing in interpersonal skills, management, and motivation of frontline workers.
- Tracking and counselling pregnant mothers on prenatal health, birth-dose polio vaccination, neonatal health and routine immunization.
- Conducting targeted communication and outreach for routine immunization sessions and advocating for the fully-resourced sessions.
- Advocating for better delivery of health services that meet social, cultural, and gender-based needs of communities.

- Promoting and delivering additional health interventions, including de-worming medicines, vitamin A supplements, measles vaccine, sanitation services, bednets, and routine immunization.
- Building trust for OPV in inaccessible or insecure communities by hosting health camps.

Lesson 3: The value of an advanced, state-of-the art global, regional, and national laboratory network

A sophisticated, state-of-the-art poliovirus laboratory network had been built, consisting of national laboratories, regional reference laboratories, and global specialized laboratories. It demonstrated that an efficient global surveillance system can be built in resource-poor countries at relatively minimal cost. This platform had served as the basis for other laboratory networks for vaccine-preventable diseases (e.g. measles and rubella). Laboratory professionals have been trained and supported by GPEI. Characteristics and innovations included:

- Provision of timely data as the model for other laboratory networks.
- Integration of case-based epidemiologic and laboratory information.
- Performance of supplementary environmental surveillance.
- Inclusion of networks for other diseases (measles, rubella, yellow fever, Japanese encephalitis, rotavirus infection, invasive bacterial disease infections, and influenza).
- Inclusion of an annual accreditation process; proficiency testing; tracking of laboratory surveillance performance standards; standardized surveillance data collection, formatting, compilation, analysis, and feedback; quality assurance/quality control; supplying laboratories with reagents and testing kits; extensive technology transfer of new diagnostic testing procedures (e.g. genetic sequencing and real-time polymerase chain reaction [PCR] analysis); periodic technical meetings for coordination and to share knowledge and findings; and periodic regional and national staff training to maintain and enhance capacity.

Lesson 4: Real-time disease surveillance and response capacity, data analysis, and immunization programme monitoring

The high-performance disease surveillance and programme monitoring system developed by the GPEI had enabled rapid detection of polio cases and outbreak response worldwide, including in low-income countries. This system, composed of people, transport, Internet connections and communications, and data management facilities had been used for surveillance of other vaccine- preventable diseases, and other programmes. GPEI-trained health workers have been used for other health programmes and represent a substantial human resource capacity for the future. Closer links between measles and rubella programme activities and the GPEI had well-recognized benefits. SAGE recommended that countries and global immunization partners assess the potential synergies and take active steps, where appropriate, to adapt and apply the polio infrastructure and lessons learnt to support achievement of measles and rubella elimination targets and strengthening of routine immunization programmes.¹⁷⁴

Resources should contribute to the goals of the Decade of Vaccines, outlined in the Global Vaccine Action Plan.¹⁷⁵ Characteristics and innovations included:

- Performance of case-based, rapid clinical and epidemiologic case investigation and reporting.
- Creation of a weekly global, regional and country World Wide Web-based reporting system with mapping of individual cases that was publicly available and unprecedented in scope.
- Unparalleled global surveillance and response capacity.
- Integration of case-based epidemiologic and laboratory information.

- Provision of data-driven guidance on allocation of resources, outbreak investigations, measurement of programme progress, adjustments/improvements in programme strategy, and implementation.

Lesson 5: Addressing strategy implementation in conflict-affected areas and the risks of international spread to previously polio-free countries

The GPEI had successfully implemented strategies in conflict-affected areas, having developed a range of tactics to access children and boost immunity more rapidly in these areas. This had occurred in the context of the spread of the virus from polio-endemic countries to previously polio-free countries. Characteristics and innovations included:

- It was an example of a global public good.
- It reaffirmed the importance of coordinating global efforts to minimize the risk of re-infection.
- It mobilized human and financial resources to protect at risk polio-free regions and countries (especially through SIAs).
- It used the WHA, other forums and the 2005 IHR to persuade low-performing countries to improve programme performance.

Lesson 6: Essential need for a programme of research and innovation

The GPEI had maintained an active ongoing research agenda, driven by the need to adapt and optimize strategies, developed in the Americas to other contexts and cultures. For more than 20 years it had used new technologies including diagnostic tests (e.g. PCR), vaccinology and cold-chain technology to improve effectiveness and reduce costs. Innovative problem solving was required both ‘bottom up’ and ‘top down’. Characteristics and innovations included:

- Recognition of the need to adapt.
- Embracing research as an essential part of the programme.
- Fast-tracked development, testing, and licensure of new tools.
- Appreciation that operational research is a key for the success of an eradication or elimination programme.
- Development of special strategies to reach underserved and migrant populations.
- Universal use of finger-marking and independent monitoring technologies.

Lesson 7: Partnership coordination, advocacy, and resource mobilization

Cross-agency coordination of an effective advocacy agenda had been central to the “*eventual endorsement of and crucial support*” to the GPEI by political bodies, including the African Union and the G8. Rotary International had engaged in this form of mobilization and with key individuals e.g. UN leaders, business magnates and international personalities, as well as politicians and community, religious and traditional leaders at the local level. Advisory, monitoring and technical groups supported partnership coordination and input. The numbers and diversity of partner organizations had been important. Characteristics and innovations included:

- Professionally planned and guided advocacy and resource mobilization infrastructure at all levels.
- Interagency coordination committee use at regional and national levels.
- Extensive infrastructure and experience for conducting partner coordination.
- Infrastructure for tracking financial resource requirements and cash flow management.

Lesson 8: Strategic planning and policy development

Over time the GPEI had developed a comprehensive approach for completing polio eradication through global certification, recently including a long-term budget (six years) and timeline for raising most funds ‘up front’, i.e. US\$ 4.1 billion of the US\$ 5.5 billion estimated cost, together with improving immunization systems and an extensive monitoring framework. Characteristics and innovations included:

- Multiyear strategic plans and planning processes.
- Elaborated NEAPs for the remaining polio-endemic countries.
- Technical advisory groups and policy development at all levels.
- Guidance through task forces in key countries.

Lesson 9: Oversight and independent monitoring and evaluation

A strong oversight framework was required to support the programme, monitoring, and management of the collaborative process and for communication with stakeholders. Characteristics and innovations included:

- An independent monitoring group, IMB.
- A strong central technical advisory body, SAGE.
- Highest level of governance, WHA and EB.
- Independent global and regional certification commissions.
- PPG as the stakeholder voice for GPEI.
- Surveillance and programme performance indicators.

Lesson 10: Monitoring of programme accountability and performance

Technical solutions do not “*compensate for basic management and accountability shortcomings in key countries and areas*”. It was therefore necessary to work with political leaders at lower levels in large, federated countries with weak health systems and to put in place systems for greater staff and financial accountability. Characteristics and innovations included:

- NEAPs in polio-endemic countries with country-level oversight bodies reporting to the Head of State.
- Micro-plans and mapping of communities.
- Accountability frameworks.
- SIA coverage surveys, SIAs independent monitoring teams, lot quality assurance sampling, and sero-prevalence surveys.

Preparing for the future

The paper concluded that lessons learned from the GPEI and its infrastructure and unique functions could contribute to strengthening overall immunization programmes, especially routine immunization systems in low-income countries, through the use and redirection of GPEI resources and innovative approaches.

Global Polio Eradication Initiative. Polio Eradication & Endgame: Midterm Review. World Health Organization, July 2015¹⁷⁶

The Midterm Review (MTR) included an examination of the main objectives, outcome indicators and major activities of the GPEI polio eradication and endgame (Box 6.3).

Box 6.3 GPEI Legacy planning

Legacy planning		
Main Objectives	Outcome Indicators	Major Activities
1. Develop a plan to ensure polio investments contribute to future health goals, through documentation and transition of GPEI lessons learnt, processes and assets	Polio legacy plan developed by end-2015	1. Attain legacy planning stakeholder alignment 2. Develop polio legacy plan 3. Initiate implementation of polio legacy plan
Monitored by the WHA		

Source: Ref 176

The MTR reported that two progress indicators (1: initiate a global legacy process; and 2: complete a broad consultation process) had been achieved and that only the third indicator (3: establish polio legacy plan) remained, having achieved 80 percent of the goal, with some countries having *“delayed in polio legacy planning due to eradication status and delays in undertaking the process”*.

Therefore Objective 4 of the Polio Eradication and Endgame Strategic Plan 2013–2018 was largely on track and aimed *“to ensure that investments made to eradicate polio contribute to future health goals, through systematic documentation and transition of the GPEI’s knowledge, lessons learned and assets”*. This would be achieved by *“mainstreaming essential polio functions; sharing knowledge and lessons learned; and transitioning assets (people, physical assets, supporting tools/systems and enabling factors) to other health priorities”*.

The report pointed to the role of the LMG (see below) in guiding the planning process at the global level and in reaching out to a wide range of stakeholders, as well as its engagement with the SAGE and IMB. Meanwhile country-level discussions were underway for India and have also recently started in Nigeria.

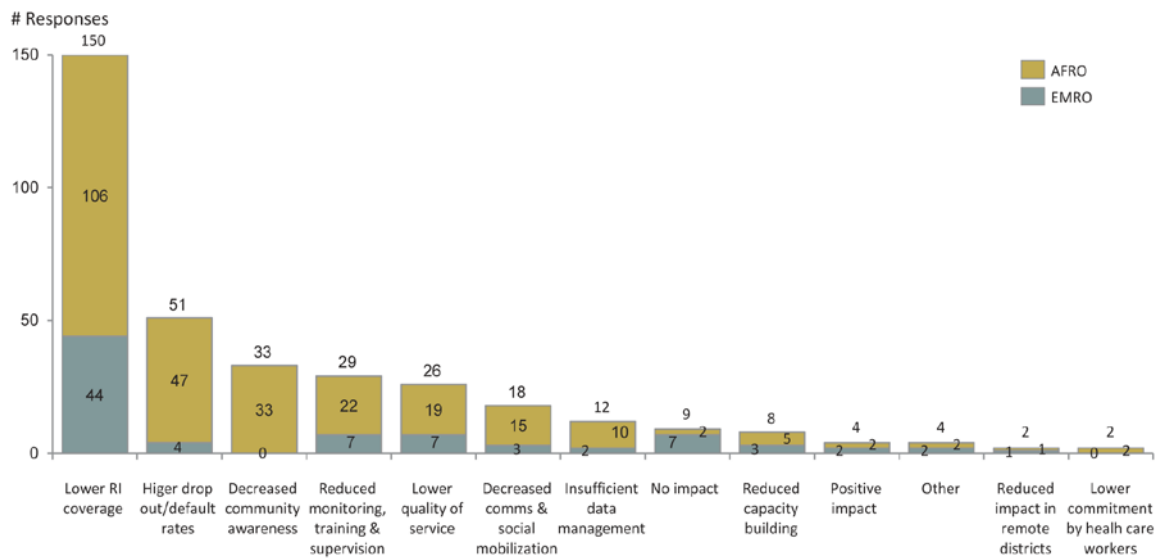
It was emphasized that legacy planning should not distract from eradication activities, with certain risks being identified with the third indicator related to the status of polio eradication in some countries and the possibility that others that had already interrupted transmission being slow in beginning legacy planning. The MTR noted the lack of understanding of the legacy planning process among GPEI partner organizations, donor partners and at regional and country level, given that was a new activity of the GPEI; and also that indicators for monitoring progress of country-level implementation were not included in the monitoring framework of the Endgame Strategic Plan.

Progress during the previous two years had included the development of an evidence base, with legacy pilot planning studies being conducted in DRC and Nepal, as well as the Guidelines referred to above and the draft Legacy Planning document as part of a toolkit for country-level distribution. The donors’ interest to be engaged in the process (e.g. a donor meeting was held at the Canadian mission in Nigeria) was also reported, noting their importance to the process.

A study of the 10 priority countries in Objective 2, corroborated with self-reported data from Nepal, revealed that among lessons learned and risks, *“polio-funded staff spend a significant amount of time on other health priorities such as routine immunization and measles and rubella”*. The survey also projected the negative effects of discontinuation of the programme on routine immunization (Box 6.4). Pay disparity between polio and other health workers showed that there was no clear path for transitioning human resources from polio eradication effort to other responsibilities. Countries with dysfunctional health systems, such as Somalia, were of particular concern as the reduced capacity of an already weak infrastructure would not be able to support other health priorities.

Findings of the Nepal and DRC studies were provided in the MTR report as examples of ‘legacy in action’, with polio-funded staff already providing *“significant support to other health priorities”*, e.g. surveillance activities in the Immunization and Preventable Disease (IPD) programme in Nepal being provided by polio-funded personnel. As one government official said, *“without IPD, without Surveillance Medical Officers, surveillance would just go away in Nepal”*. In DRC, polio-funded personnel were *“deeply integrated into the DRC health system, supporting surveillance and immunization, delivering other health services and providing field infrastructure”*, noting that *“without these polio assets, critical capacities in DRC would be at risk in the absence of polio funding”*.

Box 6.4 Project Effect on routine immunization from discontinuation of the polio programme



Survey question: "What would be the impact on routine immunization if your team was no longer able to contribute?"

Source: Routine Immunization - IMG Polio Survey

Source: Ref 176, p36.

In contrast to the benefits of legacy planning for a wide range of health priorities, such as the emergency response to the Ebola outbreak,¹⁷⁷ the potential detrimental impact of ending of polio funds on routine immunization cannot be ignored. The legacy planning process must therefore *“find synergies with routine immunization and reinforce collaboration between the groups working on routine immunization and legacy planning”*.

The example of India in beginning the legacy planning process and providing valuable lessons was noted, with two presentations from India included in the Legacy Planning toolkit to share its lessons learned with others. The experience of India, moreover, highlighted the need for *“country-level ownership of the legacy planning process to drive transition planning to support other health priorities identified by the government”*. India, however, is exceptional as it was already providing some domestic funding support for polio eradication activities.

Data was provided on the transition of funding sources for the National Polio Surveillance Project, established by WHO and the Government of India, to other health priorities beyond polio. Support for the UNICEF-initiated Social Mobilization Network was also being transitioned from GPEI partner funding to other sources of funding.

The review concluded that in some cases *“external technical assistance may be required to support the legacy planning process as will financial support to ensure that adequate time and resources are dedicated to the process of developing and executing legacy plans”*. Where possible, legacy planning should complement plans to strengthen routine immunization and the impending switch from tOPV to bOPV to *“avoid the burden of countries’ needing to develop another plan related to the polio end game”*.

The MTR report noted that the transition process for both of these activities was complex, requiring extensive engagement with a variety of stakeholders. It did, however, provide lessons learned that would be of help to other countries undergoing the transition planning process.

Another lesson learned in mainstreaming essential polio functions is “the potential for surveillance systems to significantly decline after a region has been declared or certified polio-free”. Examples were given of the Americas where “polio surveillance indicators declined after that region was certified polio-free in 1994”, as well as surveillance indicators in several countries in the European and Western Pacific countries which do not meet international surveillance standards.¹⁷⁸ Once polio is eradicated, it will be critical to integrate a surveillance system into a strong national disease surveillance system, including the use of environmental surveillance, to maintain a polio-free world.

The report noted that the “urgency of beginning the legacy planning process cannot be overstated” now eradication was imminent and “the reality that polio funding is limited is setting in”. The entire legacy planning and implementation process was expected to take several years and would take place concurrently with the “established timeline to certify the world polio free”.

The Midterm Review made the following recommendations:

Recommendation: Increase the visibility and urgency of legacy planning work

“National government ownership of, and donor partner engagement in, the legacy planning process are required. To maximize impact, the GPEI must work closely with donor partners to identify strategic entry points and opportunities for donor engagement with legacy processes across levels. The early availability of the Legacy Planning toolkit in June 2015 to stakeholders at the global/regional/country levels, with a robust engagement strategy, is needed to move legacy planning forward and facilitate the transition of GPEI assets to routine immunization and other health priorities, document lessons learned and ‘legacy in action’ and mainstream essential polio functions.”

Risk: Heavy reliance on polio funding for routine immunization, especially in Africa, and the need for strengthening basic health systems in many countries, can lead to failure to plan mainstreaming of essential polio functions jeopardizing sustaining a polio-free world and routine immunization programmes.

Recommendation: Increase sustained surveillance capacity and quality

“A long-term surveillance strategy with clearly identified milestones through 2018 and beyond, taking into account countries current status and risk for outbreaks, is needed. The role of environmental surveillance should be included in such plans as a key, cost-effective component to maintaining a polio-free world. “

Risk: The level of polio surveillance needed during the period after the interruption of the transmission and before the certification of the eradication of polio and post-certification may be different and countries may not sustain the required high level surveillance after interrupting transmission and/or certifying eradication.

N. Previsani, R.H. Tangerman, G. Tallis; H.J. Jafari, World Health Organization Guidelines for containment of Poliovirus Following Type-Specific Polio Eradication – Worldwide 2015. Centers for Disease Control and Prevention: Morbidity and Mortality Weekly Report 28 August 2015¹⁷⁹

This article looked at the global, synchronized withdrawal of OPV2 in the context of the endgame. It pointing out the links between minimizing the number of essential facilities worldwide in reducing the risk; facilitating national and international oversight; and strengthening the likelihood that global containment standards can be met and successfully maintained. It was estimated that 500 facilities worldwide were holding type 2 polioviruses and that diagnostic laboratories would continue to be critical for surveillance for years to come.

The need for continuation of polio vaccine production, surveillance and research well after final certification takes place was highlighted and it will be important to consider how this aspect of the endgame will contribute to the legacy going forward.

S. Cochi. Polio Legacy Transition Planning: Status Update. Presentation at GPEI SAGE Meeting, 20 October 2015¹⁸⁰

In his status update on polio legacy transition planning, Stephen Cochi (Chair of the LMG) referred to the key components of transition planning as maintaining and mainstreaming polio functions; sharing lessons learned to improve child health; and transition polio functions to improve child health.

In addition to enumerating the GPEI workforce (above 30,000 working in endemic and transitioning countries), he provided examples of 'Legacy-in-Action'. These included building on the more than 700 laboratories in the polio laboratory and surveillance network, as well as estimates of time allocation of polio personnel by country, showing a total of 46 percent of time spent on routine immunization-related activities. He also referred specifically to the use of polio assets/infrastructure in Nigeria's response to Ebola, as well as the various aspects of intensification of routine immunization in India. Specific resources that he mentioned included the polio legacy transition planning toolkit and guidelines, as well as the 2015-2016 priorities. He also listed specific action that have been taken including the designation of legacy focal points by WHO (AFRO, EMRO and SEARO) and corresponding UNICEF regional offices to serve on the LMG and referred to the role of the IMB as the independent oversight group for legacy planning. Issues for discussion included risks and consequences of not conducting good polio legacy transition planning; polio legacy and the global/regional policy framework – how does polio legacy interface with the WHO Global Vaccine Action Plan, measles and rubella elimination, immunization systems strengthening and GAVI health systems strengthening; and relevance beyond immunization and vaccine preventable diseases surveillance.

This update highlighted key concerns of the LMG in October 2015 and the progress made to date in India and in Nigeria. It also demonstrated the magnitude of the task needing to be undertaken and directions for the work ahead.

P. Crowley. Polio on the brink of eradication. Devex 27 October 2015¹⁸¹

The author, the head the UNICEF polio team, attributed the success of the polio eradication Initiative to date to a wealth of data, innovation, community engagement, research and community links. He considered that the success hinged on the 'game changers' and that the efforts of the GPEI partners could only go so far without the commitment and leadership of a country's own government, citing India and Nigeria as examples, while noting that there had also been a shift in Pakistan.

Discussing the legacy for the future, he said that they still faced setbacks, for example the recent outbreaks of circulating vaccine-derived poliovirus in the Ukraine and Laos and that they must prevent such lapses by intensifying their efforts, and by *"strengthening and maintaining optimal levels of immunity around the world"*. When they achieved eradication, they *"will be leaving behind not only a world that is free of this paralyzing disease, but also a legacy of systems, learning and innovations that can support our continuing quest for a healthy future for all children, everywhere"*.

This short article from UNICEF focuses specifically on the legacy as it relates to immunization, referring to the recent outbreaks in the Ukraine and Laos as setbacks. It emphasised that while WHO would undoubtedly be the major partner in implementing the legacy, insofar as much of it was focused on immunization, health and health systems, it was important that all other partners, as well as donors, were equally committed.

N. Bristol. Repurposing Global Polio Eradication’s Tool Kit: “Polio Legacy” Activities in India. Washington DC: Center for Strategic and International Studies (CSIS), September 2014¹⁸²

Bristol pointed out that, while the GPEI continued an acute focus on completing global polio eradication through its strategic plan, it was also anticipating *“its own post-eradication demise”*. This would mean the risk of losing systems and innovations which it developed and funded and many of which could be used to support other health programmes. The GPEI was therefore beginning to catalogue and assess the assets that it created and to seek ways to transfer them to government health systems and other health initiatives as part of polio legacy planning. The paper then focused on India and its actions so far in legacy planning. It also considered funding from some major donors beyond polio eradication as well as urging the US government, as a major contributor to polio eradication and global health issues, to support legacy planning.

Following the reporting of the last polio case in India in January 2011, the country was now moving to legacy planning, against a background that some of its projects and resources might face an uncertain future. Its National Polio Surveillance Project was almost entirely supported by external funding, which would mean alternative funding sources as the GPEI shrinks, or the 145-facility Global Polio Laboratory Network developed by the GPEI, although it also responded to other diseases, could begin to falter.

Polio was eradicated in India through *“solid financial, political, and logistical commitments from the national government, unwavering support from the international community, and innovative, relentlessly methodical record keeping and oversight”*. Vaccinating 170 million children under-5 involved reaching them in very remote areas by walking for hours, using boats and motorcycles and negotiating floods and droughts. They also had to track and vaccinate an estimated at 326 million internal migrants and overcome cultural barriers and distrust of government in UP and Bihar. Success required *“continuous real-time data feedback”* to enable immediate midcourse corrections, effective communications with those resisting vaccination and ownership of and involvement in the programme at all levels.

Key elements of the programme included planning, supportive supervision and accountability, surveillance, communications, high-risk strategies and partnerships. The elements of the polio eradication programme led to a major accomplishment which, according to government officials, built confidence and pride in government health programmes and local communities.

The legacy began before India was declared polio free, with WHO moving polio staff to parts of the country that needed most help to improve routine immunization systems. Some states, moreover, agreed to pay the salaries for polio volunteers who could contribute to other health improvements, with WHO providing training, supervision and oversight. WHO was also transferring staff, previously paid by GPEI, to their regular budget. This transition was set out in WHO’s Country Cooperation Strategy with India, which *“emphasizes broadening the scope of disease-specific programs in the country including those related to polio, AIDS, and tuberculosis”*.¹⁸³

Other legacy actions dated back to 2005 with training of National Polio Surveillance Project staff to conduct measles surveillance in the state of Tamil Nadu. Subsequently, all 35 states and territories provided training to incorporate measles into the polio surveillance system and in 2013 India with other countries in the region pledged *“to eliminate measles by 2020, an effort that will involve improving routine immunization systems and disease surveillance”*. This led to a drop in India in measles cases from 56,188 in 2009 to 13,822 in 2013.

Nevertheless, there was still a long way to go in improving childhood immunizations in India, especially in the poorer areas.

For routine immunization, long-term systems needed be built up to reach all children regularly and bring in new vaccines when they become available. Immunizing 27 million children [the number of children born in India each year] six times in a year on specific dates, required different skills and organization from polio eradication campaigns. Despite the efforts of the Indian Government, *“the health system is known for weak infrastructure, lack of accountability, and glaring resource inequities, particularly in the poorer states”*.

Polio eradication donors and the programme’s legacy

Bristol also commented on the major GPEI donors, namely the USA, UK, Rotary International, the World Bank and BMGF, saying that budget needs were expected to diminish after 2018, (this will now be 2019) and that legacy planning would ensure *“continued resources for critical assets to guard against polio re-emergence and for continuation and expansion of other health activities now supported by polio eradication resources”*. She also warned that while donors were focused on eradication, *“several are beginning to think how they might use their money later”*.

Repurposing polio eradication’s tool kit: The US Government’s role

Bristol commented on the role that the US Government had played in the context of the GPEI and made a number of recommendations for its continued support.

This paper provided important insight into the legacy in India, including a number of successful transitions from polio eradication to routine immunization programmes. It also pointed out that transition might be very difficult and warned that donors may not necessarily keep their same priorities once polio is eradicated.

Other sources consulted include the report of a high-level PPG meeting on polio legacy planning in June 2014,¹⁸⁴ a draft of the GPEI Endgame Strategic Plan 2013-2018 as of 14 April 2013,¹⁸⁵ a list of frequently asked questions on the GPEI’s legacy transition planning from March 2015¹⁸⁶ and a presentation from WHO AFRO at the MTR TAG meeting in June 2015.¹⁸⁷

A. O. Odutolu, R. Dimka, M.O. Alade. Nigeria’s seven lessons from polio and Ebola response. Investing In Health: News and Vies in Healthy Development. Washington DC: World Bank 5 January 2016¹⁸⁸

This blog, by a Senior World Bank Specialist on the Africa Region and others, pointed to the lessons that could be learned from Nigeria for the West Africa region to be better prepared to handle future disease outbreaks. While Nigeria was able to contain Ebola as it was caught early, some components of the response were adapted from polio eradication efforts in the country, as well as from infrastructure and capacity built in response to an Avian Flu outbreak in 2006.

The blog gave responses to the questions *“How did a previously weak system suddenly gain the momentum to operate efficiently and yield favourable outcomes? Are there lessons we can learn related to the effectiveness of future disease surveillance and emergency response efforts?”* It noted an alignment of several factors that termed the seven “P’s”, namely:

- **Politics of Purpose** – eradication of polio and Ebola were both made national priorities by the political leaders, thereby establishing clarity of purpose and focus and enabling cooperation across political and technical cadres, federal and state institutions, and across public and private sectors.

- **Providing the Right Platform** - The Polio EOC served as a ‘springboard’ for the country’s Ebola response. It could make decisions and respond quickly.
- **Aligning People with Processes** – The EOC structures had routine operational cycles, which allowed a fast response, with all roles clearly defined.
- **Proactive Public Engagement** – Myths and rumours affected both polio immunization efforts and the Ebola response. Communication with the public and communities, however, improved in clarity and consistency, thereby “*building trust and enhancing cooperation*”.
- **Prolific Partnerships** – As in polio eradication initiatives, a range of actors from within the public and private sectors, including the donor communities were brought together.
- **Pioneering Alternative Pathways** –As human resources could not be mobilized from health facilities, the EOC team had to use an alternative recruitment strategy to bring together “*willing and motivated health workers to work at the frontlines*”. The polio eradication experience also helped to reach areas affected by insurgency.
- **Priming the System** – Although Nigeria had been largely unprepared for a response to polio, previous investments in the health system, e.g. the Nigeria Field Epidemiology Training Program, helped to provide an army of frontline health workers trained in surveillance to carry out contact tracing.

For Nigeria, investments in the EOC presented a great opportunity. Extending its legacy could include creation of decentralized EOCs in each state, to incorporate the health, animal and environmental sectors in a bid to achieve the ‘One Health’ goal’ and the lessons learned about health systems, public institutions and their capacity to deliver should be well-documented and brought to bear in future planning.

6.2 The endgame: how and when eradication will be achieved

6.2.1 Political and economic factors

P.V. Ganapathiraju, C.B. Morssink J. Plumb Endgame for polio eradication? Options for overcoming social and political factors in the progress to eradicating polio, Global Public Health: An International Journal for Research, Policy and Practice 2015¹⁸⁹

This publication discussed some of the possible social and political factors that have impacted on polio eradication and might continue to do so during the endgame. It focused particularly on the problems that had affected polio eradication programmes in the two countries which were then still classed as endemic, namely Afghanistan and Pakistan, as well as Nigeria.

The authors noted that polio transmission was concentrated in conflict-affected regions in Afghanistan and that the conflict from 2010-2012 hindered vaccinations in the southern parts of the country. It was possible to improve access in 2013 through negotiations, alongside efforts being made to improve the quality of SIAs.

In Pakistan, SIAs were suspended temporarily in 2013 in some areas as the result of the violence. Targeted attacks on vaccinators and law enforcement affected SIAs in parts of FATA and local leaders stopped vaccinations from June 2012 to October 2014. This was

responsible for the increase in WPV cases and for importation into Afghanistan and Syria.

Social factors: As posited by Sir Michael Marmot, a *“human rights approach to health supports giving priority to improving health and reducing inequalities”*, which requires *“absolute action on the social factors in polio eradication as a major policy challenge”*.¹⁹⁰ As far as polio eradication is concerned, the principal social factor has been *“inadequate flexibility in accessing children safely”*. This disconnect can be explained by the fact that, while awareness that polio eradication may be widespread, many of those in affected communities have not perceived vaccination as a high priority. In addition, community leaders are *“not educated nor mobilized to get more invested in polio vaccination”*.¹⁹¹

Cultural values that are shaped by religion have also impacted on polio eradication. In northern Nigeria, for example, which is predominantly Muslim, the Supreme Council of Islamic Affairs has control over the population *“for whom religion is a way of life”*, e.g. it was thought that polio was caused by *“evil spirits who drink blood of victims”* resulting in paralysis or death. Other cultural factors included beliefs in native medicine and choice of ‘traditional doctors’ as opposed to vaccination.¹⁹²

Immunization locations may not offer sufficient vaccines to meet the local demand and in addition, given that many of those in the countries concerned live in rural areas, their local primary care systems may not reach the expected standards in vaccination delivery, e.g. vaccine storage may be a problem.

Efforts that have been made to improve social mobilization, as discussed in Chapter 5, must involve women as an important part of polio eradication programmes. This has included the use of women literacy students, a programme that was first launched by UNICEF in Jalalabad, Afghanistan, as well as female vaccinators and supervisors.

Political factors of concern are the deadly attacks in fragile areas, which have affected Pakistan and Afghanistan and also Nigeria (see Chapter 5). It should be noted, however, that the central causes of the failure of polio eradication are country-specific. In the case of Afghanistan, according to Toole et al,¹⁹³ while President Karzai wanted to bring an end to the Afghan war via a political settlement with the Taliban, they would not negotiate while US and other foreign troops were in the country. Therefore political endorsement of polio eradication programmes may have been counter-productive. At the same time the Taliban could be unlikely to carry out attacks on polio vaccinators, as they wished to regain control of national politics in Afghanistan, to rebuild trust among the population and to allow locals to engage in social campaigns, including the GPEI. The situation remained fragile as terrorist forces could interfere with polio eradication efforts *“as part of a political strategy tool for countering the western front in Afghanistan”*.¹⁹⁴

Although polio vaccinations were carried out for 15 years without interference in Pakistan, more recently there had been attacks on vaccinators in FATA and other areas (see Chapter 5). The situation was exacerbated by the use of polio campaigns as a cover for espionage by the CIA, as well as by drone attacks.. In addition, the attention given to the attacks by international media *“has led terrorist groups to believe that they can achieve their aims by interfering with polio eradication”*.

In the case of northern Nigeria, vaccination campaigns were stopped in Kano, Zamfara and Kaduna states by political and religious leaders, who believed that the vaccine was contaminated with anti-fertility agents. This belief had its roots in the 1980s when the then President Babangida *“embraced a policy to control the population by limiting the number of children a woman should have”* and this was then linked to the polio vaccination campaign. In addition the power shifted to the south, increasing tensions within the country and the lack

of trust of the federal government by northern Nigerians and linked to the prominence of Boko Haram.

The authors noted, however, that the current political climate of violence in these countries was not conducive to global coordination as it had been during the smallpox eradication programme, which had been supported by both the superpowers – USA and Russia – and with national campaigns continued even during long-standing wars.

At the global level a further political dimension was added with the ending of polio being considered a global public health emergency in 2013. Subsequently in 2014 the DG declared the recent spread of the wild strain of polio as a PHEIC with temporary recommendations under IHR 2005 to reduce its global spread and importation. This, according to the authors, then addressed the remaining factors and barriers *“using a ‘top-down’ authority approach”* (see Chapter 2).

Insofar as the major problems are at the local level, however, it is at this level that political streams needed to engage with the process. The authors therefore posed the question whether the ‘visible cluster’ of policy actors such as WHO, UNICEF, CDC, Rotary International and BMGF should also include *“the Taliban, Boko Haram and the continued support of the Imams of Nigeria”*.

In discussing possible options the authors observed that WHO and Western health agencies preferred to use persuasion rather than force. However, they pointed out that mandatory vaccination plans were used with the assistance of national and local support including the police and paramilitary units. Such use of force should be short term and must clearly benefit the public at large. In the three countries discussed, however, they concluded, *“it is the political violence around other policy issues with the resulting breakdown of law enforcement that will make mandating the polio endgame a no-win strategy”*.

In the authors’ view, the alternative to using force was respect for individual choice and securing individual and communal buy-in. This entailed the public realization of polio as a threat; then education for behavioural change could be used *“as a crucial mediator in political, economic and social determinants of health”*. In the case of polio eradication, achieving an increase in vaccination rates required that parents realized the severity of the disease. The authors pointed out, however, that in the case of the populations that were being targeted, individual freedom of choice might not fit in with their cultural framework.

Politically, a possibility might be to try to use moderate leaders to gain support of those who were vulnerable, and therefore religious and tribal leaders should continue to be asked to support eradication programmes. The leaders, however, had to be specific to the situation of the country concerned. The emphasis therefore had to be targeted to the local political situation.

In conclusion the authors asserted that *“the notion that polio is almost eradicated is not sufficient”* and that it was as an all-or-nothing situation. The campaigns should be negotiated away from the political strife in each of the countries. The final comments put polio eradication in a wider context, namely that *“polio vaccination is part of a larger set of children’s health issues that should be addressed worldwide”* in the context of the Convention of the Rights of the Child and the setting up of a type of ‘Geneva Convention’. While this idea was probably untimely at that point, it did highlight the importance of child health in the context of legacy planning.

E. Callaway. Public health: Polio's moving target – finding and vaccinating Nigerian nomads may be one of the last obstacles to the eradication of polio. Nature 17 April 2013¹⁹⁵

This article focused on polio eradication in Nigeria, noting that the country did not have a working public health-care system and there was lack of commitment on behalf of some of the local government officials. Parents had refused vaccination for their children in the north, moreover, because of widespread distrust of the government. It also commented on the deaths of several polio workers in Kano.

Nomads were seen as a polio reservoir, spreading the disease during their migrations, which led to a census of Fulani nomads and other hard-to-reach populations. The Fulani nomads had little education and little health care from the government.

Religious opposition to vaccine among settled populations had now been supplanted with refusals driven by disenchantment. According to David Heymann, Chair of the Advisory Board for Public Health England and the former head of polio-eradication efforts at WHO, *“people want things other than polio vaccination. They can't understand why people are coming once a month to give them vaccination when what they want are treatments for their children with fever or diarrhoea”*.¹⁹⁶

However, the nomads rarely refused polio vaccinations and were eager to have other health and veterinary services. Yet, according to Heymann, lack of a working public health-care system was a problem and other countries with migrant populations had been successful, e.g. India offered polio vaccinations at train stations. Other questions about migrants included whether mapping data allowed health workers to locate nomads.

Finally, the article pointed to the sheer size of the GPEI in explaining some of the tensions, noting that it had missed three deadlines at the time of writing – 2000, 2005 and 2012 – and *“now burns roughly \$1 billion per year chasing the last remaining pockets of disease”*.

The Lancet Infectious Diseases. 2018 must be the final target for polio eradication. Editorial, 13 March 2013¹⁹⁷

No disease had been eradicated since smallpox in the late 1970s. The disease that has come closest was polio, yet, at the time of writing, it was entrenched in Afghanistan, Nigeria, and Pakistan, where *“social, political, and logistical factors prevent effective vaccination campaigns and lead to export of virus to countries that have previously been free of the disease”*.

The Lancet editorial pointed out that the global polio eradication programme suffered a grave setback in December 2012/January 2013 with the deaths of vaccination workers Karachi, Peshawar and in the Kurrum tribal region. As well as being tragic losses, they also meant that children who would have been vaccinated remained unprotected and the virus continued circulating. The consequences were far reaching in January 2013, with poliovirus related to strains circulating in Pakistan detected in sewage samples in Cairo, Egypt.

The editorial highlighted the then eradication target of 2018. It noted this was not, however, the first deadline, as the planned date for eradication when GPEI was set up was 2000. It pointed out that as cases become fewer, *“the problems become knottier, and hindrances to final eradication become ever more dependent on localised factors and characteristics of the virus's remaining toeholds. As the saying goes, the devil is in the detail”*. The Strategic Plan 2013–2018 contained intricate analyses of recent outbreaks, reasons for programmatic declines and reflection on the lessons learned from success in India. *“It is an excellent example of how data, local knowledge, and experience can be synthesised to provide clear goals and realistic targets. 2018 seems soon, but for some children it will not be soon”*.

enough. And for the vaccination workers who have lost their lives, eradication of polio within 5 years would be a tribute to their efforts”.

C.A. Rentmeester, R. Dasgupta, K.A. Feemster, R.M. Packard. Coercion and polio eradication efforts in Moradabad, Human Vaccines & Immunotherapeutics 2014¹⁹⁸

This paper considered vaccine coercion in Moradabad in India, providing *“commentary and critical analysis on ethical complexities at the intersection of global public health and regional political strife and relate them to broader vaccine goals”*. It raised ethical issues related to polio eradication and the lack of a GPEI system-wide plan to compensate sufferers of harms, e.g. vaccine-associated paralytic polio, caused by the OPV, as well as other *“critical intersections of empirical and ethical dimensions of public health work”*.

In the case of Moradabad the authors said that one possible source of the coercive nature of the programme’s implementation was an *“overzealous adherence to the goal of polio eradication”*. They were not discussing whether eradication was a reasonable goal, which had been the focus of other literature, but instead the *“theme of leadership related to the GPEI and other public health campaigns”*.

Moradabad is known for resistance to polio eradication campaigns and this paper confirmed that coercive strategies had been adopted to implement the uptake of OPV during pulse rounds of the programme. It also cited a December 2013 issue of ‘The Indian Express’ in which escalation in the use of vaccine campaigns was referred to as a political and social ‘bargaining chip’ among factions in the region. This came at an important time as India was preparing for certification of polio eradication, with the District Administration threatening to *“invoke the stringent National Security Act to counter threats of boycott of the NID round of vaccination over local development issues”*.

Coercion was also referred to in the context of malaria and smallpox, family planning and vaccinating health care workers against influenza. The article then cited the example of the WHO Global Programme for Malaria Eradication, launched in 1955, referring to the way it was imposed on local communities, building up resistance that eventually slowed and undermined it. The lessons learned meant that an entirely different approach was used with current Roll Back Malaria control efforts.

Principles such as health justice and equitable distribution of health risks and benefits for public health could be viewed through the lens of vaccination programmes. Vaccination acceptance, moreover, was recognized as a *“critical component of a sustainable immunization program”*.

The paper noted that competing priorities may preclude the provision of resources through public health programmes for reliable vaccine availability. Ideally, compulsory programmes would not be necessary to ensure adequate immunization rates. On the other hand continuing disparities in immunization uptake worldwide and a growing incidence of vaccine hesitancy existed.

Commonwealth Leaders and Polio Survivors Unite for Polio-Free World. GPEI News story 30 November 2015¹⁹⁹

Political support and encouragement has remained an important factor in sustaining the effort during the polio endgame. This GPEI news story reported that at the Commonwealth Heads of Government Meeting in November 2015, the UN Secretary-General, the Prime Ministers of Australia, Malta and Pakistan and Ministers of Canada and the UK, as well as the newly elected Commonwealth Secretary-General and President of Rotary International, joined a high-level event to *“commend the historic progress made against polio and commit to ending the disease once and for all”*. Prime Minister Nawaz Sharif emphasized that

Pakistan would not rest until polio was eradicated from the country, while Prime Minister Malcolm Turnbull of Australia stressed his country's commitment to the campaign. Ban Ki-moon thanked the Commonwealth leaders for their support, calling on them to "*make the final push and wipe out polio from this earth*". The Nigerian Minister of Foreign Affairs Geoffrey Onyeama referred to WHO's decision to delist Nigeria as an endemic country, saying that his country would remain vigilant to ensure that polio was completely eradicated from Nigeria. Several countries outlined their ongoing financial commitment, including Canada and the UK.

6.2.2 Economic factors

A number of papers have presented the economic aspects of polio eradication, which are significant in the context of both the endgame and the legacy.

Global Polio Eradication Initiative. Economic case for eradicating polio (Summary)²⁰⁰

This 2012 paper presented a summary of a report by McKinsey & Company prepared for BMGF in consultation with the GPEI partners. The study provided cogent arguments in support of polio eradication. It noted that the Polio Eradication and Endgame Strategic Plan 2013-2018 would cost \$5.5 billion to implement and require additional resources from countries. Given the current fiscal climate of scarcity, it was important to examine the economic case for continuing to invest in polio eradication.

There were only three endemic countries in 2012. Since 1988, US\$ 9 billion had been invested, which has been critical to the success of the programme. The net benefits already generated were US\$ 27 billion, out of a total of \$40-50 billion previously estimated. The report "*offers a forward-looking perspective on the benefits of eradication using updated cost of inputs that underlie the Plan*".

According to the report, there were three core economic arguments for continuing to invest in polio:

Core argument 1: Eradication is more cost-effective than the alternatives presented.

The costs and benefits of eradication were compared to viable alternatives over time. In comparing eradication to other scenarios, the study began by estimating full costs of eradication and post-eradication activities. It noted that GPEI costs would continue to be substantial up to 2018 until interruption had taken place and certification was complete. There would be a significant drop in costs once countries stopped using OPV. Policies after this were uncertain but three post-eradication scenarios were considered: (i) Minimum IPV use assuming only one dose per child for 5 years post OPV cessation; (ii) Ongoing IPV use with one dose per child; and (iii) Ongoing IPV use with three doses per child. As alternatives to eradication, relying solely on the existing routine immunization (RI) infrastructure and a control policy aimed at keeping the number of polio cases below a certain annual level were considered. Past research showed that relying on current levels of routine immunization would lead to a rapid resurgence of polio cases, resulting in hundreds of thousands of paralyzed children each year. A control strategy might be less expensive in the next three years, but cumulatively the costs (operational costs) would quickly overtake the costs of eradication:

→ Option 1: Halting GPEI and relying on existing routine immunization system.

The least expensive option in terms of operational costs was relying on routine immunization. The immunization infrastructure, however, was insufficient "*to create enough population immunity against the poliovirus in high-risk geographies*". Within five years, this would mean a resurgence of the disease with 200,000 cases a year and cumulative costs over 20 years exceeding US\$35 billion. "*The net benefit of eradication would be \$19-25 billion over the same period.*" In answer to the

suggestion that polio eradication funds could be used to strengthen the routine immunization infrastructure in countries where it is weak, the study pointed out that this would take a long time and that relying on current routine immunization levels would lead to a rapid resurgence of polio cases. SIAs therefore would still be required.

→ **Option 2: Implementing a control scenario that established a maximum number of cases and then adjust to try to stay below that number.**

A relatively high level of activity would be maintained in Afghanistan, Pakistan, Nigeria and India, with reduced spending in other countries. With one SIA every 18 months in non-endemic areas, past analysis *“suggests incidence would stabilize at about 50,000 cases of paralysis each year within three to five years”*. In the short term, operational costs would be significantly lower, but total costs would rapidly surpass annual eradication costs, given the burden of polio cases e.g. treatment and lost productivity costs. Compared with this, eradication would *“generate net benefits of \$6-10 billion over 20 years”*. A ‘heavy control’ scenario was also considered, although previous analysis had shown that they lead to more costs than eradication. It was recognized that any control scenario would be difficult to carry out, as *“without the motivation of eradicating polio, countries would struggle to recruit the large numbers of health workers who had been crucial to polio eradication to date”*. It should be noted that the study did not include avoidance of outbreaks in high- and middle-income countries, such as the 2010 outbreak in Tajikistan with over 400 cases that also spread to the Russian Federation.

In looking at the 38 countries that were core GPEI beneficiaries, *“eradicating polio is the most cost-effective choice based on the benefits from eradicating polio alone”* in comparison to the alternatives. The plan also *“promises to yield up to \$ 25 billion in additional net benefits over the next 20 years”* with an additional US\$ 5.5 billion invested and continued investment by countries. The additional benefits over time were not included.

Core argument 2 GPEI’s commitment to strengthen immunization systems and support other health priorities will bring additional benefits.

The GPEI infrastructure had reached an unparalleled numbers of the world’s poorest and most disadvantaged children. Its over 18,000 polio staff represented the *“single largest source of technical assistance for immunization in low-income countries”*. In addition millions of volunteers and workers from national health agencies and ministries supported the polio programme, particularly in the campaigns – 2.5 million vaccinators and 155,000 supervisors took part in National Immunization Campaigns in India; the programme reached nomadic children, who had never received health services in Nigeria; and children in conflict areas in Sudan and Somalia, who were not reached by other health programmes.

The report showed the potential benefits that GPEI would bring to other health programmes, which had been “largely opportunistic” in the past. For example, GPEI workers from 1988 to 2010 administered *“up to 1.3 billion doses of Vitamin A during polio campaigns, averting at least 1.1 million deaths and creating an economic benefit of at least \$17 billion”*. The example of GPEI in Bihar showed the power of this approach with the polio programme *“not only achieving eradication but simultaneously contributed to increasing RI coverage from 19% in 2005 to 67% in 2010”*. The Plan included, for the first time as integral parts, strengthening immunization systems and legacy planning, which would generate additional economic benefits. It set explicit targets to increase immunization coverage in the 10 most-affected countries by 10 percent per year from 2015 to 2018., e.g. averting 30-35,000 deaths in Nigeria in 2014-2018, resulting in an economic benefit of US\$ 4 billion; and that by the end of 2014 *“its workers in 10 focus countries spend at least 50% of their time on activities intended to strengthen RI coverage”*. Moreover GPEI had previously leveraged its infrastructure to support other health outreach, as well as assisting with public health and humanitarian emergencies such as SARS and the Pakistani floods in 2010-11.

Core argument 3: GPEI is carefully managing its resources and making efforts to be more efficient. In the context of planning for eradication, GPEI had reviewed “*all programme costs for the next six years and conducted in depth analysis of all GPEI-funded activities and country budgets*”. It had taken “*an active approach to resource management*”, including cost reduction for IPV and OPV, which were a significant part of the GPEI budget (15 percent for 2013-2018). The aim was to bring down the cost of IPV to less than US \$1 per dose. The study pointed out that GPEI had already begun to implement changes which could save US\$ 75 million up to 2018, including: increasing adherence to OPV buffer policies (also known as “planned wastage”), which could reduce OPV demand without compromising security of supply; and adjusting the frequency and quality of vaccinators’ trainings (with 60-90 percent of vaccinators being repeat vaccinators, conducting fewer trainings and providing more on-the job coaching and monitoring would improve service quality).

GPEI was also reviewing other potential programme changes, also recognizing that better estimates could lead to purchasing fewer vaccines, freeing up US\$ 100 million or more from the GPEI budget. Furthermore, “*by developing and funding a long-term plan for polio eradication up front, GPEI minimizes additional costs later*”. Inadequate or unpredictable funding had led to the cancelling of immunization campaigns, with the resultant disruption of programmes, delayed success, and outbreaks in previously polio-free countries. Outbreak costs had remained stable at about US\$ 50 million annually with increased GPEI surveillance and aggressive efforts to reach hard to find children. Upfront funding commitments provide certainty and allow the GPEI to concentrate on eradication activities.

Conclusion

The study concluded that polio eradication was within sight but “*success is not assured. And success will require investing significant resources*”. Nevertheless, eradication “*remains unequivocally more cost effective than the alternatives presented*”. Failure to act, moreover, “*will allow polio to continue claiming victims and threatening to spread to other polio-free countries. In contrast, eradicating polio will create a polio-free world and significant momentum for other public health initiatives*”.

R.J.D. Tebbens, M.A. Pallansch, S.L. Cochi, et al. Economic analysis of the Global Polio Eradication Initiative. Vaccine 2010, 29, 334–343²⁰¹

As noted in the 64th WHA report,²⁰² the results of the above study on the economics of the GPEI were released at the launch of the Strategic Plan 2010–2012. The study indicated that the incremental net benefits of completing poliomyelitis eradication, aggregated over the period 1988–2035, would be at least US\$ 42 billion. However, shortfalls in GPEI financing continued to result in a scaling back of supplementary immunization and surveillance activities in some areas; delays in implementing outbreak response activities in others; and reductions in the long-term technical assistance provided by the Secretariat to some Member States. In March 2011, 38 percent of the 2011-2012 budget of US\$ 1,860 million remained unfunded. As highlighted in a GPEI briefing paper,²⁰³ this study underscored the benefits of completing the job of polio eradication, both in terms of humanitarian and economic benefits. Global commitment to the eradication of polio was made with an expectation of large potential benefits of eradication. At the end-stages, a disproportionate focus on the high costs for polio eradication might inappropriately influence this global commitment to the goal of eradication.

E. Sicuri, D.B. Evans, F. Tediosi. Can Economic Analysis Contribute to Disease Elimination and Eradication? A Systematic Review. PLoS One 2015, 10(6), e0130603²⁰⁴

This systematic review addressed questions related to the elimination and eradication of infectious diseases focusing on: why, how and for whom? The authors concluded that the

largest part of the literature has focused on costs and economic benefits of elimination/eradication. To a lesser extent, challenges associated with achieving elimination/eradication and ensuring equity had also been explored. Although elimination and eradication were, for some diseases, good investments compared with control, countries' incentives to eliminate did not always align with the global good and the most efficient elimination strategies may not prioritize the poorest populations. For any infectious disease, policy-makers needed to consider realigning contrasting incentives between the individual countries and the global community and to assure that the process towards elimination/eradication considered equity.

Other sources consulted included a 2007 economic analysis of eradication versus control.²⁰⁵

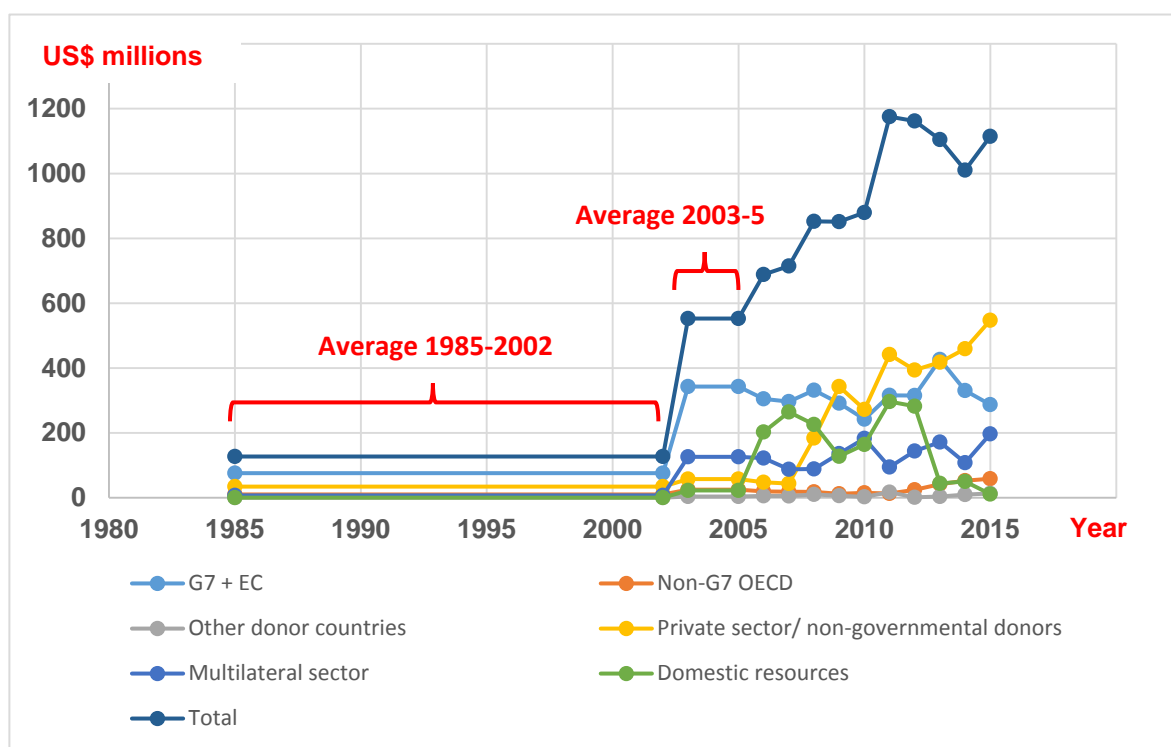
6.2.3 Financing polio eradication

The historical picture

Contributions and Pledges to the Global Polio Eradication Initiative, 1985-2019. GPEI 2016²⁰⁶

A detailed listing of contributions and pledges to the GPEI has been produced. Funding for the period from 1985 to 2015 is summarised in Box 6.5.

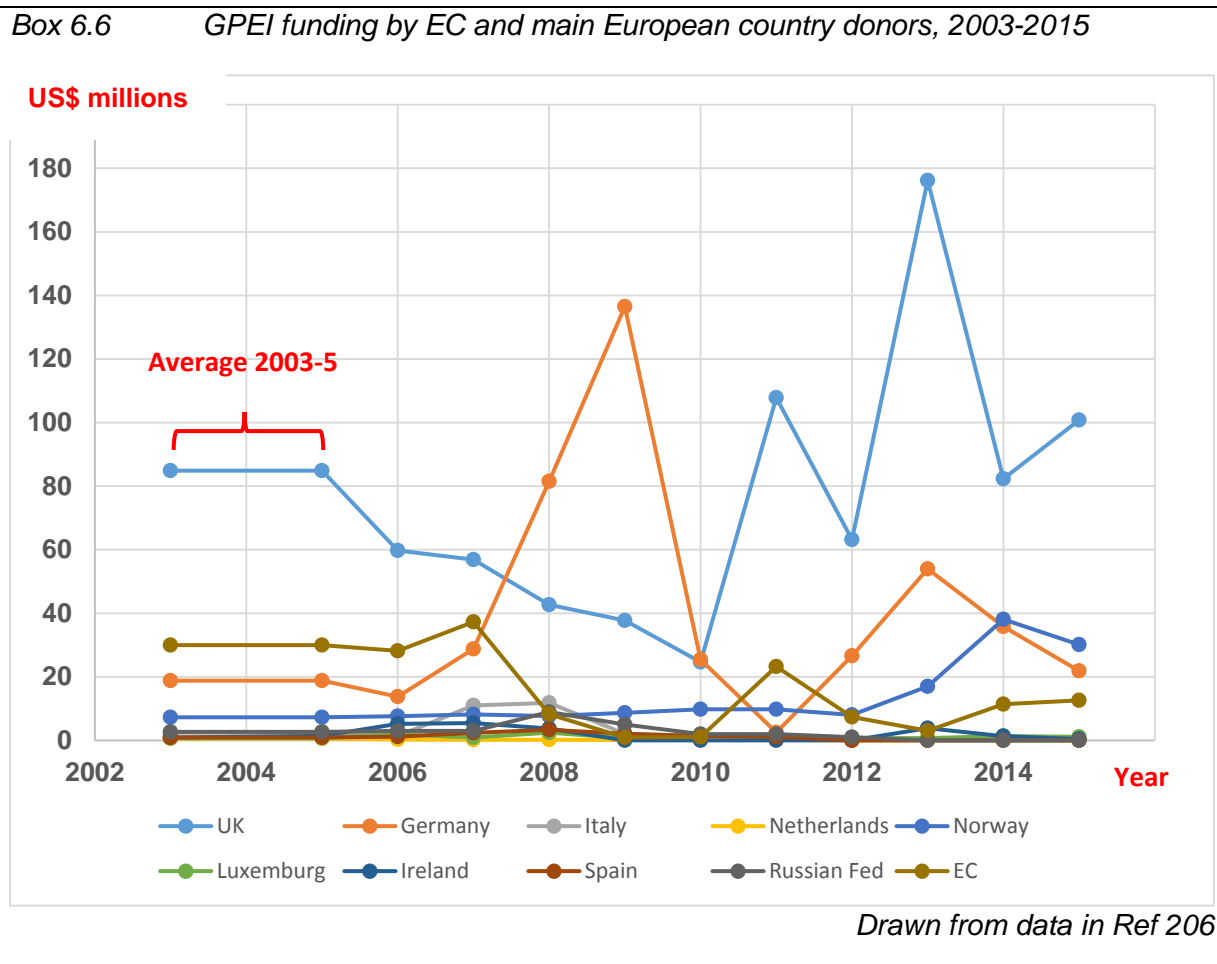
Box 6.5 Contributions to the Global Polio Eradication Initiative, 1985-2015



Drawn from data in Ref 206

Total contributions rose to a peak of US\$ 1,179 million in 2011 and subsequently fell back to US\$ 1,010 million by 2014. The G7 + EC has been the largest donor group, raising its combined contributions to an average of c. US\$ 340 million/year in the 2003-5 period (a high proportion of this coming from the G7) and a total of US\$ 3.141 billion in the decade 2006-2015. The most prominent increase in the last decade reviewed was from the category of private sector and non-governmental donors – mainly due to contributions totalling US\$ 2.457 million from the BMGF.

The costs of the GPEI programme are estimated to be US\$ 5.5 billion between 2013 and 2018. The European region will play a critical role in helping to meet the GPEI funding requirements for the period to 2018, both through the contributions of individual countries and through the EC. The recent history of European contributions is presented in Box 6.6.



The combined contributions of European countries and the EC in 2013 was c. US\$ 236 million, representing just over a fifth of the global total of US\$1,109 million. For comparison, the USA's contribution for 2013 was c. US\$ 143 million, about 13% of the global total. Figure 3 illustrates the contributions from the main European donors during the period 2003-13. There was generally a sharp decrease in contributions in the aftermath of the 2008 financial crisis, but a number of countries, including UK and Germany, markedly increased their contributions again from 2010-11 and Ireland returned to making contributions (US\$ 3.85 million in 2013) after 4 years of not funding the GPEI. The EC's financing for the GPEI was in the range of c. US\$ 30-40 million per year prior to the financial crisis, then collapsed to c. US\$ 1 million in 2009 and 2010 and after a spike to US\$ 23.21 million in 2011 fell back to, respectively, US\$ 7.39 and 3.05 million for years 2012 and 2013. In June 2015, the European Parliament announced the passage of a written declaration in support of the global effort to eradicate polio.^{207, 208} This was followed by the passing of three new amendments by the European Parliament designed to increase funding in the EU for polio elimination.²⁰⁹

By the end of 2014, the GPEI had received US\$ 2.23 billion in contributions and was tracking an additional US\$ 2.85 billion in pledges, against the overall 2013-2018 budget of US\$ 5.5 billion. Full and rapid realization of all pledges would result in a remaining funding

gap of US\$ 451 million against the Endgame Plan.²¹⁰ The GPEI Status Report²¹¹ for January-July 2015 recorded that, as of June 2015, the GPEI had received US\$ 2.84 billion in contributions with a further US\$ 2.18 billion pledged and a funding gap of US\$ 496 million remaining. The GPEI Status Report²¹² for July-December 2015 did not update the income figures, but noted that the decision by the POB in its midterm review that interruption of transmission would not occur in 2015 meant that a further US\$ 1.5 billion would be required to fully implement the Endgame Plan.

Future funding for the Endgame

Given the current worldwide financial crisis and the forecast for possible economic downturn, a number of governments have been carefully examining their official development assistance (ODA) contributions to see where possible cuts might be made. This is even more the case in Europe, where countries have been faced with unprecedented numbers of migrants and refugees as a result of the conflicts in the Middle Eastern countries from which they flee. While a clear case can be made for the funding of the endgame and legacy, the reticence of some governments that have traditionally been strong supporters of GPEI must be examined and considered objectively. The picture is not homogenous, but based on diverse situations and policies of the countries concerned. Nevertheless, insofar as Europe will need to be an important player in funding the endgame and legacy, it deserves special consideration.

On the positive side there has been commitment²¹³ by the UK, the third largest donor, that they “*remain firmly committed to polio eradication*”; while on the negative side there have been signs of a change in perspective of the traditionally supportive Nordic countries. There also appears to be a move in some quarters away from funding intergovernmental agencies, including some of those within the UN system. The literature relating to these trends is discussed below.

United Kingdom Department for International Development (DFID)

Business case: UK Support to Polio Eradication 2013 - 2019²¹⁴

In its 2014 Business Case, DFID justified why it should continue to intervene by supporting polio eradication in the 2013/14 to 2018/19 period with a package totalling GB£ 300 million (c. US\$ 430 million at the then prevailing exchange rate). It pointed to the leadership role that the UK could play within the G8 and GPEI, noting that it was “*instrumental in maintaining commitments from other G8 members (particularly Germany)*”. Its matching challenge fund mechanism in 2011 and 2012 also provided incentives for other donors, both public and private sector, to contribute to the global eradication effort.

- Among the reasons given for continuing to maintain support were that:
- Children in all polio-free countries continue to be at grave risk of importations from the endemic countries, and these outbreaks are becoming more deadly and are affecting adult populations
- Success of stopping polio transmission in India removes doubt over the technical feasibility of polio eradication, if strategies are fully implemented
- The global effort in 2012 witnessed the lowest number of polio cases in the least number of countries, and in the least number of districts
- Failure to fully finance and implement the 2013-2018 Strategic Plan and legacy plans will jeopardise US \$9 billion invested over 25 years
- Failing to finish polio eradication will result with up to 200,000 polio cases per year, in the next 10 years, primarily in (but not limited to) the poorest countries.
- A key emphasis of the Strategic Plan is to strengthen routine immunisation, which offers the potential to improve coverage for other vaccine preventable

- diseases, and will continue to play a leadership role in this area
- DFID's large programme in Nigeria (where over 50 percent of the remaining polio disease burden remained in 2013) can influence policy and programming to leverage polio to the advantage of improved public health and health services overall.

UK DFID Annual Review – Summary sheet, September 2015²¹⁵

This DFID document noted that the UK was committed to providing support for global polio eradication over the six years; for the interruption of polio transmission in the remaining endemic countries; to outbreak control; to strengthening routine immunization coverage rates; and to the establishment of legacy planning to ensure eradication is sustained, resulting in health gains beyond polio. At the time of writing the Annual Review, £215 million out of a projected budget of £300 million had been spent. The document recognized that the endgame had been delayed by one year and that further funding to support this should be considered.

Recommendations and comments in the review included the following:

- The GPEI was seen to be *“doing a good job and achieving stretching milestones in extremely challenging circumstances”*. The Business Case recognized that it may be necessary for a portion (£62 million) of the UK's overall polio investment to be channelled bilaterally in endemic countries to support ending polio. However, insofar as GPEI had performed strongly in these countries, that there would be no comparative advantage for an additional bilateral investment and that no strong proposals had been received for use of these funds, the Annual Review recommended that the £62 million be used to support the overall GPEI investment. £30 million of this was recommended to be used for the UK commitment to introduce IPV through GAVI. It was also recommended that the remaining £32 million be invested in GPEI through WHO.
- DFID Global Funds Department should review whether UK funding in addition to the £ 300m investment was needed, based on likelihood that GPEI would be one year behind schedule i.e. the last case of polio globally was likely to be in 2016 rather than the predicted 2015. This meant that additional funds would be required for global eradication. At the appropriate time and dependent on the response of other donors, the UK should consider whether to make an additional contribution to GPEI to ensure that global polio eradication is achieved.
- The UK should ensure it used its place on the Finance and Audit Committee to follow upon the recommendations of the Internal Audit Reporter 2014 and to analyse and discuss WHO's system for assurance and for dealing with misuse of funds and whether separate assurance could be provided through GPEI without the agreed WHO procedures for reporting through the WHA.

Thus, in the recommendations in its Annual Review, the UK recognized that further funding could be required in the coming years to secure the endgame and legacy. Even though in general there are strict constraints in the UK budget, the 0.7 percent of GDP/GNI funding for ODA is 'ring-fenced' and therefore additional amounts may be found. The recommendation related to the UK's place on the Finance and Audit Committee was important in relation to its concern for ensuring transparency and accountability – necessary in maintaining support for expenditure on polio eradication.

Germany

After peaking at US\$ 136.51 million in 2009, Germany's contributions to the GPEI fell precipitously in 2010 and then rose again to a few tens of million per year from 2012. In parallel with the support to the GPEI, Germany has made substantial direct inputs to polio eradication at the country level through the channelling of funds from BMZ through KfW. For example, € 96.5 million was contributed for polio eradication in Nigeria from 2004 to 2015, with some funds earmarked for measures to make the health workers more secure in high-risk areas such as those affected by Boko Haram. KfW has also supported polio eradication in Afghanistan and Pakistan.^{216,217}

Political support for polio eradication has come from Germany's Chancellor Angela Merkel (who received the Rotary International Polio Champions Award in 2008)²¹⁸ and the German Cabinet²¹⁹, as well as other politicians. Writing in June 2016, German MP Stefan Rebmann²²⁰ noted that the German government had been a strong and reliable partner to the GPEI since the beginning of the initiative, which it had supported with more than US\$ 500 million, and was the first donor to pledge an additional €100 million to finance the GPEI Endgame Strategy. He also called for the EU to lead the way by encouraging its members to increase their commitment to polio eradication and create a blueprint for taking on tomorrow's threats to global public health.

Norway and other Nordic countries

The total Norwegian contribution to the GPEI was US\$ 179 million in the period 1985-2015, with US\$ 145 million of this being contributed in the decade 2006-2015. The donations, which had been running at US\$ 7-10 million per year from 2003-2012, increased sharply to US\$ 17 million in 2013 and US\$ 38.1 million in 2014, sliding back to US\$ 30.15 million in 2015, evidently as a result of a currency depreciation. At the Global Vaccine Summit in Abu Dhabi in 2013, the Norwegian government announced that it intended to contribute NOK 240 million (then US\$40 million) for the GPEI in 2014, a sharp increase from planned contributions of US\$8 million (NOK 50 million) in 2013, and to sustain this level through to 2019.²²¹ However, the Norwegian kroner declined in value against the dollar by about one third between 2013 and the end of 2015. Norway's pledge to the GPEI is currently²²² shown as US\$ 31.67 million per year for each of the years in the period 2016-2019.

Norway has also made direct contributions to polio eradication in a number of countries, including support for programmes in Afghanistan, Nigeria and Pakistan²²³ and, together with BMGF and UK, support for introduction of IPV in 72 GAVI-supported countries including Afghanistan²²⁴ and Pakistan.²²⁵

Against a background of overall strength in ODA and advocacy for 'social sectors' or 'soft policies' it is striking that other members of the core Nordic group have not matched Norway's support for polio eradication. GPEI contributions from Denmark ceased in 2006, those from Finland in 2010 and those from Sweden were interrupted in 2006 and it then made only one further donation (US\$ 0.7 million in 2013).

M.E. Hansen, T. Gjefsen. The end of Nordic exceptionalism? Norwegian Church Aid, Finn Church Aid, DanChurchAid and Church of Sweden. 2015.²²⁶

This document examined the unique role of the Nordic countries in their efforts in peace, sustainable development and poverty alleviation, which had been characterized by high levels of development aid with poverty alleviation as the overall objective. Their politicians have also invested time and resources in peace negotiations, SDGs and gender equality. This was referred to by the authors as "the Nordic exceptionalism" – by which they mean idealism. However, the authors also noted that shifts seemed to be under way which prompted the question whether 'Nordic exceptionalism' was coming to an end.

In the 1980-90s, as a group Sweden, Denmark, Finland and Norway pursued a common Nordic agenda. Sweden met the UN target of contributing 0.7 percent of GNP/GNI²²⁷ to ODA as early as 1974, with Norway in 1976 and Denmark in 1978 and for the past 40 years the three countries was well above 0.7 percent target and closer to 1 percent. Meanwhile, Finland struggled to match the other Nordics and, although they reached 0.8 percent in 1991, they were unable to reach this level again. Furthermore, the Nordics have been strong advocates for the 'social sectors' or 'soft policies', e.g. health, education and gender equality, while promoting good governance, human rights and civil society as a foundation for development.

Other donors, such as Luxembourg, Netherlands, UK and Ireland, have subsequently joined the Nordics, often referred to as "Nordics plus". In addition, the Nordics, particularly Sweden and Finland, allocated a substantial portion of their aid through the EU. Due to their EU membership, Denmark, Sweden and Finland have also prioritized influencing EU development policies and as a group they were influential in the IMF and World Bank.

Consequently, the Nordics have been extremely influential, 'punching above their weight' in Europe and on the international arena. Recent trends in their approaches to aid are discussed below.

Norway: Particular concern was raised²²⁸ when, in October 2015, major amendments to Norway's national budget were presented by the Norwegian Government in their plan for financing the expected additional costs related to the massive increase in refugees coming to Norway, which had already begun to impact^{229, 230} on the 2015 ODA budget. In the proposed revised aid budget, while an additional NOK 1.2 billion for ODA was added to the Government's original budget proposals, going beyond the 1 percent of GNI mark, it also increased the amount of ODA dedicated to covering Norway's reception of refugees from NOK 1.9 billion to NOK 7.3 billion, representing an increase from 5 percent to 21 percent of the aid budget going to refugee costs inside Norway. This would impact most on civil society organizations, as well as cutting the allocation for the UN system.

Sweden, with a new government in office in 2014, made efforts to increase their ODA by SEK 3 billion. However, the ODA-approved refugee costs in-country increased by SEK 4 billion, with an actual reduction from SEK 30.7 billion to 29 billion being available for international development. The 2016 budget, moreover, saw total ODA increasing by another SEK 3 billion, reaching SEK 43.4 billion or 1.02 percent of GNI. It was anticipated that the number of refugees would go down to 'only' 73,000 in 2015, although the actual number was 190,000 and the Finance Ministry was looking to the ODA budget to use as much as 60 percent for refugee costs.

Finland's new government in 2015 planned an overall cut of approximately € 400 million (43 percent of its total development assistance) for 2016, bringing its ODA down to 0.35 percent of GNI. This would impact particularly on its support for multilateral cooperation, while humanitarian assistance was prioritized. Support to civil society was reduced by 38 percent and aid to UN agencies by nearly 60 percent with effect from 2016.

Denmark is also making cuts to NGO funding (26 percent) under its new liberal government elected in 2015, while establishing a new private sector fund for accessing new markets. Aid cuts as recently as 2015 have been linked to the need for additional resources for the health sector, as well as the costs of refugees and asylum seekers. Increases have also been proposed for humanitarian assistance "so called neighbouring countries". For 2016 expenditures, the costs for asylum seekers are expected to exceed the estimated 19 percent.

The role that the Nordic countries will play in the financing of the endgame and legacy is therefore likely to be less than might previously have been anticipated, given the changes in budgets and priorities.

7. OTHER DISEASE ERADICATION EFFORTS

The initiation of the GPEI in 1988 was preceded by the successful effort to eradicate smallpox, concluded in 1980. However, prior to smallpox there had been several failed efforts to eradicate other diseases (hookworm, yellow fever, yaws and malaria). As polio eradication now moves through what is hoped to be the final and successful phase of a programme that has taken over a quarter of a century and as the parallel effort to eradicate Guinea worm also appears to be drawing to a successful close, new disease eradication targets are already being proposed. There have been discussions for several years about the feasibility of eradicating measles and rubella and a 2050 target date for malaria has been proposed. In this chapter, selected literature on these earlier and proposed future programmes is examined, with a particular focus on the extent to which lessons and legacies were, or are now being, captured.

7.1 Attempts at disease eradication: early failures, progress and revivals

Hookworm^{231,232}

The first disease to be seriously considered for global eradication was hookworm. This disease was prevalent throughout the world and at the beginning of the 20th century was recognised as a serious problem in the southern states of the USA where it especially affected poor, rural populations and caused pernicious anaemia, retarded educational development and impaired capacity to work. Transmission of the intestinal parasite occurs through fecally-contaminated soil, especially where sanitation is poor. An eradication programme was mounted from 1909 with US\$ 1 million funding from John D. Rockefeller,²³³ initially as the Rockefeller Sanitary Commission for the Eradication of Hookworm in the USA.²³⁴ In 1913 this was incorporated into an International Health Commission (in 1916 renamed the International Health Board and then in 1927 the International Health Division of the newly established Rockefeller Foundation),²³⁵ which decided to extend the eradication programme and eventually reached 52 other countries. The Rockefeller campaign stressed education, treatment and the assumption by local and state boards of health of the responsibility to carry on what the foundation had begun.

While the incidence of hookworm infections was reduced somewhat in the USA and other locations during the 1910s-1920s, the disease was very far from being eradicated and there are currently more than half a billion people globally living with the infection. Several factors contributed to the failure, including the persistence of poverty and lack of education; the unpleasantness of the early drugs used to treat the condition; inadequate scientific knowledge; the need for stool examination to diagnose the condition; and reliance on local health authorities to take up and sustain the campaign.

However, this early effort had a number of positive consequences. Importantly, it contributed to the momentum to extend access to sanitation and clean water supplies; brought benefits of better health, improved educational attainment and economic performance to those treated and those spared from infection; and set a precedent for further efforts to control infectious diseases through large-scale programmes.

Yellow fever²³⁶ **and dengue**

Yellow fever is a viral disease, currently causing c. 200,000 infections and 30,000 deaths per year. Probably originating in Africa and transmitted to the Americas with the slave trade, several major outbreaks of the disease have occurred in the Americas, Africa, and Europe since the 17th century. The recognition in the late 19th century that the infection was being transmitted by *Aedes aegypti* mosquitos paved the way for early successes in eradication programmes in Cuba (1904) and subsequently Panama – the latter being a critical factor in

the completion of the Panama Canal (1912). Dengue, a viral fever with flu-like symptoms, is also carried by *Aedes aegypti* mosquitos.

The Rockefeller Foundation's International Health Board undertook a number of successful yellow fever eradication campaigns after the First World War in Central and South America, with the one in Mexico in the early 1920s helping to strengthen the hitherto poor relationship between the USA and Mexico; and in the period April 1927-March 1928 no cases of yellow fever were reported from anywhere in the Americas. The Rockefeller Foundation then prepared for programmes in Africa, establishing laboratories there to study the disease, but the resurgence of outbreaks in South America and the recognition of a jungle reservoir of the disease in mosquitos dwelling in the forest canopy indicated that eradication would not be achievable with the tools then available. Nevertheless, more successes came in Brazil in the 1930s and in the American region after World War II, when *Aedes aegypti* was eliminated from 23 countries in Central and South America between 1946 and 1970, effectively preventing epidemics of yellow fever and dengue, which is also a mosquito-transmitted viral infection.

However, these success, along with advances made against malaria and other infectious diseases, led to over-confidence and resulted in a 30 year period of complacency and apathy during which resources were re-directed to other competing public health priorities and vector-borne infectious disease control infrastructure deteriorated in most countries of the world.^{237,238} This failure was compounded by a mistaken reliance on an ineffective tool: the concept of space spraying of insecticides using the then new ultra low volume technology was initiated in the early 1970s as the recommended method to control *Aedes aegypti*, but this failed to reach mosquitos inside dwellings and therefore to protect people at risk.

After a long struggle to develop a vaccine, spurred on by World War 2 and by later competition between US and French efforts, a single safe and effective yellow fever vaccine emerged in the 1980s and has been the standard approach to controlling the diseases since then.²³⁹ Debate about control versus eradication of yellow fever has resurfaced from time to time.²⁴⁰

Developing a vaccine for dengue has proved to be a considerably greater technical challenge, owing to the existence of four virus serotypes of the dengue virus and the occurrence of a severe form of dengue known as dengue haemorrhagic fever. Infection by one of the four dengue virus serotypes has been shown to confer lasting protection against homotypic re-infection, but only transient protection against a secondary heterotypic infection. Moreover, secondary heterotypic infection is associated with an increased risk of severe disease.²⁴¹

In the absence of a vaccine or effective mosquito control measures and with the operation of complex demographic, societal and public health infrastructure factors probably playing a role, dengue has spread extensively during the last few decades, affecting hundreds of millions of people and presenting a major challenge for health systems and public health officials around the world.^{242,243,244}

WHO published a global strategy for the prevention and control of dengue 2012–2020.²⁴⁵ Its goal was to reduce the burden of dengue worldwide, with specific objectives to reduce mortality by at least 50% and morbidity by at least 25% by 2020. The strategy relied on five technical elements: diagnosis and case management; integrated surveillance and outbreak preparedness; sustainable vector control; future vaccine implementation; and basic, operational and implementation research. Successful implementation of the global strategy required five enabling factors: (i) advocacy and resource mobilization; (ii) partnership, coordination and collaboration; (iii) communication to achieve behavioural outcomes; (iv)

capacity-building; and (v) monitoring and evaluation. Nationally, these elements required greater collaboration at all levels of government and between sectors. Globally, implementation required concerted action by Member States, effective global leadership and appropriate engagement of all relevant stakeholders.²⁴⁶

The first dengue vaccine, was first registered in Mexico in December, 2015.

The first available dengue vaccine, Dengvaxia (CYD-TDV) produced by Sanofi Pasteur, is a live recombinant tetravalent dengue vaccine that has been evaluated as a 3-dose series on a 0/6/12 month schedule in Phase III clinical studies. It was approved by the regulatory authorities of Mexico, the Philippines, Brazil, El Salvador, Paraguay and Costa Rica in December of 2015. WHO has recommended that countries should consider its introduction only in geographic settings (national or subnational) where epidemiological data indicate a high burden of disease.²⁴⁷ There were approximately five additional vaccine candidates under evaluation in clinical trials at the end of 2015.²⁴⁸

Malaria^{249,}

Like hookworm and yellow fever, malaria was an early target of the Rockefeller disease eradication programmes, first in the USA (1915) and then in other countries, with research being carried out in Brazil, Nicaragua, Puerto Rico, El Salvador, the Philippines, and Palestine. While an antimalarial drug, quinine, had long been available the eradication strategy again depended heavily on the use of vector control measures against the *Anopheles* mosquitos that carry the parasite. These involved screening houses, oiling water, draining standing water, distributing larva-eating minnows and (from c. 1923) spraying Paris Green, a copper/arsenic salt which was an effective mosquito larvicide with established use for insect control in agriculture.

The preference of the Rockefeller programme for a vector-control strategy using Paris Green spraying, without use of quinine to treat those already infected, created consternation in public health circles in the USA and elsewhere. Nevertheless, they pressed forward with the programme, developing it in Italy and elsewhere, sometimes with equivocal results but with demonstrated effectiveness in trials in India.

The Rockefeller programme set the stage for the new insecticide DDT (dichlorodiphenyltrichloroethane) which became available in the early 1940s and was rapidly used with great effect to combat malaria, typhus, and the other insect-borne human diseases among both military and civilian populations. The USA's National Malaria Eradication Program (1947-1951) conducted over 4 million hose sprays and by 1951 malaria was considered eliminated from the USA.

The WHA in 1955 received an ambitious proposal from WHO for the eradication of malaria worldwide. The resulting Global Malaria Eradication Programme focused on indoor house spraying with residual insecticides, antimalarial drug treatment and surveillance. Successes included elimination in nations with temperate climates and seasonal malaria transmission. Some countries such as India and Sri Lanka had sharp reductions in the number of cases, followed by increases to substantial levels after efforts ceased. Other nations had negligible progress (such as Indonesia, Afghanistan, Haiti, and Nicaragua). Some nations were excluded completely from the eradication campaign (most of sub-Saharan Africa). In addition to concerns about the long-term toxicity and environmental impact of DDT,²⁵⁰ the emergence of drug resistance, widespread resistance to available insecticides, wars and massive population movements, difficulties in obtaining sustained funding from donor countries and lack of community participation made the long-term maintenance of the effort untenable. Completion of the eradication campaign was abandoned in 1969.²⁵¹

According to Stapleton,²⁵² *“the lessons of malaria control in the 20th century remain ambiguous. The Rockefeller approach – a single-minded, insecticide-based attack on*

malaria – may have been the most successful anti-malaria strategy of modern times, yet contributed to a legacy of resistant insects. Moreover, it brought us no closer to a cure for the disease itself. The technological path to malaria control has had its limits”.

Nájera et al²⁵³ summarised positive contributions of the campaign to world health, which included: (1) achieving a considerable reduction in the geographical distribution of malaria although most of this reduction was in areas that already had well-functioning control programmes; (2) being the first global health programme aimed at ‘total coverage’; (3) leading to the establishment, in some countries, of effective although partial contact with the communities, through networks of ‘voluntary collaborators’ for diagnosis and treatment; (4) making a serious attempt to use local maps to guide its activities, even if that practice was later neglected; and (5) having an important influence on the subsequent planning of health programmes. However, criticisms included that emerging problems, including chloroquine resistance and vector avoidance of contact with the insecticide, were overlooked. Antimalarial interventions other than indoor residual spraying were abandoned and there was a general disregard for social and cultural barriers, which often prevented the acceptance of the campaign activities in many of the ‘remote areas’. Moreover, even though most country programmes established health education units, these were rarely given the recognition or the means needed to provide a useful contribution. And nobody had a clear idea of how to organise a surveillance system capable of detecting the last cases of malaria. Research into new approaches was only belatedly given attention in the 1960s. Lessons drawn from the WHO malaria eradication programme included:

1. A public health service is needed to support malaria surveillance. The WHO Registry of countries that have achieved local malaria eradication, elimination in present terminology, shows that a prerequisite for elimination may be the existence of a previous prolonged control programme that has contributed to the development of epidemiological services and a rural public health service.
2. Control has to be supported with research. The relations between control programmes and research institutions still need to be revived or strengthened.
3. Active participation of communities in the understanding of and actions for the solution of their health problems needs to be incorporated into antimalarial programmes.
4. The GMEP’s “*failure to achieve its objective*” was taken into consideration in the design of the successful Intensified Smallpox Eradication Programme. An important principle of this programme was that the administrative structure and pattern of operations of each national programme should be integrated into the health and socio-cultural setting of the country. Fenner et al²⁵⁴ noted that the smallpox programme’s success depended on stating the strategic plan in terms of principles and illustrative methodologies rather than in terms of directives and on recognising that continuing field and laboratory research would be essential.

After a gap of three decades, a new global effort to control malaria was initiated in 1998 with the launch of the Roll Back Malaria (RBM) Programme, defining progressive intervention coverage targets for control designed to eliminate malaria as a public health problem, while emphasizing that this could only be achieved through vastly strengthened local health systems. High level political support for RBM came in 2001 with proclamation by the UN General Assembly that the period 2001-2010 was designated the Decade to Roll Back Malaria in Developing Countries, Particularly in Africa.²⁵⁵ The 58th WHA in 2005 reinforced the need for stronger action on malaria and set a number of targets for malaria control, including that national policies and operational plans should be established to ensure that at least 80% of those at risk of, or suffering from, malaria would benefit from major preventive and curative interventions by 2010 in accordance with WHO technical recommendations, so as to ensure a reduction in the burden of malaria of at least 50% by 2010 and 75% by 2015.²⁵⁶

The 66th WHA in 2013 expressed support for a proposal for the Secretariat to draft a global technical strategy for malaria for the post-2015 period.²⁵⁷ The global technical strategy was presented to the WHO EB in January 2015,²⁵⁸ subsequently adopted by the 2015 WHA and published as the Global Technical Strategy for Malaria 2016-2030.²⁵⁹ The strategy noted that some 3.4 billion people were at risk of malaria infection in 97 countries, territories and areas and that the disease killed an estimated 627,000 people in 2012, most of whom were children under 5 years of age in Africa. There was both an opportunity and an urgent need to accelerate progress towards elimination. Since 2000, the expanded effort had contributed to a 42 percent reduction in the global malaria mortality rate and an estimated 3.3 million deaths had been averted. At the time, 52 countries were on track to achieve the WHA's target of reducing their malaria burden by 75 percent by 2015. However, the threats posed by emerging parasite resistance to antimalarial medicines and mosquito resistance to insecticides could not be ignored and the global health community needed to pay close attention also to systemic and technical obstacles, such as the inherent weakness of health systems, including poor disease surveillance and limited pharmaceutical regulation; a lack of adequate technical and human resource capacities; the high prevalence of asymptomatic infections, which contribute to disease transmission; the complex biology of the malaria parasites; and the diversity of vectors and their behaviour.

The draft technical strategy was built on three pillars: ensuring universal access to malaria prevention, diagnosis and treatment; accelerating efforts towards elimination and attainment of malaria-free status; and transforming malaria surveillance into a core intervention. Support for these three pillars would come from harnessing innovation and expanding basic, clinical and implementation research; and strengthening the enabling environment, including strong political commitment, sustainable financing and increased multisectoral collaboration. It was noted that the expansion of malaria interventions could be used as an entry point for strengthening health systems, including maternal and child health and laboratory services, and to build stronger health information and surveillance systems; with empowerment of communities, a skilled health workforce and strong regulatory frameworks being cornerstones of success. Targets for the strategy for 2030 included reducing both malaria mortality and case incidence from their 2015 levels by at least 90%, eliminating malaria from at least 35 countries where malaria was transmitted in 2015 and preventing malaria re-establishment in all countries that were malaria free.

In the light of these efforts there has been renewed interest in the possibility of eradicating malaria,^{260,261} and a vision for achieving this through a science-supported endeavour with strong political leadership, perhaps by 2050, has been sketched out.²⁶² However, Tanner and de Savigny²⁶³ have cautioned that there was currently a lack of sufficient knowledge, systems and tools to eradicate malaria. They considered that there was a window of political will and financial resources to refocus on the goal of effective control through universal coverage of appropriate interventions. They considered that prerequisites for a successful start were: (i) a process of inclusive discourse to agree on global vision, goals and strategy; and (ii) a global plan for all endemic areas describing how, where and when to move from control towards elimination. In their view, *"what must distinguish the new era, especially in Africa, is a real rather than rhetorical emphasis on health systems"*.

Alongside this, there was an evident need for enhanced technologies. The UK government and BMGF announced in January 2016 that they were pledging £3 billion over the next five years to *"eliminate malaria"*, in support of the WHO goal of reducing malaria deaths by 90 percent by 2030. Some of the money would go to the Liverpool School of Tropical Medicine to support malaria research. The announcement built on the new £1 billion Ross Fund established the UK government and BMGF in November 2015, which aimed to develop, test and deliver a range of new products (including vaccines, drugs and diagnostics) to help combat serious infectious diseases including malaria, TB, Ebola and neglected tropical diseases.²⁶⁴

Yaws²⁶⁵

Yaws is a bacterial tropical disease of the skin, cartilage, and bones caused by *Treponema pallidum* subsp. *pertenue*. Due to the high morbidity of treponemal diseases and the ease with which they responded to treatment with single dose depot penicillin, a 1949 WHA resolution²⁶⁶ to establish an expert group to study and make recommendations for further action led to yaws eradication campaigns which WHO and UNICEF ran between 1952 and 1964. The main strategy was mass treatment of cases and contacts with injectable penicillin aluminium monostearate in oil. This vertical programme reduced the number of cases by 95% but was then gradually dismantled in favour of integration into PHC systems, confident that these would suffice to identify and treat the remaining 5% of cases. Ultimately, the lack of continued surveillance and waning of commitment and resources led to the resurgence of yaws in West Africa, Asia, and the Pacific in the late 1970s and global eradication of yaws was not achieved. Further “half-hearted” efforts in the 1980s to revive eradication were not successful.

With the availability of single-dose azithromycin as well as benzathine penicillin for treating yaws and evidence of its repeated resurgence,^{267, 268} the case for a renewed programme for the eradication of yaws has been made²⁶⁹ and the financial costs estimated to be in the region of a few hundred million dollars for eradication in the 12 known endemic countries.²⁷⁰

Lessons from the past indicate that yaws can be eliminated with sustained efforts, as shown in many countries including India.^{271, 272} In 2012, the WHO Morges Strategy targeted yaws for eradication by 2020, but in 2015 the global campaign had yet to be financed.²⁷³ With the goal and timeframe set, the generation of political will and donor commitment became the essential hurdle to overcome and they would need to be sustained until transmission is interrupted, building good infrastructure and surveillance mechanisms and setting time-bound targets – a major challenge when yaws is accorded a relatively low priority against other diseases. The Third WHO Consultation on Yaws Eradication, 24-25 March 2014, identified that, at the technical level, there was now the opportunity to eradicate yaws, but what was most lacking was a high-profile champion to galvanize and sustain the effort, as was being seen in the case of Guinea worm eradication.²⁷⁴

7.2 Smallpox eradication^{275,276}

A devastating viral infection with a high mortality rate and causing severe disfigurement and disability in survivors, smallpox began to be controlled following the discovery in the 18th century of the protective effects of inoculation with cowpox virus. Vaccination programmes in the 19th and 20th centuries eliminated the disease in many countries and the progress of an effort by the Pan American Health Organization beginning in the 1950s to eliminate smallpox from the Americas encouraged escalation to a global programme.

In 1959 the WHA passed a resolution (WHA11.54) to eradicate smallpox, but initial progress was disappointing, especially in Africa and in the Indian subcontinent. In 1966 an international team, the Smallpox Eradication Unit, was formed at WHO under the leadership of Donald Henderson. In 1967, WHO intensified the global smallpox eradication, contributing US\$ 2.4 million annually to the effort and adopting a new disease surveillance method.²⁷⁷ The last naturally occurring case of smallpox was diagnosed in Somalia on 26 October 1977 and the disease was certified as eradicated by a commission in December 1979 and this was endorsed by the WHA on 8 May 1980.²⁷⁸ Since then, the only known cases were caused by a laboratory accident in 1978 in Birmingham, UK, which killed one person.²⁷⁹

One of the distinctive features of the smallpox eradication programme was that it operated during the period of the Cold War between the USA and Soviet Union, but there was close

cooperation between the two superpowers on this issue and built on their own domestic experiences in the containment of the disease.²⁸⁰

The smallpox eradication programme had significant lessons and legacies for the EPI, as discussed below (see chapter 7.4). Smallpox, however, was in some ways a special case. Many attributes of the disease and the vaccine favoured eradication. The vaccine was heat stable and required only a single dose to protect a person for a period of at least 5 to 10 years. Vaccination was easily performed and protected immediately on application. Every individual who became infected exhibited a typical, easily recognized rash, thus permitting accurate surveillance without recourse to laboratory diagnosis. The disease spread slowly so that transmission could readily be stopped by isolating the patient and vaccinating contacts within the area.

7.3 Dracunculiasis (Guinea worm) eradication

Infection with the Guinea worm (*Dracunculus medinensis*) in humans and dogs usually occurs through ingesting water contaminated with larvae (the water flea being an intermediate host), leading about a year later to blistering of the skin, usually on the lower limb, from which the worm emerges during several weeks. The ulcers formed by the emerging worm may get infected by bacteria. Pain may continue for months after the worm has been removed. There is no medication or vaccine against the disease. Prevention approaches include provision of clean water (even filtration through cloth will often remove the larvae) and the use of a larvicide.

In 1986, there were an estimated 3.5 million cases of Guinea worm in 20 endemic nations in Asia and Africa. In that year, the Carter Center Guinea Worm Eradication Program was initiated, with persistent championing by former US President Jimmy Carter. In collaboration with WHO, UNICEF, US-CDC and other partners the incidence of Guinea worm was reduced to 22 cases in humans and 419 in dogs across four African countries (Chad, Ethiopia, Mali, South Sudan) in 2015 and 11 cases in humans and 769 in dogs in 2016 by 22 August. It has been hoped that Guinea worm will soon become the first parasitic disease in humans to be eradicated.^{281,282,283} However, the recent emergence of numerous Guinea worm infections in domestic dogs in Chad, probably due to their consumption of fish and fish entrails containing Guinea worm larvae, has presented a setback.²⁸⁴

Important lessons of the Guinea worm eradication campaign have been highlighted.^{285,286,287} The campaign was succeeding even in the absence of a drug or vaccine,²⁸⁸ focusing on provision of clean water, simple technology of a pipe and filter cloths to prevent ingestion of the worm; larviciding potentially infected water sources; and preventing reintroduction into drinking water. The problem of improving reporting of disease incidence was tackled, was central to infectious disease control efforts, through developing village-based monthly reporting in Africa; and the campaign also demonstrated the efficacy of health education and of the role of local volunteers. There had been major impacts on national economies in the endemic countries and the campaign had also trained a new generation of health-care workers. Behaviour change was another factor critical to the success of the Guinea worm eradication campaign and could be achieved by a grassroots approach, as a counterpart to the high-level prioritization of the issue by the ministries of health in endemic countries and the support of partners such as WHO, UNICEF and the Carter Center.²⁸⁹ With persistent championing by former US President Jimmy Carter, Guinea worm is likely to become the first parasitic disease in humans to be eradicated, running in parallel with the end of the polio eradication programme.^{290,291}

7.4 Eradication lessons and legacies and new eradication initiatives

WHO Expanded Programme on Immunization

WHO initiated the EPI in 1974 with the objective to vaccinate children throughout the world.²⁹² EPI built on the smallpox eradication infrastructure and gaining from the inspirational momentum that the successful eradication programme generated, but whilst the campaign for smallpox eradication was set up as special and time-limited effort, the EPI requires long-term sustainable approaches to protect new cohorts of susceptible persons with vaccination and monitor trends and progress towards disease control with high quality surveillance..^{293,294}

The first diseases targeted by the EPI were diphtheria, whooping cough, tetanus, measles, poliomyelitis and tuberculosis. Prior to the initiation of the EPI, child vaccination coverage for these diseases was estimated to be fewer than 5 percent. Global policies for immunization and establishment of the goal of providing universal immunization for all children by 1990 were established in 1977, this goal being considered an essential element of the WHO strategy to achieve health for all by 2000,²⁹⁵ with each Member State needing to create and implement their own policies for vaccination programmes following the guidelines set by the EPI. Problems encountered by the Programme included: lack of public and governmental awareness of the scope and seriousness of the target diseases; ineffective programme management; inadequate equipment and skills for vaccine storage and handling; and insufficient means for monitoring programme impact as reflected by increasing immunization coverage levels and decreasing incidence of the target diseases.²⁹⁶ Wide inter- and intra-country differences still exist and the need has been identified for increased political and financial commitments as key factors for both maintaining current achievements and making additional progress for EPI, for example in Africa.²⁹⁷

Coverage of the initially targeted infections has increased to at least 80 percent, and has also been expanded to include other vaccinations such as for hepatitis B, Haemophilus influenzae type B, rubella, tetanus and yellow fever. WHO works in partnership with other organisations – notably UNICEF²⁹⁸ – and a target has been set of reaching 90 percent of children under the age of one in each country with routine immunization by 2020, as part of the Global Vaccine Action Plan (GVAP) — endorsed by the 194 Member States of the WHA in May 2012.²⁹⁹ GVAP aims to strengthen routine immunization to meet vaccination coverage targets; accelerate control of vaccine-preventable diseases with polio eradication as the first milestone; introduce new and improved vaccines and spur research and development for the next generation of vaccines and technologies.

The origin of GVAP was in an initiative of the Bill and Melinda Gates Foundation. At the World Economic Forum in Davos, Switzerland, in January, 2010, BMGF launched the Decade of Vaccines by pledging US\$ 10 billion (in addition to the US\$ 4.5 billion it had already committed to vaccine research, development and delivery to date across its entire disease portfolio since its inception) to support worldwide efforts to develop and deliver vaccines to the world's poorest children in the next decade.³⁰⁰ The BMGF announcement noted that critical funding gaps existed at GAVI and in the global polio and measles programmes, and more support was also needed for the research and development necessary to produce new vaccines. In December 2010, global health leaders committed to ensuring that the Decade of Vaccines would provide for discovery, development, and delivery of lifesaving vaccines globally, especially to the poorest countries,³⁰¹ attracting support from the private sector as well as public and not-for-profit organizations.³⁰² An edition of the Lancet in June 2011 focused on the Decade of Vaccines.³⁰³ It included an examination of ways of improving vaccine coverage and financing of both existing and newer vaccines, as well as how to communicate the benefits of vaccines and ensure public trust and confidence. The editors noted that broad optimism about the potential for the Decade

was tempered with caution and that while there was an unprecedented opportunity for vaccines, it was necessary to choose a different trajectory for this future decade if those opportunities were to be fully realised.³⁰⁴

The report³⁰⁵ of the WHO Secretariat on GVAP to the January 2016 EB, which included a summary of the 2015 Assessment Report of GVAP by the SAGE, noted that there had so far been weak implementation of the action plan, with five of the six goals set by the GVAP with deadlines at the end of 2014 or 2015 still requiring substantial progress to get the goals on track (poliovirus transmission interruption, maternal and neonatal tetanus, measles and rubella elimination, and DTP3 coverage targets). Indeed, most had seen very little progress three years after the programme began and some had been missed multiple times before. While there had been some success stories, these isolated improvements in countries and at the global level would have to become the norm if the plan is to get back on track; and the assessment report focused on the need for leadership and accountability systems at all levels, particularly within countries, to achieve this. Factors in the lack of progress included the need for much greater efforts at country and regional levels; poor data quality and use; issues of affordability and supply of vaccines; failures of basic integration, with health care workers repeatedly missing easy opportunities to offer vaccinations when people attend clinics with other problems; and situations disrupting immunization, including war and major disease outbreaks (such as Ebola).³⁰⁶

M. Chan Beyond expectations: 40 years of EPI. The Lancet 2014³⁰⁷

Writing on the 40th anniversary of the EPI, DG Margaret Chan reflected on the reasons for the EPI's success, which included:

- Prevention of childhood deaths has great public and political appeal, which had helped create momentum within individual countries and the international community to support immunisation programmes.
- Vaccines are scheduled interventions that can be delivered even in the absence of well-functioning health systems and even in places where capacities are weak and skilled health workers are scarce
- The costs of the initial six EPI antigens against polio, diphtheria, tuberculosis, pertussis, measles, and tetanus were low.
- EPI had encouraged new models of international cooperation, found new sources of funding, and stimulated innovation in technology and the operational performance of national immunisation programmes.
- It had pioneered improvements in surveillance and monitoring as a contribution to accountability for results.
- Fundamental public health capacities had also been strengthened; e.g. there were nearly 700 laboratories, in 164 countries, accredited by WHO to undertake laboratory-based surveillance for measles and other vaccine-preventable epidemic-prone diseases.
- The establishment of GAVI in 2000 helped launch the most innovative EPI decade to date. Since the start of this century, WHO, UNICEF and GAVI have worked to change the dynamics of the market for public health vaccines, making supplies more plentiful, predictable, and affordable. Collaboration with the pharmaceutical industry also intensified, leading not only to new vaccines against the world's biggest childhood diseases, but also to new product designs and formulations that simplified safe administration in resource-constrained settings.
- Commitment to fairness had always been a driving force for the expansion of immunisation coverage and the introduction of new products. GAVI, with support from WHO, UNICEF, and others, had increased equitable access through rapid introduction of the newer and more expensive vaccines into the routine immunisation programmes of low-income countries.

Lessons for future public health went beyond infectious disease programmes. With chronic non-communicable diseases now responsible for most deaths worldwide, the 21st century must be an era of prevention. Immunisation programmes - a prime model for prevention – had dealt with the problems of poor procurement policies, weak supply chains, infrequent supportive supervision, insufficient planning and inadequate engagement of community leaders. Any goals set for health in the post-2015 era would need to address similar problems and could benefit from the pioneering work done by EPI in many respects – e.g. finding new ways to secure and increase funding, fostering cooperation between multiple partners to work together with shared yet flexible strategies, stimulating industry innovation and promoting country ownership through the streamlining of programmatic demands. EPI had carved out pathways and strategies to achieve universal access to immunisation services and this legacy provided guidance for reforms that would move health systems towards universal coverage.

Other potential disease eradication targets

P. Yekutieli. Lessons from the Big Eradication Campaigns. World Health Forum 2, 1981, 467–469³⁰⁸

Yekutieli drew on experiences from the eradication campaigns against malaria, smallpox, yellow fever and yaws which revealed the complex factors involved in their success or failure. He proposed six preconditions as criteria for deciding whether to opt for control or eradication and concluded that the outstanding feature had been the important but underestimated role played by socioeconomic factors. Looking at the gross administrative deficiencies and operational flaws which, to a greater or lesser degree, impeded all the campaigns, he argued that the fundamental misjudgement was failure to recognize the spread of diseases as basically social phenomena, and the resulting eradication approaches focused on primarily technical and methodological problems. In Yekutieli's opinion, there were no suitable targets for disease eradication in the immediate future. In the case of polio he considered it was best controlled by immunization, provided that this was accompanied by careful surveillance.

D.A. Henderson. Eradication: Lessons From the Past CDC MMWR Supplements 1999 48 (SU01), 16-22³⁰⁹

Shortly after the declaration in 1980 that smallpox had been eradicated globally, a meeting had been convened at the Fogarty International Center to explore what diseases should be eradicated next. Henderson and Fenner had provided a sceptical introductory note to the meeting, pointing that smallpox had a number of highly favourable characteristics which facilitated eradication and that, at the time, no other disease came close to matching these advantages. Despite these advantages, eradication had been achieved by only the narrowest of margins.

Nevertheless there has been continuing interest in new disease eradication targets. In a 2013 review, Hopkins³¹⁰ noted that since the last case of naturally occurring smallpox in 1977 there had been three major international conferences devoted to disease eradication, with several diseases considered as potential candidates. While to date only polio and dracunculiasis have been designated for eradication and both are requiring much longer than initially envisaged, there remains interest in some of the other potential candidates. Hopkins' review summarised key principles for any new campaign contemplated, including the need to intervene everywhere the disease occurs, no matter how remotely located or difficult to access or how minor the perceived problem is in an individual country or area; the importance of monitoring the target disease and the extent of interventions closely; the need for flexibility and urgency in response to ongoing monitoring and operational research; and the need for an intense focus on the goal of stopping transmission of the targeted disease, even when the costs per case rise sharply as the number of cases declines. Common

difficulties faced by such campaigns included sporadic or widespread political insecurity in areas where the disease was endemic, inadequate or delayed funding, and the challenges of motivating officials, health workers, and affected populations.

Among the candidates that have been considered as potentially eradicable, including by the International Task Force on Disease Eradication which was initiated by the Carter Center in 1988³¹¹ and reactivated by BMGF,³¹² are lymphatic filariasis, measles, mumps, rubella and pork tapeworm.^{313,314}

Among these, measles has received most attention in recent years, buoyed by a history of temporary successes in the Americas.^{315,316} In 2010, Keegan *et al*³¹⁷ reviewed the literature on the yaws, malaria, smallpox, guinea worm, and polio eradication programmes and compared enabling and constraining factors for each of the prior eradication programs with the same factors that might facilitate or hinder global measles eradication. They concluded that a potential measles eradication programme would enjoy distinct advantages in comparison with earlier eradication programmes, including strong political and societal support, economic analyses demonstrating a high level of cost-effectiveness and a rigorous upfront process. Increasing population density, urbanization, and wars/civil conflicts would pose serious challenges, but measles eradication would probably not be as difficult to achieve as polio eradication. However, measles eradication should be undertaken only if the commitments and resources were adequate to meet the political, social, economic, and technical challenges.

W. Gates, M. Gates. Our big bet for the future. Bill and Melinda Gates Annual letter, 2015³¹⁸

In Chapter 1 of the 2015 Gates Annual Letter, 'Child deaths will go down and more diseases will be wiped out', Bill and Melinda Gates, in referring to "*wiping polio and three other diseases off the face of the earth*", pointed out that it was very difficult to destroy a disease and that it has only been done once in the case of smallpox in 1980. Nevertheless they predict that with hard work, four diseases can be eradicated by 2030, saying "*we can get polio out of Africa this year and out of every country in the world in the next several years*". The aim was also to eradicate Guinea worm soon "*thanks in large part to the leadership of President Jimmy Carter and the Carter Center*" and see the end of diseases such as elephantiasis, river blindness, and blinding trachoma.

8. CONCLUSIONS

By using a mix of peer reviewed literature and grey literature – including reports of international and national agencies and NGOs as well as newspaper articles, on line media reports, blogs, tweets etc. – it has been possible to include a broad range of issues that all contribute to the subject matter of this review. In addition, the personal contacts and interviews have added a richness and reality check to the work, while clearing up discrepancies and questions that have arisen at various times.

The review shows a number of key issues that contribute to *polio eradication: history, lessons and legacy*.

History

The chronological inspection of the successive phases of the history of polio eradication from 1988 to the present day reveals the diverse and complex nature of the challenges that have had to be addressed. When the Initiative started it was expected to take 12 years. At the time of writing, with the extension to 2019, the time frame has become over 30 years and more work will need to continue into the future.

The history also shows how the programme has had to change to deal with the virus in different settings and time and again proves that ‘one size does not fit all’ and that local situations require local responses. One important lesson that could be transferred to other situations is that ‘picking the low-hanging fruit first’ leaves the programme exposed to criticism while battling the hardest countries at the end. Greater efforts should have been made to make more progress in difficult countries such as Afghanistan, Nigeria and Pakistan from the outset. While increasing the funding available in India made the difference, complex political issues and conflict made the task much harder in the other three, with the added problems, especially in Afghanistan and Pakistan, of very weak health systems.

Innovative thinking and ideas

Policies and programmes for the eradication of polio at all levels have thrown up challenges and have needed ‘course correction’ at various times. New ways of addressing these challenges have had to be found. At the global level, special meetings have been convened, evaluations carried out and new programmes introduced, leading finally to the Polio Eradication and Endgame Strategic Plan 2013-2018. New governance mechanisms have been introduced including the powerful POB, which comprises the Heads of the core partners. In addition, without precedence in any other body, the IMB was set up as a watchdog over the GPEI.

New processes and bodies have also been introduced in the most challenging countries and are beginning to make a difference in both Pakistan and Afghanistan, with the Head of State/Government in both instances now taking charge of the processes with committees also established at the provincial and local level. Both countries are now cooperating on cross-border infection issues, with regular communication at different levels. This may bring about final eradication of the virus, but it will not be easy as the virus now lingers in what is, from political and security perspectives, the most dangerous parts of both countries.

A lesson to be learned is not only that a robust structure is required at the global level, but there is also need for an equally robust structure at the national level, under political leadership at the highest level. Dealing with polio eradication as a health issue is not sufficient to bring about its eradication. It requires a broader political commitment that also addressed economic, social, cultural and other issues. Polio eradication must, however, maintain neutrality. The US intervention on Osama bin Laden together with the drone attacks

set back polio eradication and provided an opening for increasing opposition to the programme.

Financing polio eradication

The assessment of financial requirements of the programme when it started in no way corresponded to the huge financial commitments that subsequently had to be made. Fortunately, although funding gaps have been a constant theme throughout the process, a number of governments, agencies, NGOs (particularly Rotary International) and foundations (particularly BMGF), have made repeated substantial contributions to the GPEI. These have shown their commitment to keep going to get the job done, but it is not necessarily an ideal model for future campaigns. The literature has also shown a potential problem in ensuring that there is enough funding to finish the job completely. The current author has found, even including among some members of Rotary, the impression that polio has already been eradicated, which is certainly not the case; and there appears to be among some funders an inclination to look to the next problem rather than continue to fund polio eradication. Funding will be required for many years after eradication is certified for further vaccination programmes. Eradication does not mean the end and resources, albeit on a smaller scale than heretofore, will be required for years to come. This is not strongly highlighted in the literature.

The importance of legacy planning... and security issues

The literature reviewed stresses the importance of legacy planning as a major part of the current agenda, while recognizing that it must not detract from the task of polio eradication. There are fewer peer-reviewed articles on legacy and transitioning than for other areas, reflecting the fact that this is indeed the latest issue to be addressed. Legacy planning should be explored further at all levels to ensure that the broadest approaches are used and that the legacy is not confined to other immunization programmes alone, nor even just to strengthening health systems and improving service delivery, but that it also benefits global health institutions, architectures and governance mechanisms and activities beyond health.

Lessons have been learned, for example, on how to provide services in areas of conflict and great insecurity. They include providing services on the peripheries, in medical camps and at football matches, social events and melas, as well as short, fast programmes. Security forces have also been deployed to protect the health care workers, with many incidents leading to loss of life of both health care workers and those protecting them. Further strategies may be required to ensure that those missed children in the most challenging areas are reached and vaccinated in the coming months.

Not health workers alone...

The literature has shown the importance of involving others in the task of eradicating polio. Indeed, efforts have been and continue to be made to involve religious leaders in supporting eradication campaigns, as well as to include other health workers together with the vaccinators to provide other services when going house-to-house. More recently there have been greater attempts to involve celebrities, such as cricketers, to support the programmes. At the same time, the detrimental impact of some religious leaders and others, such as Taliban leaders, as exemplified in a number of the sources reviewed, must not be underestimated.

Final words...

As the reports at the end of 2015 have shown, despite the loss of life of vaccinators and others and the fact that the period the endgame has been extended to 2019, the significant decrease in the number of cases of WPV indicated that the end was within reach, as long as the commitment to polio eradication remains strong. One size, however, will not fit all and the local and national leadership and activities will be critically important.

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ANNEX

Summary of reports to WHA on polio eradication, 2002-2015

Document	Date	Date for Eradication	Countries carrying out activities	Major Reservoir Countries	Finding requires/raised/Shortfall
A55/11	27-Mar-02	2005	<p>A "Meeting on the impact of targeted programmes on health systems: a case study of the Polio Eradication Initiative" was held in Geneva from 16 to 17 December 1999.</p> <p>16 West African countries synchronized national immunization days in October- November 2000 and 2001. Angola, Congo, Democratic Republic of the Congo and Gabon synchronized three rounds of intensified national immunization days in July-September 2001. Afghanistan, Islamic Republic of Iran and Pakistan continued to synchronize activities.</p> <p>The Global Action Plan for Laboratory Containment of Wild Polioviruses is now being implemented. National task forces have been appointed in 114 countries and areas: 36 in the Western Pacific Region; 50 in the European Region; 19 in the Eastern Mediterranean Region; seven in the South-East Asia Region; and two in the Region of the Americas.</p>	<p>High transmission: Northern India, Pakistan, Afghanistan, Nigeria, and Niger.</p> <p>Low transmission: Angola, Egypt, Ethiopia, Somalia, and Sudan</p>	<p>Funding gap of \$275 million to end of 2005: "single greatest threat to the goal of poliomyelitis eradication".</p> <p>Critical to achieving this acceleration have been large, un-earmarked contributions for poliomyelitis eradication to WHO totalling US\$ 308 million during 1999-2001, from the governments of the Netherlands and the UK; BMGF and UNF. During the same period, additional contributions to the eradication Initiative, through either multilateral or bilateral channels were made by Rotary International and by the EC; the governments of Australia, Austria, Belgium, Canada, Denmark, Finland, Germany, Ireland, Italy, Japan, Luxembourg, Norway, Oman, UK and USA; Aventis and De Beers.</p>
A56/20	28-Mar-03	2005	In India, Nigeria, Pakistan, Egypt, Niger, Afghanistan and Somalia multiple additional rounds of large-scale supplementary poliomyelitis immunization activities will be needed in 2003-2004.	Seven countries still endemic for WPV at the end of 2002: India, Nigeria, Pakistan, Afghanistan, Egypt, Niger, Somalia	Shortfall of US\$ 85 million for 2003
A57/8	15-Apr-04	2005	Global Polio Eradication Initiative launched new Global Polio Eradication Strategic Plan for 2004 to 2008	Nigeria, India, Pakistan, Niger, Afghanistan, and	At G8 summit (June 2003) leaders pledge to close funding gap for 2003-2005 as did leaders at African Union Summit (July 2003).

				Egypt still considered endemic	Leaders at Islamic Conference (Oct 2003) called on member states to accelerate efforts.
A58/11	07-Apr-05	2005 (EB115/2005/RE C/2)	<p>In 2004, the intensified eradication activities made good progress in Asia. An increase in the quality and quantity of poliomyelitis campaigns in Afghanistan, India and Pakistan reduced the geographical distribution of wild-type poliovirus in those countries, with altogether just 194 cases reported compared with 336 for the same period in 2003.</p> <p>In Egypt, poliovirus transmission fell to its lowest level ever as the quality of poliomyelitis campaigns improved further.</p> <p>Sub-Saharan Africa experienced epidemic poliomyelitis as a result of a suspension (from August 2003 to 31 July 2004) of immunization against the disease in the state of Kano, Nigeria, and low routine immunization coverage in some neighbouring countries. Consequently, reported cases of poliomyelitis in Niger and Nigeria increased to 814 by 8 March 2005 compared with 395 at the same time in 2003, and 254 cases occurred in 12 previously poliomyelitis-free countries due to imported wild-type polioviruses. In five of these countries (Burkina Faso, Central African Republic, Chad, Côte d'Ivoire and the Sudan) endemic transmission of the imported polioviruses was re-established.</p>	<p>Afghanistan and Pakistan share two reservoirs of poliovirus, requiring very high immunization coverage during large-scale, synchronized mopping-up activities, in addition to ongoing nationwide poliomyelitis eradication campaigns in both countries.</p> <p>In Egypt and India the transmission of polioviruses is particularly efficient requiring mass campaigns to reach more than 95% of children with OPV in the infected areas, every six weeks until transmission stops.</p> <p>Niger and Nigeria have had very low poliomyelitis immunization coverage. Burkina Faso, Central African Republic, Chad, Côte d'Ivoire and the</p>	<p>International support for poliomyelitis eradication grew in 2004. In June 2004, G8 leaders renewed their pledge to finance eradication activities.</p> <p>As of 18 March 2005, the funding gap for activities in the second half of the year was US\$ 75 million and the gap for activities in 2006 was US\$ 200 million.</p>

				Sudan need a marked increase in the number and quality of immunization campaigns	
A59/6	04-May-06		Interrupting indigenous wild-type poliovirus transmission in Asia. Wild-type poliovirus transmission in Afghanistan, India and Pakistan is now restricted to a single serotype, type 1 or 3, in most geographical areas.	<p>Northern Nigeria constitutes the last reservoir of indigenous wild-type poliovirus in Africa and appears to be the only significant remaining reservoir of types 1 and 3 poliovirus together in the world.</p> <p>WPV transmission in Afghanistan, India and Pakistan is now restricted to a single serotype, type 1 or 3, in most geographical areas. Large-scale supplementary immunization activities that reach more than 95% of children in the infected areas with the appropriate mOPV are required every four to six weeks until poliovirus transmission is interrupted.</p>	Ensuring financing for the 2006-2008 “mop-up and certification phase”. Multi-year and flexible financing commitments are needed to cover the unmet funding requirement, which at 6 April 2006 was US\$ 575 million for 2006-2008, of which US\$ 150 million is immediately required for activities in 2006.

A60/11	12-Apr-07	<p>In order to intensify efforts to interrupt the remaining chains of transmission of indigenous wild poliovirus in Afghanistan, India, Nigeria and Pakistan, the DG urgently convened a stakeholder consultation on poliomyelitis eradication (Geneva, 28 February 2007). Participants reaffirmed the technical, humanitarian and economic case for completing eradication.</p> <p>In 2006 Ministry of Health of Saudi Arabia issued a directive requiring all travellers aged less than 15 years from countries with recent or ongoing circulation of polioviruses, and all travellers from Afghanistan, India, Nigeria and Pakistan, regardless of age, to provide proof of vaccination before an entry visa could be issued.</p> <p>The ACPE recommended that all travellers from areas where poliovirus is circulating should be fully immunized against poliomyelitis before travel. The EB at its 120th session adopted resolution EB120.R1 which contained a resolution recommended to the WHA that urged Member States to implement this policy.</p>	Afghanistan, India, Nigeria and Pakistan.	Additional funding of US\$ 575 million is needed for 2007–2008, of which US\$ 100 million are needed for activities in the first half of 2007 (as of 27 February 2007).
A61/5	03-Apr-08	<p>Efforts are being focused on: the Southern Region of Afghanistan; the 72 highest-risk blocks (out of a total of 433 blocks) of Bihar State, India; the high-risk local government areas that have been identified in the northern states of Nigeria where transmission of wild poliovirus has never been interrupted (especially those local government areas in Borno, Jigawa, Kano, Katsina, Kebbi and Sokoto states); and the North-West Frontier Province and large areas of Sindh and Balochistan in Pakistan. Outbreak response activities must be fully implemented in Angola and Chad, where transmission of imported viruses has continued since 2005 and 2003, respectively.</p>		To implement the intensified eradication plan for 2008–2009, the budget of US\$ 1306 million must be fully financed.

A62/23	09-Apr-09	<p>While indigenous WV1 had not been detected in Uttar Pradesh in India for 12 months, there was a new outbreak in the western part, imported from Bihar state. There were mopping-up activities on average every six weeks in both western Uttar Pradesh and central Bihar. The type 1 WPV originating in western Uttar Pradesh was also found in a sewage sample in Cairo in December 2008. The numbers of cases in Pakistan, and to a lesser extent in Afghanistan, surged in the latter half of 2008 because of a deterioration in security which led to outbreaks in polio-free areas, including in the Punjab in Pakistan, because of large-scale movements of populations. However, by early 2009 polio was restricted to insecure parts of the NWFP in Pakistan and three provinces in the Southern Region of Afghanistan. Two doctors and their driver working for WHO on polio eradication were killed in Kandahar province, Afghanistan in 2008. Out of 16 countries where there had been imported cases of polio in 2008 and early 2009, 12 had become re-infected since mid-2008 and outbreaks in Angola, Chad, Ethiopia and the border areas of southern Sudan had continued for more than 12 months</p>		<p>As at 27 February 2009, the GPEI, against its budget of US\$ 1,340 million, had a US\$ 340 million funding gap for 2009-2010.</p>
A63/27	15-Apr-10	<p>In February 2010, a total of 1,595 polio cases were reported from 23 countries for 2009, including 1,247 from Afghanistan, India, Nigeria and Pakistan and 142 from the Angola, Chad, DRC, and Sudan, where poliovirus transmission was known or suspected to have been re-established. By late 2009 no new case had been reported for more than three months in the Horn of Africa.</p>		<p>126th EB strongly supported a proposal for a three-year strategic plan formulated by the GPEI with a corresponding budget for the 63rd WHA.</p>

A64/26	21-Apr-11		<p>At 1 March 2011, the status of the three major milestones of the Strategic Plan 2010–2012 was:</p> <ul style="list-style-type: none"> • Countries with new outbreaks of poliomyelitis due to an imported poliovirus: since mid-2010, no polio cases had been detected due to the original importation in any of the 15 countries that had reported new outbreaks in 2009. In the 11 countries with new outbreaks in 2010, none had persisted for longer than six months • Countries with re-established poliovirus transmission: the re-established WPV1 in south Sudan had not been detected since 27 June 2009. Countries with ongoing transmission of their re-established poliovirus were Chad, DRC and Angola • Countries with endemic transmission of poliovirus: overall, in the four remaining countries, cases of poliomyelitis had declined by 82 percent in 2010 compared to the same period in 2009. In India cases had declined by 95 percent (42 cases compared with 740 cases); in Nigeria, by 95 percent (21 compared with 388 cases); and in Afghanistan by 35 percent (25 compared with 38 cases). In Pakistan, cases had increased by 61 percent (144 cases in 2010, compared with 89 in 2009) 		<p>Shortfalls in the financing of the GPEI had continued to result in a scaling back of supplementary immunization and surveillance activities in some areas, delays in implementing outbreak response activities in others, and reductions in the long-term technical assistance provided by the WHO Secretariat to some Member States. As at March 2011, 38% of the 2011–2012 budget of US\$ 1860 million remained unfunded.</p>
A65/20	05-Apr-12		<p>A Global Polio Emergency Action Plan 2012–2013 was developed to support Afghanistan, Nigeria and Pakistan in implementing corrective actions to achieve, by end-2012, the coverage levels needed to interrupt poliovirus transmission in each of the remaining infected areas.</p>	Afghanistan, Nigeria and Pakistan	
A66/18	28-Mar-13	2018		Afghanistan, Nigeria and Pakistan.	<p>The budget for the polio eradication and endgame strategic plan 2013–2018 is US\$ 5525 million, with costs peaking at US\$ 1054 million in 2013 then declining annually to US\$ 760 million in 2018.</p>

A67/38	21-Mar-14	2018	<p>The WHA is invited to note the report and encourage: all polio-affected Member States to undertake immediately emergency measures to overcome remaining obstacles to reach all children with oral polio vaccine; all Member States that currently use only oral polio vaccine to establish by the end of 2014 a plan for introducing at least one dose of inactivated poliovirus vaccine into their routine immunization programme by the end of 2015; and all Member States to implement phase 1 containment activities for poliovirus by the end of 2015, ensure highly sensitive surveillance for polioviruses, and implement relevant polio vaccination recommendations for travellers.</p>	<p>Pakistan, Somalia, Kenya, Ethiopia, Pakistan, Syrian Arabic Republic, Cameroon.</p> <p>Declines in Nigeria and Afghanistan.</p>	<p>In April 2013, donors and governments of polio-affected countries pledged US\$ 4,040 million towards the US\$ 5,530 million budget of the Endgame Plan at the Global Vaccine Summit (Abu Dhabi, 24 and 25 April 2013). A further US\$ 490 million has been pledged since then. In order to operationalize these pledges and mobilize additional funding for the remaining US\$ 1 billion gap, WHO and its GPEI partners have enhanced their resource mobilization and strategic communications capacities and refocused their cross-agency polio advocacy group on intensified resource mobilization. A cross-agency finance working group ensures stronger cost control, accountability and resource management.</p> <p>At the end of November 2013, aggregated requests for financing of eradication activities in 2014 exceeded the budget of US\$ 1033 million by US\$ 286 million. Reconciling these requests with available financing required a substantial rescheduling of supplementary immunization activities in many countries and allocation of part of the programme's limited discretionary funds for inactivated poliovirus vaccine introduction. As at 23 January 2014, the cash gap for eradication activities planned for 2014 was still US\$ 497.52 million, against the 2014 budget of US\$ 1033 million, requiring intensified efforts to operationalize financing pledges.</p>
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A68/21	01-May-15		<p>On 5 May 2014, the DG declared the international spread of wild poliovirus a public health emergency of international concern (PHEIC) and issued temporary recommendations.</p> <p>UNICEF has contracted two manufacturers of the WHO-prequalified product to establish a global stockpile of 500 million doses of monovalent oral poliovirus vaccine type 2 by the end of 2015.</p>	<p>Pakistan the only country continuing to export WPV internationally.</p> <p>In 2014, 359 cases of paralytic poliomyelitis due to WPV were reported globally compared to 416 in 2013. All the cases were caused by WPV1 and most (85%) occurred in Pakistan, where intense transmission was ongoing. In Afghanistan 28 cases were reported, primarily as a result of cross-border importation, although transmission of an indigenous WPV continued in the Southern Region. In the only other remaining country in which poliomyelitis was endemic, Nigeria, the systematic application of eradication strategies had resulted in a substantial reduction in the number of cases, with six reported cases in the</p>	<p>By the end of 2014 the GPEI had received US\$ 2,230 million in contributions and was tracking an additional US\$ 2,850 million in pledges, against the overall budget for 2013–2018 of US\$ 5,500 million. Full and rapid realization of all pledges would result in a remaining funding gap of US\$ 451 million against the Endgame Strategic Plan 2013–2108. Some members of the EB at its 136th session expressed concern at the ongoing funding gap and the risk it posed to implementing fully the Polio Eradication and Endgame Strategic Plan 2013–2018 and called on all donors to rapidly fulfil pledges and fill the residual funding gap as urgently as possible.</p>
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				year and onset of paralysis in the most recent case on 24 July 2014.	
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