23

TWENTY-THIRD REPORT

THE LONG GOODBYE

POLIOVIRUS **CONTINUES TO RESIST** EXTINCTION

INDEPENDENT MONITORING BOARD
OF THE GLOBAL POLIO ERADICATION INITIATIVE

SEPTEMBER 2024

IN MEMORIAM

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Aidan O’Leary

1965-2024

INDEPENDENT MONITORING BOARD

The Independent Monitoring Board (IMB) provides an independent assessment of the progress being made by the Global Polio Eradication Initiative (GPEI) in the detection and interruption of poliomyelitis (polio) transmission globally.

MEMBERS

Sir Liam Donaldson (Chair)

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The IMB was asked by the GPEI to make its 23rd meeting in July 2024 a joint meeting with the Polio Transition Monitoring Board (TIMB). This report deals only with the IMB's monitoring responsibilities. The TIMB will be producing its own report.

To avoid the cumbersome terminology of calling the July 2024 meeting "the IMB/TIMB meeting," it is simply referred to in this report as "the IMB meeting" for consistency with the scope and subject matter of the report.

The IMB meeting itself comprised over 30 hours of detailed discussions with many valuable points and insights about the Polio Programme made by almost 100 people. In addition, through the year before the meeting, the IMB's chairman and its small secretariat had numerous discussions with individuals and groups who are involved in planning, delivering and funding the programme as well as those who closely follow its progress. In synthesising this volume of inputs to its work, the IMB will sometimes inevitably make small factual errors. The IMB is always happy to correct the online version of its report if these are drawn to its attention.

The IMB's reports are entirely independent. No drafts are shared with the Polio Programme prior to finalisation. Although many of the data are derived from the GPEI, the IMB develops its own analyses and presentations.

AIDAN O'LEARY

The joint IMB and TIMB meeting opened its first plenary session with presentations from Aidan O'Leary, the Head of Polio and Sir Liam Donaldson, the Boards' Chairman. This was followed by a free-flowing and vibrant discussion between the presenters and the delegates to the meeting.

On that July morning in Geneva, everyone present saw, in Aidan, the personification of a passionate, wise, compassionate and hugely skilled global health leader. His dedication and commitment to eradicating polio always burned bright and remained undimmed through all the ups and downs, geopolitics and complexities that come with leading such a programme.

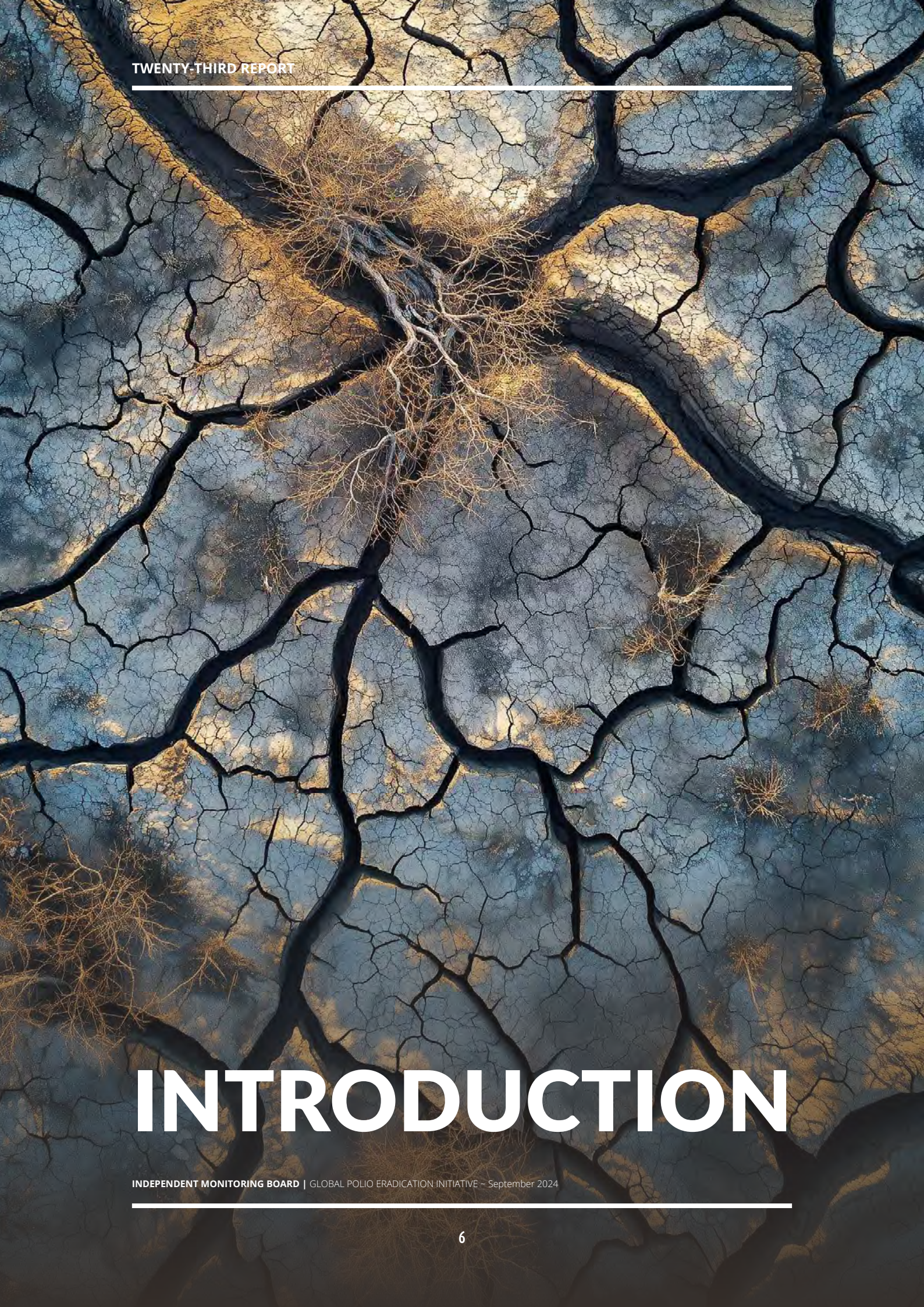
No one present at that meeting knew that within three weeks Aidan would be dead. His loss to the world of global health was an enormous shock and that deep sense of loss and grief is still being felt, of course by his family and friends, but also by all those who worked with him currently and in his many past roles.

Softly spoken, but with a steely determination to serve the populations of the world in greatest need, especially the children, that shone through all his work. Many richly deserved tributes have been paid to his life of service, particularly his major achievements in the humanitarian sphere.

In the weeks following his death, those who knew and worked with him have spoken of their respect, their admiration and their deep affection for a man who indelibly touched their lives.

The IMB and TIMB members and secretariat feel deeply for Aidan's family, his friends and colleagues and share the profound sense of loss in all the many ways it is being felt.

CONTENTS



INTRODUCTION

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The *Polio Eradication Strategy 2022–2026, Delivering on a Promise*, set 2023 as a target year to interrupt all remaining type 1 wild poliovirus transmission (Goal One) and circulating type 2 vaccine-derived poliovirus transmission (Goal Two) with the aim of reaching certification by the end of 2026.

The IMB had been asked by the GPEI to carry out a formal mid-term review and to give the Board's view on the prospects for achieving these two strategic goals. The IMB's previous –22nd – report *(Closing in on Zero)*, published in September 2023, provides that mid-term review.

Presenting the results of the mid-term review and the rest of its 22nd report to the Polio Oversight Board meeting in Berlin, Germany in October 2023, the IMB stated that:

- For Goal One (interruption of wild poliovirus transmission globally by the end of 2023), despite encouraging progress, the programme was judged to be **off track** with a very high probability that the goal **would be missed.**
- For Goal Two (interruption of vaccine-derived poliovirus transmission by the end of 2023), this poliovirus was considered not to be under control and it was judged, therefore, that the goal **would be missed.**

Following the IMB report's publication and presentation, the Polio Programme had approximately 12 weeks to initiate further actions so as still to achieve one or both strategic goals before the calendar year ended.

In the event, in line with the IMB's assessment, neither goal was achieved by the end of 2023.

So, 2023 ended with wild poliovirus extending its decades-long period of success in continuing to survive attempts to destroy it and prevent paralysis of children. Therefore, it was essential for the Polio Programme to begin the new year by sustaining the gains made in Pakistan and Afghanistan.

In concluding the mid-term review analysis in its 22nd report, the IMB urged the Polio Programme, globally and at country level, to immediately set itself the task of achieving both goals by the end of 2024.

To assist the Polio Programme in this endeavour, the IMB identified 20 highly specific risks that needed to be blocked or mitigated if the interruption of poliovirus transmission were indeed to be achieved during 2024.

The GPEI responded at the end of 2023 by publishing a formal response to the IMB's 22nd report: *Polio Eradication Strategy: GPEI response to the midterm review*.

This document revisited the achievability of the two eradication goals in the light of the IMB's assessment and concluded that:

- Interruption of wild poliovirus transmission is achievable in 2024 if intense efforts are maintained and future risks are successfully managed, leaving the 2026 target for certification of transmission within reach (enabled by the Global Certification Commission revision of the necessary period on non-detection from three to two years).
- Interruption of vaccine-derived poliovirus transmission is achievable in 2025, given the intensified outbreak response that was underway in 2023, a policy that will be continued into 2024 and 2025. The timing of certification for vaccine-derived polioviruses depends on forthcoming Global Certification requirements.

The GPEI report also rated the severity of each of the 20 IMB-specified risks and added two of its own (inaccessibility and insecurity; and suboptimal operational effectiveness) and addressed each of the IMB's 15 recommendations.

This 23rd IMB report reviews progress since the mid-term review and the GPEI response to it, with particular emphasis on the management of risks and seeking evidence of improvement in programmatic quality.

In concluding the presentation of that mid-term review in September 2023, the IMB urged the Polio Programme, at global and country levels, to immediately set itself the task of maintaining the momentum gathered in 2023 and achieve both goals by the end of 2024.

The story of whether that is happening is the story of this report.

POLIO RISK MANAGEMENT IN ENDEMIC COUNTRIES

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POLIO RISK MANAGEMENT IN ENDEMIC COUNTRIES

In addition to making recommendations, to assist the Polio Programme, in its mid-term review report, the IMB identified a range of risks, some of which were almost certain, if not dealt with, to trigger renewed spread of wild poliovirus in the endemic countries.

The first and most straightforward of these risks was the loss of control over the programme during the electoral period in Pakistan.

The IMB has long been concerned about the risks to polio eradication posed by the process of changing governments in Pakistan. Previously political transitions have had a negative impact on the Polio Programme.

A caretaker administration was appointed towards the end of 2023, to govern and make arrangements for the federal elections that were held on 8 February 2024. The outcome of the election heightened political tension.

The previous Prime Minister, Shehbaz Sharif, was returned to power, but this time as leader of a coalition government.

The caretaker arrangements were dysfunctional for continuity in the control of polio in Pakistan.

Attempts were made to revise the programme management and to change funding flows. There was conflict with the head of the emergency operations centre.

Thus, the poor maintenance of the polio gains that had been made in Pakistan in the pre-election period was a key factor in triggering the wild poliovirus resurgence during 2024.

In the year preceding the mid-term review, the Pakistan Polio Programme had built some strong resilience features.

The IMB noted these encouraging gains, but, in framing its risks, pointed out that any true re-establishment of wild poliovirus in these historical reservoirs would be very negative for polio eradication in Pakistan and for the world.

Unfortunately, the Pakistan Polio Programme did not stop wild poliovirus from circulating again in the historical reservoirs. Polio cases and large numbers of environmental positive samples have affected all of these reservoirs.

In the first six months of 2024 eight children were paralysed, and the historical core reservoirs of the Quetta Block, Khyber Pakhtunkhwa and Karachi that serve as "engines of transmission", were reinfected. Six of the eight polio cases came from core reservoirs and one each from Dera Bugti District and Shikarpur District that form part of another epidemiologically important zone of central Pakistan. There were also widespread detections of environmental positive samples.

As 2024 has moved on, there has been a further accumulation of cases and environmental detections of the wild poliovirus.

Similarly, in the mid-term review, in July 2023, the IMB saw the Quetta Block as a special case among the historical polio reservoirs. At that time, the others, notably Karachi, had been confronted by the return of the wild poliovirus and withstood the challenge. Quetta Block had

PAKISTAN 2023-2024

↑117%

INCREASE

in polio cases and positive environmental samples

(To 21 August in each year)

not at the time been challenged in this way. In the informal discussions at the July 2023 IMB meeting, many people expressed a lack of confidence in this province's level of resilience if wild poliovirus were to return.

The IMB concluded that poliovirus appearing in Quetta was a further risk, in its own right, to stopping polio in Pakistan.

In early June 2024, Quetta City did indeed see the return of the wild poliovirus when the first case of paralytic polio in four years was detected in a two-year-old child, who quickly died of the disease. IMB sources close to the frontline say that the case was missed by two officials conducting surveillance before being reported. If this is true, then it is a serious weakness of vigilance that is unacceptable for this stage of the eradication endeavour.

At the time of the mid-term review, the only polio-endemic zone in Pakistan was in seven south districts of Khyber Pakhtunkhwa. Here, it had a stubborn hold. The IMB considered that failing to interrupt transmission in this area was probably the greatest risk to achieving Goal One of the strategy, even by the end of 2024. Therefore, evidence of transformative improvements in access and programmatic performance in south Khyber Pakhtunkhwa was essential if this risk was to be regarded as effectively managed.

At the time of the IMB's mid-term review in late 2023, the number of genetic clusters of wild poliovirus in the endemic countries had reduced from 12 to two: YB3A and YB3C. In November 2023, YB3C circulation in south Khyber Pakhtunkhwa Province was stopped. It has not re-emerged since that time. This is a very substantial achievement.

However, the operating environment in south Khyber Pakhtunkhwa is still complex and threatening. A remarkable 200 plus boycotts of the polio vaccination programme, with diverse sources of grievance and demands, had been running at the beginning of 2023.

This situation continued after the mid-term review. For example, the Utmanzai Tribal Alliance's jirga has repeatedly prohibited polio vaccination until its demands, including those related to infrastructure, livelihood and health are met. Individual negotiations by the provincial authorities have enabled campaigns to go ahead in over 80% of cases, but this still leaves boycotts of polio vaccination as a major barrier to eliminating poliovirus transmission in the province.

It is disturbing to realise that violence, insecurity and boycotts are still as prevalent in the Khyber Pakhtunkhwa Province as they were in 2023. Since the IMB's mid-term review, 15 policemen have died while trying to ensure safe, effective delivery of the Polio Programme.

KHYBER PAKHTUNKHWA PROVINCE 2024

423,000

children missed in each full campaign

(To 21 August; average number of children; data rounded)

These serious insecurity problems have meant delayed, attenuated or cancelled vaccination campaigns. As a result of insecurity, some union councils have had to resort to a site-to-site vaccination delivery modality. There has, however, been some success in getting into North Waziristan District and, particularly, the Mahsood Belt, which was a worryingly large area of inaccessibility identified by the IMB in its mid-term review.

Discussions about campaign design in Khyber Pakhtunkhwa Province, where security problems are compromising access, decided on a so-called "3+2" approach as the ideal operational modality. In other words, there are three days of house-to-house vaccination and two days of catch-up and follow-up. This arrangement has been the agreed and desired quality standard for 18 months, but it has not been possible to implement it uniformly in all parts of the province. Again, compromises have had to be made on a regular basis and campaign quality has suffered.

On the vitally important surveillance front there are practical considerations to be borne in mind when interpreting the results of environmental sampling. In south Khyber Pakhtunkhwa, the sewage drainage feeding into the sampling site is from a small number of union councils. There is no drainage site which relates to the union councils that represents a whole district. To try to compensate for this, the Polio Programme takes ad hoc samples from unofficial sites every month.

Many broader-based integrated immunisation delivery initiatives are continuing in Khyber Pakhtunkhwa Province in 2024. A longer-term commitment has been made to build stronger systems of essential immunisation and to develop primary care modelled on the Punjab Province's approach.

Despite the intense focus of the Polio Programme, and the skilled and intensive work of the provincial Chief Secretary, the IMB has not yet seen the tide beginning to turn towards interrupting transmission in Khyber Pakhtunkhwa, nor a critical mass of transformative solutions building towards this goal in this polio-endemic zone of Pakistan.

The IMB's mid-term review risk assessment of Afghanistan concentrated on two main vulnerabilities. The first reflected the widespread concern of Polio Programme insiders and knowledgeable observers that a re-establishment of wild poliovirus circulation in Kandahar would be a major blow for hopes of interrupting transmission in the near future. The second concentrated on fears of a loss of momentum in closing the immunity gap in the east of the country.

Re-establishment in Kandahar City in the south region of Afghanistan, will prolong the process of interrupting wild poliovirus transmission in the country unless it is immediately closed down with a highly effective outbreak response.

An explosive outbreak with major spread is a plausible scenario from a wild poliovirus in this location. A large outbreak would paralyse hundreds of children in Afghanistan and then it would hit Pakistan. The wild poliovirus would move along the southern corridor into Quetta and onwards to Karachi, the traditional route of spread. It is predictable and inevitable that, if a major uncontrolled outbreak were to happen in Kandahar City, the entire prospects of clearing the remaining polio-endemic countries could be set back, potentially by years.

A polio eradication operational delivery standard is not being reached in Kandahar City.

AFGHANISTAN 2024

89% **OF POLIO CASES WERE IN SOUTH**

65% **OF POSITIVE ENVIRONMENTAL SAMPLES WERE IN SOUTH**

(Data to 21 August)

Without comprehensive house-to-house campaigning, involving more female health workers, this risk identified in the mid-term review remains unmitigated and leaves the children of Afghanistan, Pakistan and possibly other countries within WHO's Eastern Mediterranean countries extremely vulnerable to paralytic polio.

The Polio Programme in the east of Afghanistan was badly damaged by two years of vaccination disruption. At the time of the mid-term review, progress had been made, but improvements in programmatic quality and penetration to open up access into communities were relatively recent.

Unhelpfully, in June 2023, just before the IMB met, a decision to suspend polio vaccination campaigns on political grounds emphasised the vulnerability of this improved trajectory. Historically, the polio epidemiological experience of this area teaches that it will take longer to interrupt transmission once circulation is established there.

In framing its risk assessment, in mid-2023, it was impossible for the IMB to predict how long suboptimal immunity to polio could be sustained in the endemic zone of Afghanistan without a new surge in cases. Nor, could the IMB predict when the political and public health leadership policies and governance processes would become fit for polio eradication purpose. That was why the IMB identified loss of, or breaks of continuity in, momentum for the Polio Programme in the east as a major risk factor.

The last IMB report, as part of its assessment for the mid-term review, recommended an immediate independent external audit of the acute flaccid paralysis investigation and data gathering processes in east Afghanistan.

All five cases of polio diagnosed in Afghanistan in 2023 up to the time of the IMB mid-term review meeting had been reported from Nangarhar Province and had a past polio vaccine history of receiving between 16 and 28 doses each. It seemed implausible to the IMB that all the children should have contracted polio in these circumstances. The IMB felt it important to find out what is going on in the Polio Programme of one of the last two endemic countries.

The audit was carried out six months after the IMB's recommendation by a team of 19 independent reviewers in east and north-east Afghanistan during the period 19 April to 15 May 2024. It was reported as work in progress via a presentation to the Technical Advisory Group for Afghanistan at its meeting in June 2024.

The IMB did not receive a full and final report of the findings of the audit of the Polio Programme in east Afghanistan that it had recommended in time for its 2024 meeting.

Provisional information provided to the IMB Chairman by the Technical Advisory Group clarified that the objectives of the audit were:

- To assess the accuracy and reliability of surveillance and immunisation programme data;
- To assess programmatic reach to high-risk population subgroups;
- To identify programmatic gaps and suggest next steps.

Key areas of scrutiny were: the quality of surveillance; vaccination coverage; microplanning; and missed children gaps.

Interim findings include: gaps in surveillance between the provinces of Kunduz and Nangarhar; district level vaccination coverage is adequate, but sub-district level reveals poorly performing clusters; microplans not systematically updated before each round; migrant and mobile populations not systematically reflected in microplans; plans for border areas and villages not found; lack of social mobilisation plans despite presence of known refusals; lack of local level cross-border coordination in bordering districts and areas; increasing trend in refusals within highly-resistant households, refugees and returnees, mobile populations and guest children; anecdotal reference to fake finger marking and "official"

households refusing vaccination; clustered refusal in Kunar Province and Nangarhar; lack of a comprehensive strategic approach for cluster refusals; and an absence of female monitors that is limiting access within households.

These findings (yet to be confirmed in an official report) paint a picture of a Polio Programme in the east of the country that is gradually strengthening, but still well short of eradication standard.

The IMB's mid-term review also identified the risk to polio eradication posed by the lack of external and donor funding for Afghanistan. The failure to meet international standards of human rights, particularly of women and girls, is the major factor in limiting access to aid, frozen funds and the international banking system. This is, of course, a much wider complex geopolitical issue. However, it does have a direct bearing on the effectiveness of the Polio Programme. As part of its strategy to rid itself of wild poliovirus, Afghanistan will have to build resilience to ensure that it can retain its polio-free status. At the core of this is the need to strengthen essential immunisation and build a comprehensive system of primary care. Afghanistan will require external funding for this. Although providing such funding raises difficult geopolitical problems, doing nothing is not an option if a polio-free world is to be secured.

Although the IMB identified, in its mid-term review, cross-border population movement as an important risk to interrupting wild poliovirus circulation, this has been a recurring theme in past IMB reports over the last decade. Nor is it a novel observation for the Polio Programme, which is well aware of the risk associated with the border between Pakistan and Afghanistan. This is, however, the most crucial period in the entire history of the Polio Programme for the closest cooperation between the two countries to prevent spread.

In recent months, it has become clear that cross-border movement is not only happening because of long-standing patterns of migration and population flow between Afghanistan and Pakistan. There has also been a great deal of unpredictable movement resulting from the Pakistan Government's programme of repatriation of people to Afghanistan.

This has not only greatly increased the volume of movement across the border, with associated population churn, but also the movement of people within Pakistan who do not want to be found by the authorities.

The emergence of this new source of population movement – and it is one of considerable scale and complexity – means that the current programme of action, in relation to borders and migrant populations, is not strong enough for the risk that it poses to be judged as being successfully managed and mitigated.

In the mid-term review, the retirement of the Regional Director of WHO's office for the Eastern Mediterranean Region, Dr Ahmed Al-Mandhari, was identified as a risk to the maintenance of the positive polio position at the time of the review. Following an earlier IMB recommendation, a Regional Subcommittee for Polio Eradication and Outbreaks had been established and supported by WHO's Regional Director. It has played a vital role in ensuring collective ownership of the priority for action on the polio-endemic status of Pakistan and Afghanistan, as well as the outbreak countries in the region.

The transition to a new Regional Director, at the end of 2023, was seamless and free of risk to the continuity of polio leadership and commitment. Dr Hanan Balkhy immediately pledged herself to the polio eradication initiative and has remained very active in her leadership and work in coordinating action with the health ministers of Eastern Mediterranean countries. The current co-chairs of this important committee are the health ministers of Qatar and the United Arab Emirates.

Mid-term review risks for endemic countries

MITIGATED

- Continuity EMRO leadership

PARTIALLY MITIGATED

- No critical mass for integrated delivery
- Closing immunity gap East Afghanistan

NOT MITIGATED

- Pakistan Election
- Weakened resilience in reservoirs
- Re-established transmission Quetta Block
- No transformation of KP Programme
- Poor sanitary conditions
- Continuing community boycotts
- Re-established transmission Kandahar
- Ongoing funding gap Afghanistan
- Cross border weaknesses

PROSPECTS FOR STOPPING POLIO IN THE ENDEMIC COUNTRIES

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PROSPECTS FOR STOPPING POLIO IN THE ENDEMIC COUNTRIES

"The Polio Programme cannot credibly be on track whilst the cycle of poliovirus in the key reservoirs across Pakistan and Afghanistan remains unbroken."

IMB Report, **October 2018**

"IMB's analysis found that 89% of all paralytic polio cases … in Pakistan in the period 2012-2019 … have been in Pashto speaking families."

IMB Report, **November 2019**

"Oppressive top-down demands … [are] creating a climate of fear at the frontline."

IMB Report, **November 2019**

"Since the IMB's meeting, Pakistan has elected a new government. It comes to power at a crucial time for polio eradication."

IMB Report, **May 2013**

For wild poliovirus circulation to be eliminated globally, both countries have to stop circulation at the same time. Indeed, one of the biggest problems in the past has been that all polio reservoirs across the two countries have never been inactive simultaneously.

Wild poliovirus circulation has been unbroken in Pakistan and Afghanistan, with two recent major waves. During 2021/2022, the circulating wild poliovirus was brought to its lowest level in both countries, but never with simultaneous effect to interrupt circulation across a single epidemiological bloc.

LEADERSHIP DYSFUNCTION TRIGGERING CHANGE

The months following the IMB mid-term review were a period of turbulence in political and public health leadership in both endemic countries. This disrupted the pathways of effective policy-making, together with reducing the strength and effectiveness of the national emergency operations centres. Coordination with the provincial emergency operations centres fractured.

In the weeks running up to the IMB meeting in July 2024, decisions at the top level of government in Pakistan and Afghanistan led to new polio leadership and governance changes being put in place in both countries.

At its meeting in July 2024, the IMB held discussions with the teams of both countries to clarify their understanding of the current situation and their plans to strengthen their polio programmes to reach eradication standard and eliminate the wild poliovirus.

The Pakistan delegation that attended the IMB meeting comprised: the Coordinator to the Prime Minister (in charge of the health ministry), the Prime Minister's Focal Point on Polio Eradication, the Head of the National Emergency Operations Centre, the Strategic Adviser for the Communicable Disease Centre in Pakistan, and the chief secretaries for the provinces of Sindh, Punjab, Balochistan and Khyber Pakhtunkhwa. The provincial emergency operations centre coordinators attended online.

Miss Ayesha Raza Farooq, in a second term as the Prime Minister's Focal Point, brings invaluable experience of leading the Polio Programme previously after the explosive outbreak of 2014.

The Afghanistan delegation that attended the IMB meeting was also new in post and comprised: The Minister of Public Health, the Director of the National Emergency Operations Centre, the Director Health System Strengthening and Aid Coordination and the communications lead at the National Emergency Operations Centre.

PAKISTAN 2024

4

MILLION

children missed after campaigns

(To 21 August; total number of children; data rounded)

RESPONDING TO PAKISTAN'S INABILITY TO HOLD ON TO 2023 GAINS

Pakistan was unable to move from the "near miss" on its goal of interrupting wild poliovirus by the end of 2023 to continuing to hold this same level of control of the poliovirus into the new year.

The YB3C genetic form of the wild poliovirus seems close to elimination, but it is too early to be confident of that. This is especially so because the polio case detected in the Bannu District in September 2023 was an orphan virus. Its absence for a year or more will be needed to be confident that this strain of the poliovirus has been eliminated.

Unfortunately, the other genetic cluster of the wild poliovirus, YB3A, has increased in Pakistan during 2024 and has begun circulating in the historical reservoirs that, at the time of the mid-term review, had been clear of wild poliovirus for some time.

The extensive spread of the YB3A genetic cluster of the wild poliovirus is disappointing. This is the poliovirus that was in the east region of Afghanistan, and that started being detected sporadically in early 2023 in Peshawar, in Punjab province and in Lahore. However, initially, it did not re-establish itself. The virus would apparently disappear and reappear after a month or two.

The historical polio reservoirs and bordering districts account for approximately one third of the total population of Pakistan.

In Khyber Pakhtunkhwa, the security situation is causing the Polio Programme to have to "slice" its campaigns: do a little bit here, a little bit there, so there is no large or intensive vaccination round. As a consequence, the poliovirus always escapes.

In Peshawar, poliovirus has been present for 16 months now, in spite of the quality of operations. There are many orphan viruses there that are not fully explained. Peshawar now has a daily influx of an estimated 7,000 children under five years of age due to the repatriation programme.

Punjab will always have importations of infection because of Pashtun communities moving from Kabul to Lahore, but it has good essential immunisation.

In Quetta Block, in areas like Killa Abdullah and Chaman, the Polio Programme is not able to do full vaccination rounds. It is a complex environment because of migration, lack of health facilities and very, very low essential immunisation coverage.

One campaign in these districts in 2024 could not be done at all because of insecurity.

Weaknesses in past campaigns has led to a big accumulation of susceptible children. Across the border, is an area with a large number of such children, though vaccination rounds and coverage are improving.

Karachi has always posed a big polio challenge. It has long been a hub for mobile populations, and is now described as having "phenomenal" numbers of people going into and out of it.

The migrant settlements in Karachi are not small. There are large Pashtun communities. They have constant visitors, both from Afghanistan and from the border communities of Pakistan.

Some campaigns in Karachi are missing large numbers of children so that a big immunity gap has developed. Karachi East is particularly challenging.

The number of zero-dose or unvaccinated children in Karachi East is also extremely high. It is not clear why this is happening because there have been extensive activities by polio partners to improve essential immunisation.

Looking at polio in Pakistan in the round, parts of south Khyber Pakhtunkhwa, even parts of central Pakistan, but most glaringly, Killa Abdullah and Chaman, are those places where the basic Polio Programme has never really reached a level that could be called strong. For example, two years ago, Pakistan did a sero-survey. Killa Abdullah and Chaman had 60% protection against wild poliovirus type 1, despite all the campaigns that have been done there.

It is inevitable that these large-scale population movements will threaten to overwhelm the Polio Programme's ability to achieve comprehensive vaccination and capture families' and children's presence in microplans. This is especially so with such a porous border and many informal crossing points. On top of this, there will be subgroups of these mobile populations who wish to conceal their existence.

Consequently, the poliovirus is finding its way successfully to the previously uninfected districts in the rest of the country. For example, IMB sources have referred to a rural district of Sindh province that has never had a Pashtun settlement. All of a sudden, a migrant settlement has formed within a sympathetic community that has agreed to host them. The poliovirus could easily be carried undetected in such undocumented settlements.

The new Pakistan polio team has made a clear-eyed assessment of the Polio Programme that it has inherited.

Coming afresh to an adverse situation, with poliovirus surging back into the seemingly cleared historical polio reservoirs, the new government polio team in Pakistan diagnosed the cause as: "complacency everywhere".

Towards the end of 2023, and into 2024, the emphasis of the Polio Programme in Pakistan shifted from broad-based action to keep all the reservoirs clear, to extremely intensive actions to interrupt endemic transmission in south Khyber Pakhtunkhwa. This was in the belief that the historical polio reservoirs would be able to sustain their poliovirus-free status while all hands went to the south Khyber Pakhtunkhwa pump.

This policy did not work. There had not been enough preventive vaccination campaigns. As the aftermath of the polio resurgence was

reviewed, it also became clear that there had been variable polio programmatic performance in Pakistan.

The high pressure to finish the job had meant that frontline teams and their supervisors were terrified of transmitting bad news up the line. The consequence of this was fake finger marking, false data returns, hiding children, chronic rates of missed households, and insufficient escalation of action to deal with clear vaccine refusals.

The new Pakistan polio team expressed its determination to remove the conditions for the propagation of fear at any level of its Polio Programme. It will also address suboptimal supportive supervision of frontline workers too. This is a further explanation of what went wrong.

Many other problems are also being addressed. Missed children levels are high in key parts of the historical polio reservoirs.

The IMB considered the Pakistan team to be very well-sighted on the breadth and depth of these challenges. It has embarked on a strong and wide-ranging programme of action.

The Pakistan Government team told the IMB that, based on the Prime Minister's directives, the Polio Programme in Pakistan has formulated a comprehensive roadmap for the next 12 months, aiming to reset for eradication, to reverse the current virological trends and target remaining poliovirus pockets to interrupt transmission by mid-2025.

This has been scoped to cover: revitalising programme oversight; management coordination and accountability; conducting targeted high-quality vaccination campaigns; essential immunisation strengthening and integrated service delivery; consistently strengthening surveillance; enhanced community engagement; and continuous political and security support.

To ensure successful implementation of the roadmap, polio eradication will be tackled as a priority national agenda and a shared priority across the political divide.

The Pakistan Prime Minister's new Focal Point has already had multiple interactions with the top leadership of all provinces and polio officials. She reports finding encouraging signs of unified commitment and a spirit of real emergency working.

AFGHANISTAN'S URGENT NEED TO BUILD AN ERADICATION STANDARD POLIO PROGRAMME

Last year and through into the first part of 2024, in Afghanistan, lack of clarity on who was in charge of the Polio Programme was confusing to those outside the country and undermined the value of effective global and regional vital technical advice, support and facilitation.

The chairman of the IMB had met the previous Afghanistan polio team last year but neither he, nor the other IMB members, had met the new Minister and National Emergency Operations Centre Director.

The new Minister, speaking at the IMB meeting in July 2024, drew attention to the impact of 40 years of war and instability on the country's infrastructure, with health suffering badly along with other sectors.

Afghanistan's health system mostly relies on financial support from donor countries, and the Minister emphasised that it does not meet the current health needs of Afghans. He said that the health context also includes preventable diseases, poor hygiene, malnourishment of mothers and children and little access to health care.

The Minister considered that this has a negative impact on the Polio Programme.

He pointed to achievements in the eradication of polio: for example, the vaccination of those children who were previously not accessible and the implementation of polio campaigns in all areas.

He expressed the strong commitment of the Islamic Emirate and the Ministry of Public Health to eradicate polio and to closely coordinate and cooperate with all organisations.

He made the following recommendations to eradicate polio in Afghanistan:

- Eradication should be a component of Afghanistan's health system, delivered through strengthening that general system; he said that people do not want to vaccinate their children because they do not see it as a priority when pregnant women die in early labour, children die of pneumonia and the doctors, the clinics and the medicines they need are not available;
- In areas where there are no health services, basic health centres or district hospitals should be established under the Polio Programme and the community should be encouraged to cooperate in the fight against polio;
- Promises must be kept to activate the polio diagnostics laboratory in a complementary and standard way;
- Other health determinants should be addressed, such as household, economic, social, cultural and individual behavioural factors;
- Acknowledging that polio is a long-term fight, it should be supported by nutrition, personal hygiene and clean drinking water;
- Routine vaccination coverage is poor and should be strengthened;
- The existing joint platform for the coordination of polio eradication between Afghanistan and Pakistan should be further strengthened;
- In the situation of mass forced deportation of refugees, the risk of polio is very high and polio preventive activities should be concentrated and increased in all the provinces of Afghanistan that lie along the "Durand Line";
- Financial assistance is decreasing and field polio staff should be recruited from within the country first, and external staff should only be hired if vacancies cannot be filled.

Thus, his two key messages were that whilst there is a strong commitment to polio eradication, there should be extensive external support and funding to strengthen not only the polio infrastructure, but also to create the breadth of health system required to meet the depth of population health needs.

The IMB concurs that the operating environment for delivering the Polio Programme in Afghanistan remains complex and greatly challenging. Many of its features remain little changed since the time of the mid-term review. In particular, the dire overall economic situation, the high level of population need for food, basic health care, education, clean water and sanitation have not significantly improved. Although the level of fighting has greatly reduced since the change of administration in August 2021, there are still some security threats and actions required.

Afghanistan is facing swelling population numbers from people deported or returning to the country as a result of policies in Pakistan regarding undocumented Afghans and refugees. There were some 1.9 million returnees in 2023, and the flow is expected to continue. People are also coming back from Iran.

Afghanistan has the second highest population of internally displaced people of any country in the world. This population surge will cause additional pressure on resources, worsen the existing humanitarian crisis (more than half the population are affected) and bring more complexity to the essential tasks of the Polio Programme at country level.

In Afghanistan, maintaining a consistently high-quality Polio Programme has always been transactional. Requests for support and funding beyond polio resources, at times, have been a condition for taking required action to stop polio in the country.

During a crucial period of 2023, vaccination was suspended, and in early 2024, there was a very damaging period when surveillance activities ceased for seven weeks. Ultimately resolution of this impasse required the intervention of WHO's Director-General, the WHO Regional Director and some of the health ministers of governments in the region.

Wild poliovirus transmission in the east of Afghanistan has been going on for a long time, giving this part of the country endemic status.

Since the mid-term review, cases of paralytic polio and wild poliovirus environmental positive samples have increased in Afghanistan.

AFGHANISTAN 2023-2024

The IMB is aware that coverage of the population with house-to-house polio vaccination campaigns was around 94% at the time of its meeting in July 2024.

The notable programmatic weakness was the failure to initiate the house-to-house modality in Kandahar City, believed to be because of the administration's concerns about covert surveillance activities. Fully accessing Kandahar to provide effective vaccination services and protect the children living there has always been a big hurdle in the Polio Programme. Until it is able to vaccinate every child, then it will be extremely difficult to get rid of polio. It is dangerous to leave the situation as it is.

It was clear that the Minister regarded the expansion of house-to-house coverage to 94% as a substantial achievement. He told the IMB that it had not been easy. Much work had been required within the whole government functioning system and, importantly, with the communities and the influential elders. What the Minister described as a "frame of mind" had been developed for the Polio Programme in his country to be able to move from site-to-site and mosque-to-mosque, to house-to-house vaccination. He emphasised that, except for one city, the entirety of Afghanistan is being reached by polio vaccination campaigns through the house-to-house modality.

The Minister explained to the IMB that he could not presently extend the south Afghanistan house-to-house polio vaccination programme to Kandahar City, but would pursue this goal. The country's leaders are living in Kandahar City and have concerns about their personal security. There are consultations ongoing which, if successful, he said, will take three to five months, even a year.

The Afghanistan Emergency Operations Centre head said that their most pressing and urgent need was for a fully operationalised laboratory in Kabul. This is required for rapid case diagnosis. Without this capability, he doubted if poliovirus transmission could be stopped in Afghanistan.

Three additional challenges for Afghanistan are now clear. The first is to comprehensively integrate the big migrant populations into the Polio Programme's key activities; the second is to gain access to groups who are refusing vaccination, especially the families of government officials who are rejecting the oral polio vaccine. The attitude of this latter group damages the prospects of ending polio in Afghanistan because the wider community models their own behaviour on their leaders; the third is to establish a female public health workforce for the Polio Programme but with extension to other areas of public health.

AFGHANISTAN 2024

30,500

children missed in each campaign in east

36,700

children missed in each campaign in south

(To 21 August; average number of children; data rounded)

VULNERABILITY OF ENDEMIC COUNTRIES TO VACCINE-DERIVED POLIO OUTBREAKS

There is a risk of a type 2 vaccine-derived poliovirus outbreak in Pakistan, if immunity against that virus type is not improved. There have been sero-surveys of all three types of poliovirus across 25 very high-risk districts. Over 11,000 samples were taken of different age groups under five years old. For the type 2 poliovirus, the seropositivity was lowest (around 30% in some places). So, unless this issue is fixed quickly, there will soon be an outbreak in Pakistan.

Pakistan has applied for inactivated polio vaccine under the Big Catch-Up. How it is applied and implemented will be crucial, and there is an opportunity for the Polio Programme to assist with the roll-out. This assistance could be through multi-antigen campaigns, providing microplanning data or in other ways.

Rather than planning to deal with outbreaks with the novel oral polio vaccine, Pakistan should take urgent practical steps to improve coverage with the first dose of inactivated polio vaccine, in very specific districts. The provincial chief secretaries have a good understanding of where the immunity gaps are.

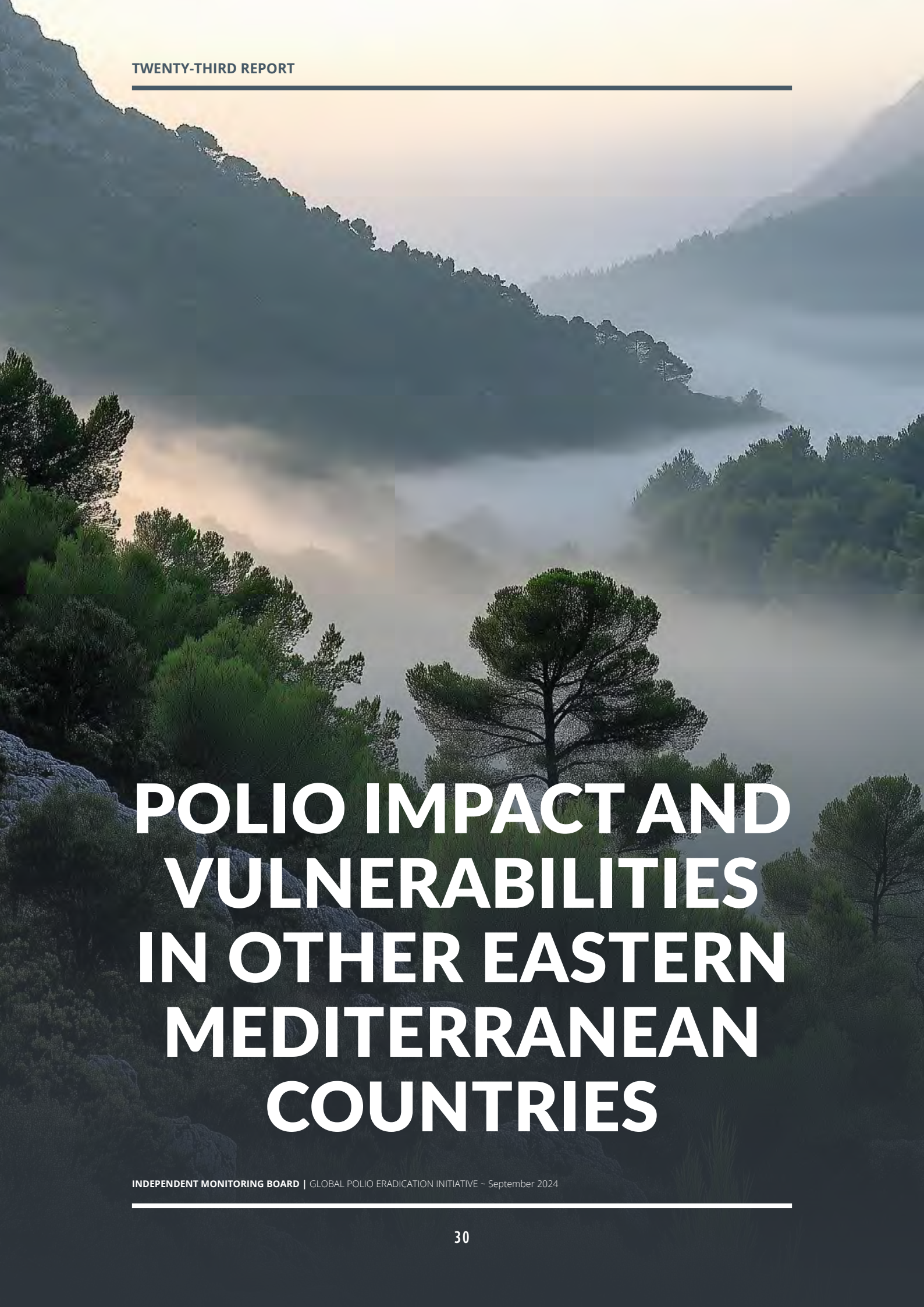
Similar thinking and action is also required in Afghanistan.

ORPHAN POLIOVIRUSES 2024

5 **IN PAKISTAN**

4 **IN AFGHANISTAN**

(To 31 August)



POLIO IMPACT AND VULNERABILITIES IN OTHER EASTERN MEDITERRANEAN COUNTRIES

POLIO IMPACT AND VULNERABILITIES IN OTHER EASTERN MEDITERRANEAN COUNTRIES

Aside from the two remaining polio-endemic countries, there are additional dimensions to how the poliovirus is behaving in other parts of the Eastern Mediterranean Region. They have an important bearing on the overall prospects of eradicating all types of poliovirus.

This broader context receives less attention because of the intense focus on Afghanistan and Pakistan and the scale and distribution of the polio outbreaks in Africa.

There are countries with active outbreaks of type 2 vaccine-derived poliovirus: Somalia, Yemen and Sudan. In addition, there are countries characterised as at high risk of such outbreaks. Egypt has had to respond to multiple importations. Iran remains at risk of polio with the resurgence of the wild poliovirus in Pakistan and Afghanistan.

As the July 2024 IMB meeting was closing, news came through that circulating type 2 vaccine-derived poliovirus had been detected in Gaza. The first confirmed case of polio in Gaza for 25 years was diagnosed in mid-August 2024. Before the current conflict, vaccine coverage there was over 95%, and in places approaching around 99%. Thus, it had a very strong primary care health system, with very high levels of coverage.

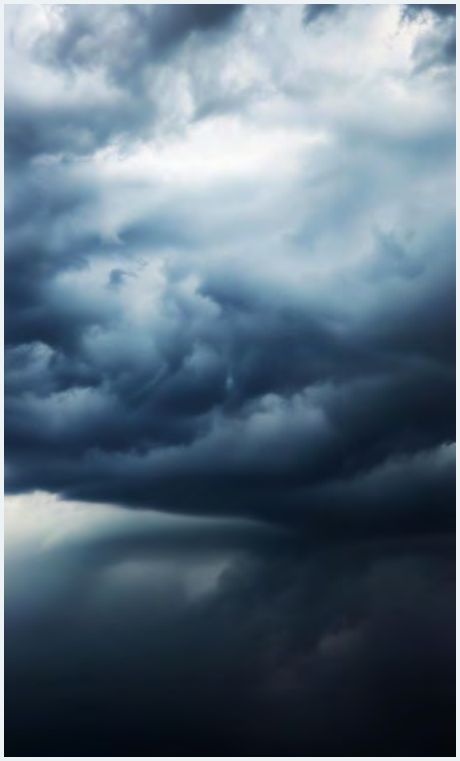
The Palestinian Ministry of Health, the United Nations Relief and Works Agency for Palestine Refugees (UNRWA), WHO,

UNICEF and many other partners started campaigns of polio vaccination using novel oral polio vaccine type 2. This initially covered almost 200,000 under 10 year old children in central Gaza at the beginning of September 2024. Further vaccination campaigns are ongoing.

Very many of the polio non-endemic countries in the Eastern Mediterranean Region demonstrate quite remarkable resilience in maintaining immunity for polio and other childhood vaccine-preventable diseases in the face of conflict, political turbulence, mass population movement and humanitarian crises.

All such countries have repeatedly stopped outbreaks of polio, either wild poliovirus or vaccine-derived polioviruses. That is because of the current capacity of the health system or its recovery capacity, or due to the legacy of a health system that worked before widespread conflict.

There is a history of health workers finding ways to be able to vaccinate in such circumstances. There is a baseline demand for vaccination in the majority of communities and so many countries are able to bounce back quite rapidly, unless there are insurmountable obstacles.



From a polio programmatic perspective, despite this backbone of resilience, there are areas where access to vaccinate children is severely compromised permanently or intermittently.

In northern Yemen, where 80% of the country's population lives, there has been no access to respond to a polio outbreak for more than two years.

With conflict in Sudan, more than half the country is inaccessible to vaccination in campaign mode. Two outbreak responses have been carried out, in 2024, in eight states where campaigns can be implemented even in the presence of conflict. There are another eight or nine states where the level of conflict is such that a vaccination campaign cannot under any circumstances be organised.

South-central Somalia is similarly compromised with intractable pockets of inaccessibility. Somalia is just recovering from an extended period with the loss of Polio Programme leadership and management. The programme was reported to have lost all motivation and direction for a couple of years and is only recovering now.

However, Somalia has a past history of repeatedly stopping both vaccine-derived, and wild, poliovirus outbreaks, including, most recently, an outbreak of type 2 vaccine-derived poliovirus.

Government commitment seems to be increasing and, in June 2024, the Prime Minister of the country launched an immunisation and polio eradication task force that he intends to chair. He also intends to conduct a stocktake on progress every three months. Clear milestones have been set to tackle the numbers of zero-dose children and areas that should sequentially stop transmission of the outbreak.

In Yemen, the outbreak response has been blocked by the authorities in the north; they have said a flat "no". Early in July 2024, the regional directors of WHO and UNICEF were due to go to Yemen and meet with the authorities in the north. A plan had been negotiated to allow improvement of primary care services, but also to allow outbreak responses for measles, diphtheria and polio in the north of the country.

However, the geopolitical situation shifted and this was no longer possible. Yet, Yemen, stopped a vaccine-derived poliovirus outbreak, including, most recently, an outbreak of type 2 vaccine-derived poliovirus. Sudan stopped such an outbreak in 2021. Yemen stopped a type 1 outbreak relatively recently.

This just emphasises how quickly windows of opportunity can open and close in circumstances where conflict, political instability and fluid governance structures can suddenly change.

National political commitment to polio eradication in general, in this region, is quite strong. Increasingly, there has been strong regional solidarity. Even countries unaffected by polio are engaging to support and solve problems across the region. They are now seeing polio as a regional challenge and not only looking inwardly at their own countries' programmes.

The Regional Ministerial Subcommittee for Polio Eradication and Outbreaks is a powerful forum to brief all the ministers of health of the region on what is happening in the Polio Programme and also to lead change. This influential group has issued some very strong statements relating not just to the endemic countries, but also to those areas (such as northern Yemen and Somalia) experiencing intractable outbreaks of paralytic polio from vaccine-derived polioviruses.

This is a reason for hope in country polio contexts that often appear hopeless.

POLIO RISK MANAGEMENT IN AFRICA

POLIO RISK MANAGEMENT IN AFRICA

Assessing the ability of polio programmatic action in Africa to stop transmission of the two types of vaccine-derived poliovirus initially focuses on how the risks identified by the IMB in its review have been managed and mitigated.

POLIO IN AFRICA, 2023 TO 2024

↓96% **TYPE 1 VACCINE-DERIVED POLIOVIRUS**

↓65% **TYPE 2 VACCINE-DERIVED POLIOVIRUS**

26 **COUNTRIES STILL AFFECTED**

(To 31 August each year)

First among these risks are the continuing vulnerabilities resulting from low levels of essential immunisation in areas affected by vaccine-derived poliovirus outbreaks and those vulnerable to them. This is not, of course, a new or surprising observation, but that does not diminish its very great importance to the Polio Programme's performance.

The most recent coverage levels for essential immunisation, globally, show an improvement and move towards pre-pandemic levels. However, when coverage data are disaggregated, the greatest gains are generally in those places that have the most resilient systems. They are not in the poorest, most complex settings.

The second, and equally major, risk to the achievement of the Polio Programme's goals is its failure to deal with outbreaks effectively. This is a subject upon which the IMB has previously made recommendations.

The quality of response is crucial. The basic standards set for this by the Polio Programme were unambiguous at the time of the IMB's mid-term review and they are still unambiguous now.

Detections must be identified early, planning and mounting the necessary response campaigns must happen quickly, and the scale, intensity and geographical scope of the response must effectively match the epidemiological situation. Faster, bigger, better is the necessary improvement that has to be made. This has been repeatedly emphasised by the IMB and multiple experts and stakeholders for many years.

The level of compliance with outbreak management standards has hardly improved. Performance, capability and commitment in-country remains very variable and, in some cases, poor.

Data show that 26 African countries had ongoing type 2 vaccine-derived poliovirus outbreaks as of August 14, 2024, with the durations ranging from 88 to 226 days. A total of 17 countries (81%) have outbreaks that have persisted for more than 120 days.

Several countries exhibited substantial delays in starting their response. The average time taken to start a response after detecting an outbreak was 45 days, with longer delays in places.

By mid-August 2024, several countries had not initiated a response despite a substantial passage of time since detection.

Closely linked is a third risk identified in the mid-term review: that prioritisation of campaigns is unbalanced, with action targeted almost exclusively towards outbreaks with little resource devoted to preventive activities in outbreak and surrounding areas.

There have been virtually no preventive vaccination campaigns, immunity levels have fallen and the risk of outbreaks, particularly in the Sahel countries, remains high.

In a fourth serious risk identified in the mid-term review, the IMB expressed grave concern about the presence of type 1 vaccine-derived poliovirus in Africa. It is a dangerous virus with the same properties as type 1 wild poliovirus. It has a strong capability to transmit and a 10 times greater capacity to paralyse than type 2 vaccine-derived poliovirus.

The IMB's worst fear was of a fast-spreading outbreak of this strain of the poliovirus in Nigeria.

Action by the Polio Programme has yielded positive results. Just six cases had been reported by late August in 2024 compared with 134 in 2023. This substantial reduction is a testament to the effectiveness of the aggressive response campaigns conducted in high-risk areas.

In Madagascar, where the outbreak of type 1 vaccine-derived poliovirus had been running continuously for five years, the Polio Programme had a major breakthrough.

It was finally able to support a highly effective vaccination response. Four polio vaccination campaigns targeted all age groups, in four hotspots. The GPEI concluded that targeting the under five-year-olds would not be enough. Older children were being infected and paralysed. Vaccination coverage targets were extended to all children under 15 years old. The quality of campaigns has improved, and there have been no further detections for six months.

The GPEI has been very active in managing the risk of type 1 vaccine-derived poliovirus. In 2024, action against type 1 wild poliovirus has seen commendable progress.

A note of caution needs to be sounded about type 1 vaccine-derived poliovirus when overall immunity levels are considered. Even with the prospect of sustaining the end of current outbreaks, the risk of the next one is still very high. The Polio Programme has not been able to do any preventive bivalent oral polio vaccination rounds anywhere in well-known high-risk zones.

Alongside the work to combat vaccine-derived poliovirus in Africa, wild poliovirus re-emergence in Africa has been successfully dealt with.

The wild poliovirus outbreaks in Malawi and Mozambique, originating from Pakistan, paralysed nine children across the two countries in a period of six months in 2022. On 14 May 2024, these outbreaks were officially judged to have been stopped.

Thus, there have been no additional cases of type 1 wild poliovirus reported in Africa in 2024. This marks a significant milestone towards ending its re-emerged transmission on the continent.

In achieving the goal of eliminating vaccine-derived poliovirus in Africa, the IMB's mid-term review pointed to the ongoing risk of Nigeria's weak health system and its failure to deliver the country's long-standing vision to develop strong, comprehensive primary care.

There are very critical and fundamental weaknesses in Nigeria's health system that no amount of polio vaccination campaigns can resolve.

Over the last 20 years, in Nigeria, the Polio Programme and its dedicated funding has been a dominant feature of the health

sector. Many other health indices have either flatlined or shown only transient improvement. The country's government has made regular policy commitments to develop a strong system of primary health care, but these have not really moved forward, leaving weak essential immunisation coverage.

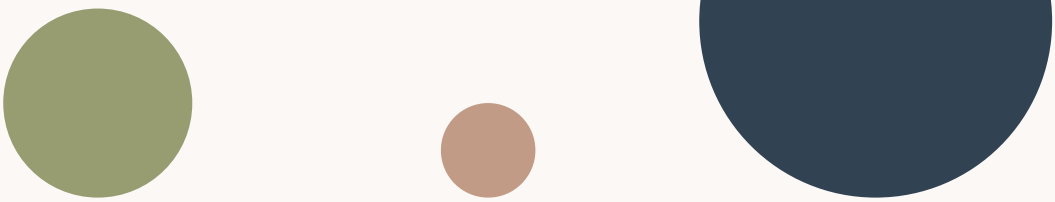
In framing a further risk in the mid-term review – which is the failure to use the right vaccine strategy – the IMB pointed to the Polio Programme's mixed record in vaccine policy-making, planning and implementation.

The IMB's mid-term review also highlighted the serious risk of collapse or major disruption in the supply of novel oral polio vaccine.

The Polio Programme is now heavily dependent on the novel oral polio vaccine for its outbreak responses and in 2023 was relying on a sole supplier. That sole supplier was Bio Farma. Problems in testing led to supply shortages at the end of 2022 and the beginning of 2023. Although these were resolved, the IMB was reassured that supplies were expected to meet all needs for the rest of 2023 and into 2024. However, the IMB continued to warn that reliance on a single supplier is hugely risky. Again, the GPEI gave reassurance that a second supplier was coming online at some point in 2024.

In reviewing the risk management of this matter, it turns out that there has been a significant disruption in the supply of the novel oral polio vaccine type 2 in late 2023 and into 2024, with no vaccine available for seven months until production restarted in April 2024. The problem was related to packaging problems rather than the vaccine itself. A different company, Biological E, was hired to assist with packaging. This shortage severely affected the ability to conduct large outbreak responses in the first part of 2024.

Mid-term review risks for vaccine-derived poliovirus affected countries



MITIGATED

- Large outbreaks VDPV1
- Fatigue

PARTIALLY MITIGATED

- Vaccine strategy failures

NOT MITIGATED

- Essential immunisation remains low
- Outbreak responses remain sub-standard
- No preventive campaigns
- Lack of primary care development
- Disruption nOPV supply

This second company producing the novel oral polio vaccine, Biological E based in India, now has prequalification. So, Bio Farma (Indonesia) and Biological E (India) are both shipping the novel vaccine in the second half of 2024. However, for both manufacturers, the "bulk," which is the vaccine itself, is produced at Biofarma. It is finished and filled in Indonesia (Biofarma) and in India (Biological E), but in the latter case using bulk shipped from Biofarma. Thus, technically, at least for now, there are not two separate suppliers. They are interlinked. So, a catastrophic failure in bulk manufacturing would again lead to a worldwide shortage of vaccine.

PROSPECTS FOR STOPPING POLIO IN AFRICA

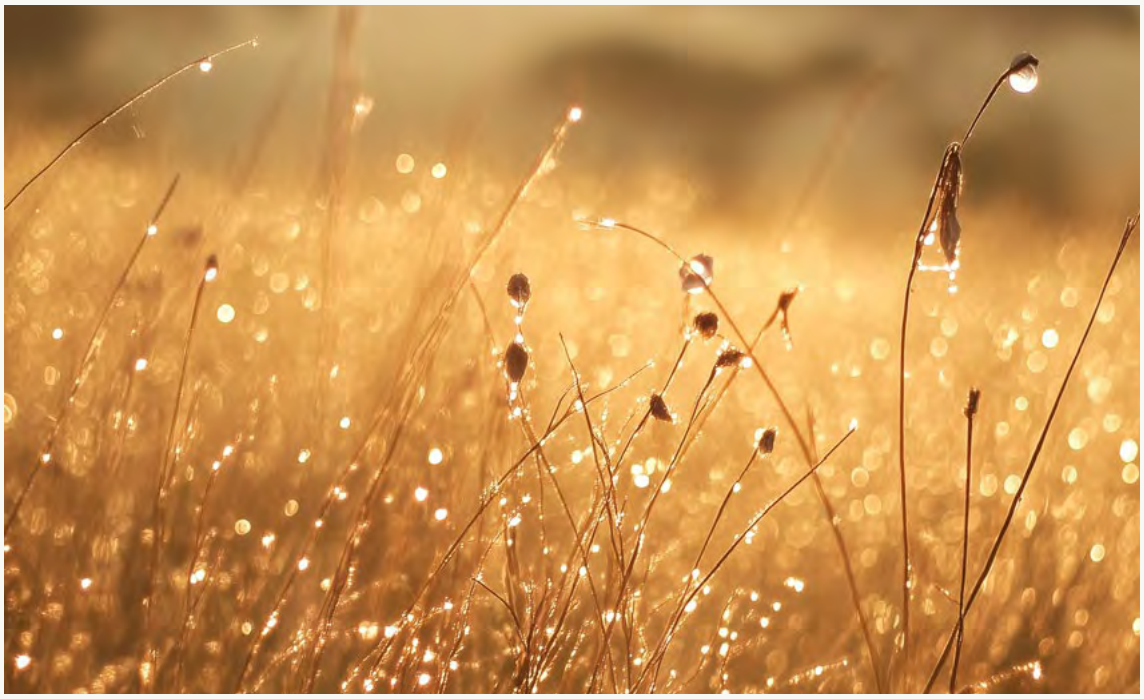
PROSPECTS FOR STOPPING POLIO IN AFRICA

"There is no doubt that the two polioviruses, wild and vaccine-derived should be viewed as having parity of menace."

IMB Report, **November 2019**

A massive and widely dispersed burden of paralytic polio affecting the WHO Africa region (and some countries beyond the continent) has turned the whole polio eradication programme on its head. The surge in polio started with the handling of the move to replace trivalent with bivalent oral polio vaccine, a key planned stage in the process of polio eradication.

There were further missteps that overwhelmed the Polio Programme and led to a massive diversion of resources.
A type 2 vaccine-derived poliovirus outbreak originating in Nigeria hit virtually the whole African continent from 2018 onwards, with cases spreading across multiple countries. By 2024, a total of 53 countries had been infected or reinfected.



In 2024, the battle against polio in Africa has seen some good progress. Yet, risks of resurgences remain high, sustaining gains is fragile, whilst making progress in some geographical areas is proving intractable.

The number of cases and positive environmental samples of type 2 vaccine-derived polio has also come down substantially in 2024 compared to 2023, but the number of affected countries has gone up. More than 20 countries in Africa have had cases of environmental detections of vaccine-derived poliovirus so far in 2024. That is a huge geographical area for polio prevention and response activities to be operating in.

The regional Polio Programme tackling the vaccine-derived poliovirus in Africa sets its sights on four epidemiological blocs:

Lake Chad Basin (Nigeria, Cameroon, Central African Republic, Chad and Niger). This epidemiological bloc is the main driver of type 2 vaccine-derived poliovirus transmission for the whole continent of Africa. This strain of poliovirus has been present in all five countries for the last two years. There are weaknesses overall with poor surveillance, inadequate immunisation responses and

postponements of programmatic activities, the last mainly being due to funding difficulties.

Central and Equatorial Africa (Angola, Republic of the Congo, Democratic Republic of the Congo, Equatorial Guinea, Gabon and Rwanda). This area has been badly affected by other serious communicable disease outbreaks, including measles, yellow fever and cholera. Various programmatic dysfunctions including delays in vaccine transport and staffing problems have meant that the quality of outbreak responses has been compromised many times. Despite operational challenges, the reduction in polio cases in this bloc has been substantial. This is largely due to extensive vaccination activity in the second half of 2023. However, sustaining this momentum in 2024 remains a critical concern, requiring improved operational strategies.

West Africa (Algeria, Benin, Burkina Faso, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Senegal, Sierra Leone and Togo). This part of Africa has been heavily hit by waves of type 2 vaccine-derived poliovirus for the last five years. Most cases originated from Nigerian strains of the poliovirus moving westward. Shortages of resources in the countries that have needed campaigns have led to delays, partial completion and cancellation.

East and southern Africa (the Horn of Africa, southern Africa, Madagascar and other island countries). Countries in these three zones have suffered outbreaks of both vaccine-derived poliovirus types 1 and 2. Successful responses have reduced the spread of type 1 vaccine-derived poliovirus. Outbreaks of type 2 vaccine-derived poliovirus have spread because of weaknesses in the response caused by failures in adequate vaccine supply and insufficient funding. This has particularly affected Kenya, Burundi, Tanzania, Zambia, Botswana, Malawi and South Sudan. New emergences were also found in Zimbabwe and Botswana. This bloc is characterised by high population movement and falling immunity levels, and it is viewed as high risk.

The two countries in Africa that are classified as "consequential geographies" by the Polio Programme are Nigeria and Democratic Republic of the Congo. They are considered to be reservoirs of the poliovirus, and "pumps" of transmission, potentially reigniting outbreaks in neighbouring countries and regions.

The concept of consequential geographies remains deeply embedded in the GPEI's strategic thinking. Nigeria is considered the most high-risk due to ongoing transmission and its record of spreading poliovirus to many other countries.

The number of cases and environmental positive samples of vaccine-derived poliovirus cases in both countries in 2024 has reduced compared to 2023, but the year has not yet ended.

The **Nigeria** delegation to the July 2024 IMB meeting set out

a range of action that they were taking to turn round Nigeria's very poor record on polio in recent years.

They reported the adoption of a "back to basics" approach, relooking at factors such as team selection, supervision, training and oversight of the work at the state level (five states in particular). Evaluative information flows have been enhanced and strengthened.

The president has launched a programme called the Nigeria Health Sector New Investment Programme. It targets primary health care, but among the small number of priorities, one is to increase essential immunisation coverage, and another is to eradicate polio. Seemingly a "vertical" Polio Programme has very little traction in the Nigeria Government.

A state Governors' Forum, is reviewing the performance of the Polio Programme in each state quarterly, alongside regular discussion of essential immunisation strengthening.

Major legislative change in Nigeria is giving the local government authorities autonomy from the states, and responsibility for their own funds. From a development perspective, many think it may be a good long-term plan, but if not managed carefully it will disrupt the planning, coordination and delivery functions of the Nigeria Polio Programme. The federal government polio leadership team has until now dealt with 36 states. If it has to deal with 774 under-capacitated local government authorities, the Polio Programme will be at major risk of discontinuity until new governance arrangements are sorted out.

The polio team is working on the resilience plan that the IMB recommended in its last report, but meantime the country programme has a polio emergency action plan that it says is active and ongoing.

The IMB had also recommended that a summit for primary health care be held. This happened in December 2023, led by the president himself, where a compact was signed with all of the 36 state governors, and with development partners, committing everybody to polio eradication. It led to substantial resources being mobilised, not only domestically but also internationally, to target action through strengthening primary health care.

Whilst the IMB appreciates the openness and commitment of the relatively new leadership of the Nigeria Polio Programme, it remains very concerned that Nigeria seems nowhere near establishing a strong trajectory towards stopping the circulation of the vaccine-derived poliovirus.

Nigeria is harbouring a complex array of adverse features, including basic problems in programmatic performance, insecurity concerns, weaknesses in surveillance and completely inadequate essential immunisation coverage.

Hotspots like the states of Zamfara, Kebbi, Kano and Kaduna in the northern and north-western regions continue to experience persistent transmission, which has been running for some three years.

These hotspots are plagued by increased insecurity, with widespread banditry and criminal activities affecting large populations. These security issues complicate the delivery of vaccination services and hinder attempts to reach vulnerable communities.

Even in fully accessible affected areas, such as Sokoto state, vaccine refusal and insufficient state-level commitment further complicate eradication action.

Despite having the necessary resources, the lack of a focused and coordinated approach at the state level undermines progress. The crowded landscape of organisations and interests involved in the polio eradication programme in Nigeria creates a sense of fragmentation. It is leading to inefficiencies and confusion regarding responsibilities.

Nigeria has taken 60% of the world's entire novel oral polio vaccine supply. Knowing this, many of those attending the IMB meeting asked: "What has Nigeria got to show for it?"

The quality of some of the Nigeria Polio Programme's outbreak responses has been so sub-optimal that there have been breakthroughs.

The recent appearance of orphan poliovirus is very damaging to the Nigeria Polio Programme's credibility.

Suboptimal management and weak accountability mechanisms, as well as other factors, are contributing to the widespread view that Nigeria is not progressing. Few are optimistic about stopping polio in Nigeria in the near future.

In addition, unless Nigeria is helped to strengthen its essential immunisation and primary care systems, any immediate gain from interrupting poliovirus transmission will be lost in a fog of unsustainability.

There has been some positive progress in **Democratic Republic of the Congo.** It is a huge country with many hard-to-reach populations. There is one area where the programme is still struggling: Tanganyika Province. Concentrated action is being taken there, aimed at ending transmission of type 1 vaccine-derived poliovirus. However, issues such as timely vaccine delivery, ensuring the presence of adequately trained team members, and the prompt payment of vaccinators are critical hurdles that need to be addressed. The country's vast and complex geography, coupled with security challenges, makes it difficult to maintain consistent and effective vaccination campaigns.

ORPHAN VIRUSES IN AFRICA, 2024

14 **IN NIGERIA**

7 **IN SIX OTHER COUNTRIES**

36% **OF NIGERIA'S VIRUSES IN ONE RECENT MONTH**

(To 31 August; orphans are type 2 vaccine-derived polioviruses; recent month July 2024)

Democratic Republic of the Congo has shown strong political commitment, especially at the provincial level. However, the country still faces major operational challenges, particularly in maintaining the infrastructure needed to support large-scale vaccination campaigns. Ensuring timely delivery of vaccines and logistic support is crucial to sustaining progress in this country.

Looking ahead, a further significant concern is the risk of another large outbreak of type 1 vaccine-derived poliovirus, which could derail current progress on this strain of poliovirus. Strengthening essential immunisation and more preventive campaigns are key to blocking this from happening.

OUTBREAKS

A major obstacle in the polio eradication campaign is the inconsistency of vaccine supply, and financial constraints. These issues have led to the cancellation of planned vaccination campaigns in several countries, resulting in ongoing transmission and new outbreaks. The inability to conduct widespread and timely vaccination rounds undermines the progress made and leaves populations vulnerable to new infections.

At this stage, it seems that polio donors are not funding an eradication programme for vaccine-derived poliovirus, but rather it is, at best, a control programme.

Timeliness of outbreak response, scope of response in an outbreak setting, and preventive vaccination rounds are the three key elements of the approach to stopping polio in Africa. They are not, however, currently well-balanced, coordinated actions.

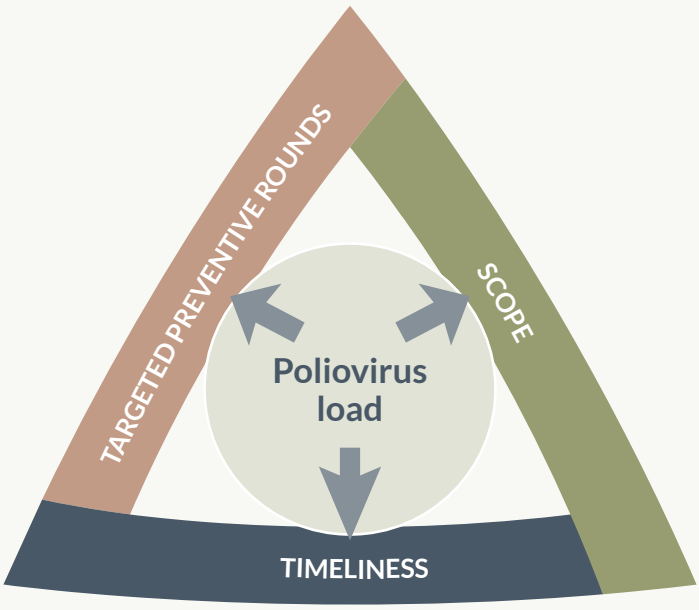
AFRICA, 2024

119.6

MILLION US $ SPENT ON OUTBREAKS

0 US$ SPENT ON PREVENTIVE CAMPAIGNS

POLIO OUTBREAKS: THE BULGING TRIANGLE



None of the countries affected have implemented preventive campaigns in contiguous areas, which is a critical gap in the strategy to contain the spread of the poliovirus.

The type 1 wild poliovirus importation in southern Africa led to the use of multiple national rounds of bivalent oral polio vaccine, and boosted immunity across the region. However, the continuing use of bivalent oral polio vaccine at suboptimal rates across the continent poses a risk of generating new type 1 vaccine-derived poliovirus outbreaks.

New methods for detection and differentiation of polioviruses exist.

Two technologies designed for direct detection are under evaluation: nanopore sequencing (NS) and intratypic differentiation (ITD). In response, national (and potentially subnational) laboratories could be established, further accelerating speciation through faster transport to laboratories, as well as more rapid laboratory work.

Both methods appear to be as specific, and possibly more sensitive, than conventional virus isolation and can be used for clinical and environmental specimens.

The IMB has been told that nanopore sequencing has been used in Pakistan, Democratic Republic of the Congo and is being introduced in Kenya, Madagascar and Ghana. At least 14 countries have been trained in its use. There may be supply chain limitations for reagents and equipment. Nanopore sequencing may be able to result in identification within 7–10 days of specimen receipt or faster.

Intratypic differentiation can result in identification within 14–34 days of specimen receipt or faster. This method is being rolled out in Nigeria and seven other countries.

Combinations of the two core technologies are also being rolled out in other countries.

The process to approve either or both of the two methods by the Global Polio Laboratory Network does not appear to be completed. There are analogous systems in widespread use (e.g. for HIV and influenza), in national and subnational laboratories. It is not clear whether supply chain lessons from other laboratory networks are being learned.

Scaling up sequencing capacity in countries appears to be a bottleneck. Although this is understandable, given the substantial requirements for electricity, internet, climate control, funding, trained personnel, data management and other inputs, these barriers have been overcome in other disease programmes ranging from Ebola (with mobile units) to COVID-19 (with public and private units) to influenza, tuberculosis, malaria and other pathogens.

INACTIVATED POLIO VACCINE

The introduction of inactivated polio vaccination is progressing too slowly. The first dose coverage is still suboptimal, globally, and this is certainly so at subnational level.

POLIO OUTBREAKS IN AFRICA, 2024

45 **DAYS ON AVERAGE TO START RESPONSE**

81% **HAVE PERSISTED MORE THAN 120 DAYS**

(Type 2 vaccine-derived poliovirus)

There are still 34 countries that have not introduced the crucial second dose yet.

As the pace of implementation increases, unless there is a clear and agreed policy, the inactivated polio vaccine will not consistently be targeted to the areas of lowest performance. There needs to be an agreement to deliver it in these zero-dose communities first.

A hexavalent vaccine, containing inactivated polio vaccine, is in the pipeline. Gavi has stated its support. Its roll-out is unlikely before the end of 2025 and wide availability may be five years away. This is not the pace needed in an emergency programme.

Some countries are now saying that they will just wait for the hexavalent vaccine, so as to avoid a separate injection. This is beginning to pose a real risk to delivering the two doses of inactivated polio vaccine.

There is a chilling recent historical parallel. Type 2 vaccine-derived poliovirus spread widely throughout Africa as countries waited for the "newer, better" novel oral polio vaccine, rather than using available supplies of monovalent oral polio vaccine. The same mistake must not be made. Inactivated polio vaccine programmes must not be paused until the hexavalent vaccine arrives. The programmatic consequences could be similarly severe.

Very deep reflection is needed on how and where coverage rates for inactivated polio vaccine can be rapidly boosted. It is not clear who is driving performance to achieve this high coverage.

GLOBAL POLICY DEVELOPMENTS

GLOBAL POLICY DEVELOPMENTS

Four major areas of global polio policy-making were in train as the IMB was having its meeting in July 2024. Two more, though not formally on the global Polio Programme agenda, were raised by delegates to the meeting as serious concerns or weaknesses warranting proper deliberation.

The first is to determine policy for the withdrawal of the bivalent oral polio vaccine when wild poliovirus circulation has been stopped. To assist with its policy-making, planning and resource-mobilisation decisions for this major shift, the GPEI had commissioned an expert review of the 2016 withdrawal of trivalent oral polio vaccine (known as the "switch"). The experts presented at the IMB meeting in July 2024.

The second is to produce a robust policy and plan capable of executing a well-coordinated, well-governed, adequately funded and effective response to move from the interruption of wild and vaccine-derived polioviruses to a world free of polio altogether. The GPEI's progress on this post-certification strategy is described in this section of the report. Much of the work so far has concentrated on how to ensure accountability and performance once the GPEI is dissolved. This is essential, but it is equally important to face up to the very variable capacity and capability of countries to achieve and sustain high enough levels of polio immunity to finish the job.

The third area of global polio policy is a new draft strategy needed to take account of the failure of Polio Eradication Strategy 2022-2026: Delivering on a Promise to meet its goals. Essentially, the GPEI has left

the content of the current strategy unchanged, except for rolling forward new deadlines for the key goals. Looking back on earlier strategies that have all missed their core eradication targets, it is evident that the implementation of broader-based goals in those strategies to strengthen essential immunisation and engage a wider range of development partners in the Polio Programme has been very weak. This is in contrast to continuing to implement polio-essential functions in a traditional manner within a vertical strategic envelope.

The fourth policy area is strongly linked to the previous point. It is the work of the GPEI to formalise a strategy to capture its approach to integrated service delivery. This addresses both the role of integration in interrupting poliovirus transmission and the building of resilience to support the journey to a polio-free world.

There were also two areas of global and systemic importance for the Polio Programme that arose during the meeting and that were not on the GPEI's work programme or agenda.

The first was a subject repeatedly raised by the IMB in the past, and highlighted in the IMB chairman's opening address to the meeting: the

need to bring management, in its widest sense, more strongly into the Polio Programme's thinking and delivery systems. This very strongly resonated with delegates to the meeting.

The second was the difficult question of clarifying and understanding the strength of donor commitment to funding the Polio Programme once wild poliovirus transmission is eliminated.

THE FAILURE OF THE POLIO VACCINE SWITCH: A CAUTIONARY TALE IN GLOBAL HEALTH

The continued use of oral polio vaccine poses an enormous challenge to the final stages of polio eradication. The Sabin strains contained in oral polio vaccine can rarely revert to a virulent form, generate and cause paralysis, just like the wild poliovirus.

In 2016, a landmark event occurred in the global fight against polio: the withdrawal of oral poliovirus vaccine type 2. This transition (the "switch"), moving from a trivalent oral polio vaccine (which contains all three serotypes of the poliovirus), to a bivalent oral polio vaccine (which contains only types 1 and 3) represented an unprecedented coordinated action in public health history, involving 155 countries and territories.

The primary objective was to eliminate the risk of reintroducing poliovirus transmission through circulating type 2 vaccine-derived poliovirus.

Unfortunately, the switch did not go as planned. The withdrawal of oral polio vaccine type 2 ultimately led to a massive increase in circulating vaccine-derived polio cases globally. The global case burden increased approximately 10-fold compared to the pre-switch era.

The spread of circulating vaccine-derived poliovirus across Africa was particularly alarming.

Nigeria played a key role in the spread of type 2 vaccine-derived poliovirus after the switch. Despite having eliminated wild poliovirus, Nigeria had failed to build resilience through strengthened immunity levels. The country struggled with the quality and scope of its outbreak responses, leading to continued transmission of vaccine-derived poliovirus. This failure to effectively contain the poliovirus contributed to its spread across the region.

Democratic Republic of the Congo was another country that faced significant challenges in stopping vaccine-derived poliovirus transmission after the switch. The scope and timing of the outbreak responses in this country were

also insufficient, leading to an increasing case burden and continued transmission.

This widespread transmission of vaccine-derived poliovirus had a devastating effect on the Polio Programme's goals and aspirations.

The comprehensive evaluation by experts uncovered several critical factors that contributed to the unsuccessful trivalent oral polio vaccine withdrawal.

Foremost among them was the inadequacy of outbreak responses in their scope, timing and quality, which led to increased transmission of type 2 vaccine-derived poliovirus.

There was also inadequate preparation, so that pre-switch levels of immunity to type 2 vaccine-derived poliovirus in key geographies were far too low.

These problems were exacerbated by a failure of leadership to promptly recognise and address the escalating problem. Furthermore, supply constraints of inactivated poliovirus vaccine and substantial immunity gaps in crucial geographies contributed to early seeding events and undetected transmission. The situation was further complicated by delays in detecting new emergences and ongoing transmission.

Another key finding was the limited progress in essential immunisation coverage and the absence of alternative strategies to enhance coverage, which left a weak foundation of type 2 polio immunity in many populations.

Looking ahead to the anticipated bivalent oral polio vaccine withdrawal, the review identifies specific prerequisites and triggers, emphasising the critical importance of ensuring vaccine availability, population immunity, robust routine immunisation programmes and effective surveillance systems.

The experts strongly emphasised the necessity of taking sufficient time to meticulously plan and execute the withdrawal, stating that another failure is not an option. They suggest that achieving the necessary triggers and prerequisites may require at least five years of concentrated work, highlighting the long-term commitment required for successful polio eradication.

A POST-CERTIFICATION STRATEGY: SECURING A POLIO-FREE WORLD

"The [polio] programme needs to set out a clear plan that runs through to post-eradication."

IMB Report, **July 2011**

The 2017 post-certification strategic thinking was mostly driven by the GPEI, in consultation with all the different parties, but many people have told the IMB that it was not a sufficiently collaborative exercise.

After global elimination of poliovirus circulation, the next stage of the polio eradication initiative is being planned by developing a post-certification strategy. This is currently in a work-in-progress phase with scenarios and options being debated within the Polio Programme.

The key requirement is for a robust governance, accountability and performance management structure.

Countries will bear the primary responsibility for sustaining polio-essential functions, but global support and oversight will be vital to ensure programmatic quality and risk mitigation.

The planning documents, so far, seem to be largely geared towards the behaviour of the poliovirus: "sunsetting" the GPEI governance model at the interruption of wild poliovirus transmission and considering what to do at the point of interruption of the vaccine-derived poliovirus.

A flawed approach will result if policy-making decisions focus only on weighing future governance and accountability arrangements against epidemiologic progress rather than also on making realistic judgements about country preparedness.

The intensity of monitoring and oversight will need to vary over time, starting high immediately post-GPEI to ensure successful cessation of bivalent oral polio vaccine and eradication of circulating types 1 and 3 vaccine-derived poliovirus, and ultimately scaling down to focus on biosecurity and containment.

The governance structure must be clearly defined, emphasising country and partner accountability. Thinking on governance models, lessons learned and prerequisites for a successful transition is still at a relatively early stage.

The experience of past transitions, such as smallpox eradication, provides valuable insights including: governance and accountability (clear structures and phased handovers are crucial); country ownership aligning with national priorities and securing sustainable financing; utilising small, agile structures with strong technical oversight; centralised versus decentralised models (weighing pros and cons of different governance structures); and sustainable transition (ensuring long-term monitoring and evaluation).

There is also a growing worry that the GPEI might end its reign prematurely, leaving countries to deal with vaccine-derived polio without a strong coordinating entity. This scenario would pose a significant risk to the gains made in polio eradication and could lead to many new outbreaks.

The TIMB has argued from its earliest meetings that a decision needs to be made on the case for a strong global entity to coordinate polio eradication activities beyond the potential sunset of the GPEI. This entity would ensure that eradication strategies are implemented effectively and that countries receive the necessary support to maintain high levels of immunity and prevent new outbreaks.

A NEW STRATEGY FOR THE PERIOD 2025–2029

"There are 10 months to go to hit the World Health Assembly's goal of stopping global polio transmission by the end of 2012. Currently the eradication programme is not on track to meet that goal."

IMB Report, **February 2012**

"With just weeks to go until the end of 2014, this global target will not be [met]."

IMB Report, **October 2014**

"In theory, the Polio Programme could interrupt wild poliovirus circulation by the end of 2017 (in line with its 'pessimistic' planning scenario) but this seems increasingly unlikely."

IMB Report, **December 2017**

The GPEI has produced a number of official strategies committing itself to polio eradication by certain deadlines.

The launch of the initiative, in 1988, fired the starting gun in the global campaign to eradicate polio, following the World Health Assembly's resolution to eliminate the disease. The target was to do this by the year 2000.

The GPEI has published strategic documents with target dates at various points over the 25 years since the initial launch target was missed, including in the time since the IMB was established.

In 2013, the GPEI published a Polio Eradication & Endgame Strategic Plan 2013–2018 which was a comprehensive strategy aiming to deliver a polio-free world. It focused on eradicating all polio disease caused by both wild poliovirus and circulating vaccine-derived poliovirus. The plan had four main objectives: to detect and interrupt all poliovirus transmission; to strengthen immunisation systems and withdraw oral polio vaccine; to contain poliovirus and certify interruption of transmission; and to plan for polio's legacy.

A Polio Endgame Strategy 2019-2023 was published in 2019. This strategy built on previous work and aimed to overcome the final hurdles to polio eradication.

It identified three risks towards achieving wild poliovirus eradication: insecurity and conflict; weak

or fragile health systems; and operational, management and resource matters.

It set three goals: eradication of all wild polioviruses and stopping all vaccine-derived outbreaks within 120 days; integration (including strengthening essential immunisation and health systems, sensitive polio surveillance through integration with broader communicable disease surveillance systems, and preparation and response for future emergencies); and certification and containment.

It introduced three "innovations": establishing a regional hub in Amman, Jordan; creating permanent rapid response teams to speed up the response to outbreaks and deal with them more effectively; expanded partnerships, including on water, sanitation and hygiene, with civil society organisations and involving a wide range of other organisations and programmes.

In 2021, a Polio Eradication Strategy 2022-2026: Delivering on a Promise was published. This strategy was developed in response to the setbacks caused by COVID-19 and aimed to overcome remaining challenges to polio eradication. It focuses on strengthening immunisation systems, enhancing outbreak response and integrating gender equality into polio eradication work. The plan also emphasises collaboration with global health initiatives and the use of innovative approaches to reach its goals.

The strategy is described in more detail in the IMB's last report and is, of course, the basis for the mid-term review carried out by the IMB.

The status of this 2022–2026 strategy was reviewed by the GPEI Strategy Committee in June 2024.

The Strategy Committee determined that a longer timeline would be required to achieve the strategy's goals, based on current epidemiology and programmatic performance.

It also concluded that, while the existing strategy remained fit for purpose, tactical adjustments to implementation and improvements in governance and accountability are needed to ensure that the GPEI "moves beyond business as usual".

On this basis, the Polio Oversight Board meeting in July 2024 discussed options. The policy decision required tied in closely to the need to agree a multi-year budget.

After considering options, the Polio Oversight Board agreed revised timelines for the two existing strategic goals.

Goal One (wild poliovirus interruption) will be met on an extended timeline for interruption by the end of 2025, with certification at the end of 2027.

Goal Two (type 2 vaccine-derived poliovirus interruption) will be met on an extended timeline for interruption by the end of 2026, with certification at the end of 2029.

The multi-year budget required for this will be $6.6 billion.

The IMB was told that this should not be regarded as a "new" strategy for polio eradication (as the content of *Polio Eradication Strategy 2022–2026: Delivering on a Promise* will remain the same), but a simple rolling over of timelines.

These strategies outline the GPEI's thinking about the approach to eradicating polio over the last decade, how it is addressing the various challenges, and its choices on setting specific goals to achieve a polio-free world within the strategies' respective time frames.

What is most striking is the extent to which the GPEI has committed to broader-based actions, involving essential immunisation, strengthening health systems, improvements in water sanitation and hygiene, and engagement of wider development partners.

Yet this wider agenda for change was never fully engaged with, nor was there a real attempt to systematically drive forward the aims of broader-based delivery.

The goals of the 2019–2023 strategy are the most inspiring in this regard, but seem to have fallen very short on implementation.

BUILDING STRONGER INTEGRATED DELIVERY SYSTEMS

"Whilst the [polio] programme leadership espouses the importance of routine immunisation, in reality polio eradication remains at heart a vertical programme."

IMB Report, **October 2014**

"The GPEI is based on 'push' [rather than]'pull'; where is the mobilisation of demand from parents?"

IMB Report, **July 2011**

Generally, siloed health campaigns have their limitations, and better coordination and harmonisation are needed for actions that depend on strengthened health systems to sustain and drive the improvement of outcomes.

Given its successes up to the early 2000s, polio could have been judged an uncommon exception where "silo is best". Yet, in the last decade, with repeated missed deadlines for meeting its principal goals, and the shift to the major burden of paralysis being with the vaccine-derived poliovirus, this is no longer a convincing viewpoint.

There is no way out of the Polio Programme's current impasse by purely doing more of the same whilst tinkering at the edges of broader-based programme design.

In practice, integration, in the polio context, is interpreted in many different ways. It is multifaceted and often described as "all things to all people".

Despite extensive discussion over the entirety of the IMB's existence, in which the Polio Programme has acknowledged the potential of integration to help deliver its goals, there has been no comprehensive, consistent and progressive programme of work on such approaches until recently.

In late July 2023, the GPEI sought to strengthen its commitment to integration, engaging with global, regional and country stakeholders and presented further work themed as: "integration to accelerate last mile eradication".

Stakeholder input noted that, despite considerable integration activities at country level, the formal GPEI structure to support and manage integration is insufficient. Those consulted cited a lack of management at global level, limited alignment on priorities, weak coordination processes, inadequate communication to partners and donors, and siloed tendencies.

Following endorsement of this work at the Polio Oversight Board meeting in October of 2023, the focus has been on integration to help the Polio Programme reach interruption of poliovirus transmission. Thus,

much activity has been based on campaign-based integration. There has also been some work moving into essential immunisation strengthening and wider integrated service delivery, particularly in the most difficult-to-reach areas where humanitarian teams are important and in the lead for securing delivery of basic public health services.

This new stream of work by the GPEI sees its focus shifting, as it gets closer and closer to interrupting poliovirus transmission. Then the push will really be to increase population immunity through more integrated working, particularly on essential immunisation.

True integration happens at the country level, where programmatic and subnational initiatives are essential. Ultimately, countries must lead in integrating polio eradication into their national immunisation strategies. The Polio Programme at global and regional levels aims to support and enhance these ground-level activities.

The immediate and long-term benefits of integration include increased vaccination coverage and the strengthening of national immunisation programmes.

Partners with deep country knowledge have a very important part to play in raising polio immunity levels.

Gavi supports 57 eligible countries with a budget of approximately $2 billion annually, focusing on vaccines and health system strengthening.

Its approach integrates not just vaccines, but also the vital "soft system" functions: coordination, planning, communication and logistics. Done well, these system measures will strengthen immunisation systems and primary health services.

Opportunities for Polio Programme collaboration include co-delivery of oral polio vaccine during Gavi-funded campaigns and leveraging Gavi's recent approval for a hepatitis B birth dose to improve oral polio vaccine zero coverage.

While polio staff have been involved in Gavi's processes, challenges remain in earmarking Gavi financing for polio high-risk areas and addressing stagnant essential immunisation coverage.

Better coordination between WHO, GPEI and Gavi, together with clear guidance from the top, and intentional integration actions, are needed.

The GPEI needs to see the opportunity of Gavi 6.0 and that organisation's new leadership, to work out jointly what actually can be done. Ultimately, there is going to have to be a conversation with the countries, too, as to where to concentrate action.

The development of better integration of polio with other programmes must be grounded in these country realities. It is essential to identify the gaps, decide priorities on which of them need to be filled and work out how best to do so. With no shared understanding of this among partners, there is no solid basis to move forward with programme design.

Integrated service-delivery models have been particularly helpful in areas where there is community hostility to the oral polio vaccine. This has been particularly so within the endemic countries. UNICEF has been a very strong force in these forms of integration that embed the polio vaccination activities within a programme of practical health benefits that are valued by families. This combines very well with UNICEF's expertise in social mobilisation and communication.

For example, in Afghanistan, interventions have included health camps, polio "pluses", as well as health, nutrition, and the water and sanitation programme.

Similarly, in Pakistan, this modality of integrated service delivery has helped to overcome refusals and boycotts in south Khyber Pakhtunkhwa, in high-risk areas in Sindh and Karachi, and in poliovirus transmission corridors like Balochistan.

This has enabled vaccination of millions of children in high-risk areas, but integrated service delivery of this kind is primarily driven by the need to increase polio coverage. It can face challenges such as short-term funding, limited geographical focus, and insufficient pace in developing water and sanitation projects.

Madagascar is often cited as a microcosm of the opportunities as well as the challenges of dealing with polio in an integrated fashion and with short-term (interrupting poliovirus circulation) and longer-term (building resilience to sustain a polio-free world) mindsets.

In Madagascar, the work of the Polio Programme led to poliovirus transmission being interrupted. Yet there has been a near collapse of the essential immunisation system outside major population centres, demonstrating the need for systemic strengthening. The country has received $100 million from Gavi and the World Bank, but average coverage for essential immunisation is in the 20% to 25% range. There is virtually no delivery of essential immunisation outside the urban areas.

A possible strategy for Madagascar can be envisioned as a tiered approach: leaving vaccination to essential immunisation teams in stable areas, using campaigns in areas with no immunisation, and collaborating with partners like Gavi and the World Bank to build infrastructure in weak immunisation areas. Such an approach would aim to raise population immunity across the country by leveraging both campaign and routine immunisation modalities.

Most recently, during World Immunization Week, Madagascar launched action to reach one million children with various vaccines. The initiative included catch-up campaigns in regional blocs, and integrating fixed and mobile approaches with other health interventions.

The Big Catch-Up initiative opens up important potential synergies for the Polio Programme. It is an ambitious global health programme, launched within the Immunization Agenda 2030 partnership, aiming to recover

lost ground in immunisation coverage that had drastically declined during the pandemic years from 2019 to 2022.

There are wider opportunities from the Big Catch-Up initiative to integrate planning for that special programme and polio programming. These can be organised *before* (identify missed children and expertise in micro planning), *during* (refer children for polio campaigns, including bivalent oral polio vaccine in multi-antigen activities, utilise polio social mobilisers), and *after* (leverage polio monitoring methodologies).

Collaboration with Gavi and other partners in the Big Catch-Up initiative aims to identify and vaccinate missed children through house-to-house campaigns and other means. It is important to establish which designs in such joint programmes of work are most effective so that they can be built upon.

Improving data quality at the subnational level is critical for better targeting of zero-dose and under-immunised children.

Increasing visibility, advanced planning, and coordinating calendars are essential activities in achieving effective integration. The ability to plan and coordinate campaigns for vaccinating against diseases like measles and yellow fever alongside polio vaccination is crucial. This strategic approach helps maintain immunity levels, especially in difficult-to-access areas.

Many countries have health programmes that are using different numbers for the same target population. The essential programme of immunisation can often have target age groups that do not match those being used by the Polio Programme. Microplans are not routinely shared, nor are monitoring systems.

Co-delivery is just one aspect of integration. There is much more room for mutual learning to develop integration across its continuum. For example, identifying best practices in one country enables it to be applied in others. There are benefits too in sharing experience on different financing approaches, and accountability mechanisms.

CIVIL SOCIETY ORGANISATIONS

Civil society organisations have a strong and underutilised part to play in integrated delivery systems. They have a very valuable role in polio surveillance and vaccination, particularly in hard-to-reach or conflict-affected areas. They will often create a bond of trust with communities where there is hostility to government or polio partner delivery programmes or where there is no official infrastructure at all.

Such organisations also innovate in integrated delivery system design. For example, the Core Group Partners Project in the Horn of Africa has developed an integrated, one-health outreach, targeting nomadic pastoralists. It has become a one-stop shop where even the country's government has bought into it and joined the outreach to give their services. Children were vaccinated and animals received veterinary extension services. On the strength of these valued and trusted services, it became possible to issue national identity cards for the nomadic pastoralists to receive future services.

The Core Group has had a broader-based initiative on polio eradication working in certain countries (e.g. India, Ethiopia, South Sudan, Nigeria, Kenya, Somalia, Uganda and Afghanistan) on polio-essential functions such as: community-based surveillance, independent campaign monitoring, cross-border initiatives, and the development of community mobilisers and volunteers.

This work has been crucial in tracking missed children, engaging families in discussions about immunisation, providing education, and combating rumours and mistaken beliefs, as well as connecting families to vaccination sites and other health services.

The Core Group's community engagement strategies have been particularly valuable. They include training local volunteers, especially in high-risk areas with marginalised and hard-to-reach populations where health systems are weak.

Its cross-border initiatives have been pivotal in areas where populations are highly mobile, and poliovirus transmission crosses national boundaries.

The Core Group Polio Project has been a vital force in the global action to eradicate polio, particularly in regions where traditional top-down approaches have floundered.

The Polio Programme could do much more to engage and formally partner with civil society organisations.

SYSTEMS THINKING, MANAGEMENT, LEARNING AND IMPROVEMENT

"People are the crucial ingredient in this Programme … Polio eradication will only succeed if its vast array of individuals are motivated, organised, well-linked and well-led. At its heart, this is a challenge of change management. [The Polio Programme pays] …little attention to [the] human factors, [with over-orientation towards] technical aspects of the change process."

IMB Report, **October, 2011**

"The polio eradication system is complex and only as strong as its weakest point."

IMB Report, **May 2013**

"[The Polio Programme] needs to be relentlessly focused on improving … quality … It needs to consistently focus beyond data that show where coverage is poor, towards a deep understanding of why it is poor. It needs to be disciplined in making and following through on plans that address these problems at their most essential level."

IMB Report, **October 2011**

The Polio Programme has its traditions and culture rooted in the world of communicable disease prevention and control. Technical and organisational knowledge and skills are vital in that field, but experience and training in management are not as common in the programme, nor even always thought to be necessary or important by its leadership.

Yet, in any other field of endeavour, an organisation that employs hundreds of thousands of people, has service transactions with hundreds of millions of people, and is underpinned with a $6 billion multi-year budget, would expect excellence in management to be essential to its success. Then, if that organisation was operating in a complex strategic, and an even more complex operational, fast-moving pressurised environment, skilled management at every level would be imperative.

The IMB has never found that the Polio Programme systematically addressed their mission with the quality of its managers and its management in mind.

Over many years, there have always been some individuals in country, regional and global polio roles who are not well matched to the jobs they have been given. The Polio Programme has been slow to recognise such situations and take remedial action.

The IMB has advocated, many times in the past, that the best and most talented managers should be stationed in the most difficult places. This is not an operating principle, as it would be in many other fields.

Appointments should only be made on merit. An appointment made because somebody is a relative of an important person or rejected because their talent will discomfort fragile leadership egos is a bad appointment.

The Polio Programme must balance an epidemiological viewpoint and a management viewpoint. Epidemiology and management perspectives are both essential for running a high-quality Polio Programme.

The style of management in the tiers above frontline delivery is crucial to the success of the Polio Programme.

If this style is exerting too much top-down pressure, too much demand for information, it can become stifling. For example, at global or regional level, seeking high levels of control and not letting decisions be taken at the provincial or district level, is disempowering for the countries' polio programmes. It is not good management. Too much centralisation leads to confused coordination, erosion of performance accountability and weakens team cohesion. Rapid and unpredictable shifts in programmatic emphasis cause rifts between agencies and groups and make it very hard to plan and act strategically.

The IMB has said many times that "all polio is local". Management at the lowest administrative level is as important as management at the top. A poorly performing union council in Pakistan, or a poorly performing ward in a local government area in Nigeria, will often be characterised by poor management.

The IMB meeting was reminded of W. Edwards Deming's (1900–1993) statement: "Every system is perfectly designed to get the results it gets." This seemingly simple statement is profound. It means that, even when suboptimal performance is consistently occurring, then it is based on a flawed system design. Poor results will carry on happening unless the system is redesigned to get a different and better result.

This is at the heart of quality improvement, or a field of management practice and research that is increasingly called "improvement science".

The Polio Programme is a system attempting to achieve the inspirational goal of eliminating a disease, poliomyelitis, that causes paralysis and death, from the face of the earth.

This whole system can be seen as comprising three broad subsystems: a system for eradicating wild poliovirus, a system for interrupting transmission of vaccine-derived poliovirus and a system of resilience to prevent the return of the poliovirus to populations and geographies where it has been eliminated.

The subsystems are, of course, closely interlinked and have many features and processes in common (e.g. surveillance methods, vaccination deployment, and engagement of communities). They also have distinct features that need different approaches to achieve improvement.

Quality improvement and systematic learning is vital to the organisational values and success of small and large endeavours in all sectors and places across the world.

As part of a rethink of its management strengths and weaknesses, the Polio Programme should adopt the philosophy and practices of quality improvement.

DONOR COMMITMENT AFTER CESSATION OF WILD POLIOVIRUS TRANSMISSION

In view of the missed deadlines at the time of the mid-term review and the GPEI rolling forward the strategy's deadlines once more, the IMB became aware of very strong rumours from many sources. They suggested that there is a prospect of stepping back from the level of financial support given to the programme if the polio epidemiology continues to be unresolved.

This was a matter that did not feature in any of the GPEI's presentations at the IMB meeting, nor was it on the agenda.

Nevertheless, the IMB felt that it would be irresponsible not to discuss it and clarify matters.

The GPEI Strategy Committee acknowledged that the

Polio Programme could not continue producing strategies that did not hit milestones, did not meet timelines, and just carried on regardless.

The current revised strategy is basically an addendum which extends timelines and milestones, but with an implicit understanding that to just keep extending and extending is definitely not acceptable.

The current operating complexities – whether fiscal, epidemiological, countries' social and economic environments, political, and areas of conflict – are raising tensions about the feasibility of achieving programmatic goals.

The Strategy Committee told the IMB that it recognised that the Polio Programme had reached a moment where it needs to deliver some transformational change to show that the project, as originally envisaged, can be made to work.

The analysis of the switch, visible to all in the presentations and discussions at the IMB meeting, is seen as salutary in what could be down the road if policy-makers, as well as strategic and operational leaders, are not at the top of their games.

It is clear that there will be a major watershed, at the end of 2025, if there are no convincing signs of progress towards the programme's goals. So, there will be intense interest in the performance of the Polio Programme over the next 12 to 18 months.

The donors have been passionate, persistent and patient in the process of eradicating polio, but that patience is clearly not infinite. There was encouragement last year, as the wild poliovirus cases were down to very few, but already the numbers are up again. This is very discouraging.

The donor commitment to eliminating type 1 wild poliovirus is unambiguous and currently unwavering. All remain fully signed up.

However, the whole eradication picture has changed as a result of the failed switch, subsequent failure to mount coordinated interventions to stop the transcontinental surge of paralytic polio in Africa, and then the ongoing difficulty of preventing and extinguishing outbreaks of vaccine-derived poliovirus.

Successful clearance of this poliovirus out of Africa is not imminent. Thus, if there is early interruption of the wild poliovirus, it is not clear what the commitment of donors will be to the second GPEI strategic goal.

Any degree of underfunding of this work and insufficient resources to prepare immunity levels for bivalent polio vaccine withdrawal would be potentially disastrous.

If high population immunity is not maintained, so that the poliovirus is locked out, thousands of cases over the next five years is not implausible and all three types of poliovirus could be involved. It seems unlikely that essential immunisation levels could be boosted quickly enough to prevent or mitigate this.

The closest possible working between the GPEI partners and donors (non-sovereign and sovereign) is essential, tied in to a "no surprises" agreement.

CONCLUSIONS

CONCLUSIONS

1. **DECLARES** *the commitment of WHO to the global eradication of poliomyelitis by the year 2000.*

2. **EMPHASISES** *that eradication efforts should be pursued in ways which strengthen the development of the Expanded Programme on Immunization as a whole, fostering its contribution, in turn, to the development of the health infrastructure and of primary health care.*

Extract from World Health Assembly resolution WHA 41.28, **May 1988.**

PARALYTIC POLIO CASES WORLDWIDE

246 **IN 2023**

192 **IN 2024**

(Data to 3 September)

Over 30 years, the Polio Programme has impressively eliminated the wild poliovirus from a huge geographical area of the world.

Under the International Health Regulations, polio is a "public health emergency of international concern." It was so designated in 2014, and still is today, while other serious health emergencies have come and gone after being successfully managed.

THE RISK OF BECOMING SPECIALISTS IN FAILURE

That polio remains a public health emergency of international concern in 2024, the longest running ever, leads people to ask: When will it end? When will the job be finished? Why has it taken so long?

These are the questions that haunt the Polio Programme.

In mid-2023, wild poliovirus seemed to be cornered in limited geographical areas of the two polio-endemic countries. The Polio Programme's mood was positive. Expectations had been rewired to foresee imminent interruption of transmission. Unfortunately, the reality was not similarly rewired.

Given the scale and complexity of what still needed to be done, the IMB was more cautious in its mid-term review in 2023. Board member, Tom Frieden said at the time: "We are closer than we have ever been, but we are not close." This was a pointer to the task facing the Polio Programme in 2024.

As the Polio Programme moved into 2024, it is clear that many of the risks identified by the IMB could not be, or were not being, properly blocked, managed or mitigated. As a result, the control of wild poliovirus in the endemic countries has slipped. The increase in numbers of cases and environmental positive samples, together with the extent of the re-population, with wild poliovirus, of the seemingly cleared historical reservoirs in Pakistan is deeply concerning. It blows out of the water, the "almost there" narrative of late 2023.

The global partnership leading the Polio Programme is remaining upbeat, understandably so, given the imperative to restore momentum. However, in discussion with IMB sources who have deep system knowledge, speaking on condition of anonymity, the shadow of pessimism is ever-present.

COUNTRY OWNERSHIP AND MANAGEMENT CULTURE

Much of the responsibility for programmatic performance rests with Pakistan and Afghanistan themselves. Their polio programmes have received unparalleled levels of funding. They have had the best international technical support. The global health world is rooting for them to succeed.

The global and regional levels of the Polio Programme, of course, make vital strategic and policy determinations that influence the shape, prioritisation and direction of the countries' programmes.

In both endemic countries, new national leadership teams had been put in place by the respective heads of state a few weeks before the IMB met with the delegations.

In Pakistan's case, this followed federal elections.

In Afghanistan, considerable polio leadership turbulence was apparent in the IMB's 2023 meeting and, after settling down, broke out again in 2024. Decisive health-system and polio-related leadership changes were then made with close alignment to the head of state.

The IMB had positive, frank and very open discussions with each delegation at its meeting in July 2024.

Both delegations stayed for the full meeting and clearly benefitted and gained insights from formal and informal contact with the entire range of programme leaders, wider partners, experts, donors and civil society organisations who attend the IMB meetings. Aside from creating a feeling of accountability, the opportunity for otherwise isolated country teams to feel part of the global polio family is one of the benefits of IMB meetings.

The journey to full country ownership of the goal of polio eradication, away from the position of responding to external demand, is not yet complete for the two remaining endemic countries. When it is, wild poliovirus will swiftly be eliminated.

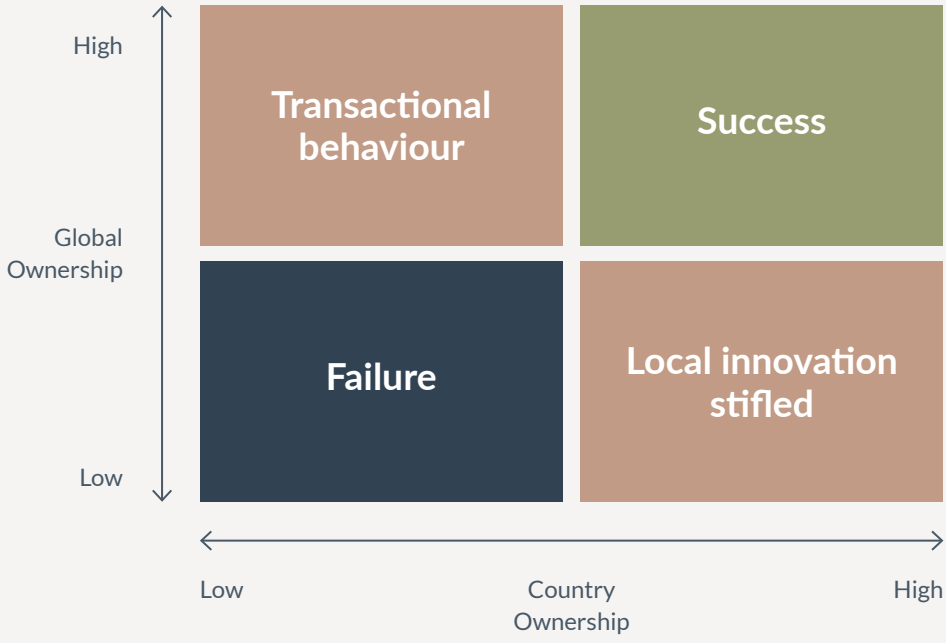
The concept of "ownership" is not always fully understood. It is not simply a commitment and determination from the top political level, nor even political alignment from national to regional to local level. Both are very necessary requirements, but not sufficient to achieve the Polio Programme's goals. For true ownership, the political will needs to be united with the undivided support of local communities, families, religious and traditional leaders, medical and nursing associations, the print and broadcast media, and modern social media voices.

All these groupings must be as one in their strong desire to live in a polio-free country, for the safety of their children, but also as a source of national pride.

It is a tough judgement to say that Pakistan does not yet "own" polio eradication, because the political determination is there and the programmatic work is carefully planned and intensively delivered. Yet the country has never been polio-free. There are dissenting factions within the country who oppose the Polio Programme. There are communities that reject the vaccine. Even small populations of children who are missed by the vaccination programme are enough to guarantee the poliovirus's survival.

Following its major leadership changes, Pakistan must move to achieve consistently high levels of programmatic performance

Ownership of polio eradication



quickly. It must ensure that immunity levels are high in all key risk areas, not just the hotspots. It must recognise, fully understand and act positively on the underlying "human factors" that are the reason for almost all successes and failures. These changes would be the clearest sign that, at last, Pakistan, as a country, fully owned polio eradication.

The ownership question in Afghanistan is a different matter, with a complex and difficult back story. When the IMB met with the delegation from Afghanistan in July 2024, it knew that the Polio Programme in that country had a long history of taking a transactional approach to its relationship with the global bodies trying to eradicate polio.

"Transactional" means that it looked outside the country to the global and regional programme to ask for something in return, before agreeing access to deliver polio-essential functions for the benefit of its population.

Polio will not be eliminated in any country that takes a transactional approach to delivering the programme's goals. There will always be something else to bargain for. This happens where the global ownership of polio eradication is higher than country ownership of the whole programme or specific parts of it.

At its meeting, the IMB discerned a potential shift in Afghanistan's position, but it is far too early to draw a firm conclusion that the country's leaders are starting to own the polio eradication challenge.

In seeking to secure country ownership, the IMB commends the strong support and direct involvement of health ministers and governments from other Eastern Mediterranean countries. They are encouraging the endemic countries to fully embrace the goal of ridding the region of polio at the earliest opportunity. The regional directors of WHO and UNICEF have been pivotal in coordinating this response.

In relating to the countries, getting the right balance between encouragement, and providing technical advice and support versus exerting pressure from the outside to improve performance is a difficult and delicate one.

In Pakistan recently, the external pressure and direct urging of the leadership to succeed, has produced a climate of fear at the frontline. One IMB source deep in the field, speaking only on condition of anonymity, said: *"I would rather drink poison than tell the Chief Secretary that we have been persistently missing children."*

This was strongly confirmed by the IMB's discussion when it was raised with the Pakistan leadership team. They saw coercion as a real problem in the Polio Programme. There

is a reluctance to report truth to power and they admitted that this culture was: *"going all the way down"*.

A management culture of fear leads to evasive and collusive behaviour such as fake finger marking, falsification of data returns, and fixing quality metrics.

Poliovirus circulation will never be stopped if this is happening. Fear, instilled in the frontline workforce and in communities, puts the poliovirus in a very comfortable position. It can carry on with its mission to paralyse and kill as many children as possible.

A cultural shift and removal of rigid hierarchies and autocratic management styles are vital if the Polio Programme in Pakistan is to progress.

Also, extreme pressure from outside the country and high public visibility of external demands can lead to inappropriately aggressive behaviour towards mothers refusing vaccination for their children. It can also heighten opportunistic awareness by factional elements within polio-affected communities who seek to gain by barring access for polio teams.

Again, the Pakistan provincial representatives confirmed this: *"The high visibility that the programme has, especially in our core reservoir areas, hurts more than benefits polio eradication and ignites demand-based refusals of a higher level; you see, these tribes realise that polio is so important to the country that it gives them unrivalled bargaining power."*

In Pakistan, team cohesion was a very significant lost function, moving from 2023 into 2024.

The IMB's discussion with the new national polio leadership and provincial chief secretaries in Pakistan was encouraging as they expressed their determination to create a "one team" culture, including ensuring that sharing bad news up the line will be turned into good practice and a springboard for everyone to seek quality improvement solutions.

In those discussions, it was also clear to the IMB how disempowering it is to them, their credibility, and longevity in their jobs if there are regular discussions going on between global leaders and their government above their heads without their knowledge and involvement.

ENDEMIC COUNTRIES: FALL, RISE AND FUTURE

The two sovereign polio-endemic countries have a combined population of almost 300 million, and share a border of almost 2,800 km which is quite porous in places.

The GPEI has repeatedly referred to Pakistan and Afghanistan as one epidemiological "bloc". The IMB has always supported this assertion. Indeed, the well-worn cliché that viruses do not recognise borders is particularly apt when considering the behaviour of the wild poliovirus in these neighbouring countries.

There are common reservoirs of infection and, with suboptimal performance by polio programmes, an expectation of predictable cross-border movements of wild poliovirus, linked closely to the knowledge of the well-established epidemiological patterns over many years.

The global and regional leadership of the Polio Programme has sought to consistently match its oversight and activities to the endemic bloc's epidemiology.

The strategies that have eradicated polio in five of WHO's six regions are still valid and include: political commitment and alignment from national to regional to local level; generating community solidarity in their embracing of positive attitudes towards the oral polio vaccine; mass house-to-house vaccination; high standards of poliovirus surveillance and reporting using the gold standard of quality acute flaccid paralysis detection and robust environmental testing; building broad-based population polio immunity; and a strong essential immunisation programme.

Afghanistan and Pakistan have been failing in more than one of these strategies for a long time, at some points in nearly all of them and, between them, are intertwined in the ignominy of being the reason that the Eastern Mediterranean Region is the last

health region of the world that is unable to declare wild poliovirus-free status.

The reality is that the strategic and operational performance of the Polio Programme has deteriorated yet again. This is deeply disturbing because it reflects a familiar cycle of "boom and bust" over the last decade.

The expectation had been that the Polio Programme in Pakistan would maintain what is often called in other circles, its "run rate". It was assumed that the level of control of the poliovirus in 2023 would be built upon, rather than drop off. Unfortunately, Pakistan's run rate did fall and the country now has polio in more places in 2024 than it had at the same point in 2023.

The ultimate goal is to have incredibly high immunisation coverage in both countries at the same time in the low season so that poliovirus strains that have been transmitting do not have anywhere to go, and die out. By the time a poliovirus surfaces, it is probably too late because it will have circulated to somewhere else.

The current strategy of focusing only on high-risk areas, such as western Pakistan and eastern Afghanistan, is insufficient. The wild poliovirus is simply being chased around, leading to recurrent outbreaks in areas once considered cleared. Highly polio-experienced attendees at the IMB meeting privately derided this as the "Whack-a-Mole" approach.

It does completely neglect broader immunity-building, leaving populations of unvaccinated children susceptible to the poliovirus.

Even within accessible areas, the Polio Programme continues persistently to miss a large number of children, in enough geographies, to give the wild poliovirus carte blanche to continue to circulate.

The new official government polio team in Pakistan and the chief secretaries of the provinces understand the fundamental nature of the reset required.

The new Health Minister and National Emergency Operations Centre Director in Afghanistan understand that the Polio

Programme in the east of the country, which is now fully accessible, still has a long way to go to lose that area's endemic status. They are also aware of the serious risk that they carry by failing to run house-to-house campaigns in Kandahar City.

It has always been difficult to ensure polio immunity among children in migrant and highly mobile populations. There has been long-standing cooperation between Afghanistan and Pakistan to coordinate their campaigns and vaccinate at border crossings. However, recent policies have made raising immunity levels in these populations much more difficult. The numbers in these high-risk groups have been greatly increased by the waves of people who have been identified in Pakistan for repatriation to Afghanistan. The sheer scale of returnees of all age groups seems to have been seriously underestimated.

It will be a formidable challenge for the two neighbouring countries' polio programmes to maintain high polio immunity in these groups, especially among the youngest children. A further, extremely challenging, situation is internal migration of people from Afghanistan within Pakistan. New strategies, including sensitive outreach to the affected communities and engagement of vaccinators from the communities themselves will be needed for success.

More generally, with action to achieve sufficient immunity, it is not clear whether the Polio Programme is creating optimum levels, particularly among the youngest children. They are the ones often kept in the house away from vaccinators or hidden from sight in the mobile populations. If the youngest children are regularly missed in two countries with high birth rates (Afghanistan: 3,000 births per day; Pakistan: 15,000 births per day), large immunity gaps are inevitable.

CAMPAIGN DESIGN: GPEI AND LOCAL BALANCE

In Afghanistan, the frequency of vaccination rounds is not giving enough time in between to plan actions that will strengthen the next campaigns.

For example, it is difficult to find time to do the social mobilisation and improve microplanning, so that the polio team in Afghanistan can update the target population numbers between the rounds. There seem to be financial limitations on how many teams can be deployed and how much training can be funded.

Getting the right campaign frequency and intensity is also important in Pakistan. On the one hand, the GPEI's strategy is for very frequent, high intensity, high-quality campaigns. On the other hand, in that country also, it does not give the teams on the frontline time to address problems in between the rounds and continually improve quality.

It is understandable that the GPEI wishes to drive the programme very hard at this stage of the eradication programme, but it must remember that quality improvement is also a key to success.

GAINING SUPPORT AND TRUST OF COMMUNITIES

Since it began its work 12 years ago, the IMB has continued to urge the Polio Programme to consider the feelings of communities and to recognise how easily negativity and hostility to the oral polio vaccine can develop.

Engaging communities and understanding their perspectives is vital to the task of interrupting poliovirus transmission. There is considerable diversity of such communities in their social and economic circumstances, the level of service infrastructure, the people that they listen to and the factors that influence them.

Listening sympathetically and respectfully to the concerns of communities should be a fundamental value of the Polio Programme. Fostering a climate where communities want the vaccine, fear the risks of polio to their children and value the protective effect of regular vaccination goes way beyond messaging. It is about proper strategic planning of communication, and building trust at a very local and personal level. This takes time, skill and constant listening to local voices.

Deeper context-specific factors must also be well understood and acted upon. For example, currently, some Afghans living in Pakistan are not opening their doors because they do not want to be part of the repatriation programme. Allowing pockets of low immunity like this to be sustained, or even grow, is a lifeline for the poliovirus.

There is a need for a fundamental look at the communication

strategy in Afghanistan. The resumption of house-to-house campaigns will raise doubts in the minds of some families. The Taliban authorities have said repeatedly in the past that house-to-house cannot be done. Communities will think, "If it was not safely permitted before why is it safe and permissible now?" There will be some misunderstanding and miscommunication about what is allowable even in house-to-house activity. This could damage the programme.

Many refusals in Afghanistan are among the families of government workers. This inexplicable behaviour sends a deeply confusing message to communities. Their government supports the Polio Programme, but they do not. Why not?

Campaign frequency and intensity is also relevant to the attitudes and behaviour of families and communities. There can be difficulty in keeping the communities engaged when campaigning is very intensive.

With high frequency, intensive vaccination campaigns, multiple knocks on the door can turn people against the programme. They do not know why repeated vaccination is necessary. They become suspicious of motives. They can become very negative and may hide their children or demand false finger marking. If the vaccinator is from the community, and is maybe even their neighbour, there is pressure to collude in deception.

Vaccinators need support and training to equip them with the skills to handle such situations.

RECOGNISING AND VALUING THE ROLE OF WOMEN AS A MAINSTAY OF THE PUBLIC HEALTH WORKFORCE

Appointing many more female vaccinators in Afghanistan, and in south Khyber Pakhtunkhwa and other socially and religiously conservative areas of Pakistan, would be transformational to the success of the Polio Programme. Without women to go into the houses and find the young children, particularly those missed by male vaccinators, there will be no workable solution to the problem of ending poliovirus transmission for good.

Several delegates to the IMB meeting spoke of seeing, in villages, a long line of mothers waiting with their children to be seen by a female vaccinator. In contrast, no one was standing in line for the male vaccinator who was there with nothing to do.

Maximising the recruitment of female frontline workers

remains imperative in both endemic countries. While some progress has been made in the east of Afghanistan, targets can, and should be, much more ambitious and closely monitored.

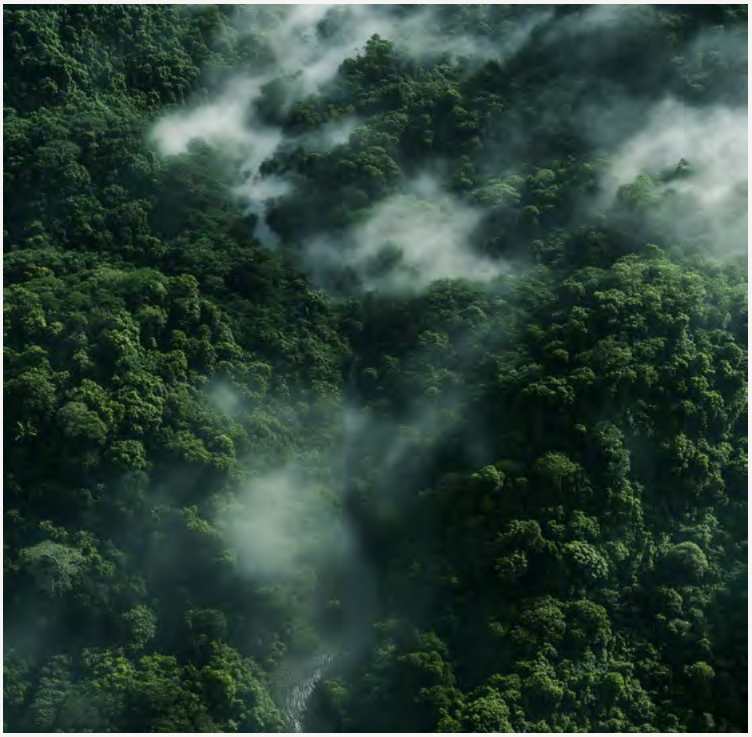
Similarly, the same aims should apply to any countries of the world where women are denied roles in the public health workforce.

The countries where polio activities are most intensive, including parts of those in Africa, contain some of the most conservative gender norms. The gender perspective applies to the design of polio campaigns and it requires systematic, reliable sex-disaggregated data, particularly for missed children and campaign coverage. Asking for such data often provokes a wall of defensiveness.

Gender should be a mandatory and core part of the discussions on planning and delivery of the Polio Programme. The majority of decisions in Polio Programme planning and operations are taken by men.

Women in supervisor roles could enhance the most critical layer of the programme: performance and oversight. This would also help meet the wider need for more women in senior programme management roles.

Recruiting more women would be an important legacy for the Polio Programme. It would be a gift to the future to leave a cadre of skilled, trained and experienced female public health workers to provide services beyond simply polio-related ones for their local communities.



AFRICA: A DELUGE OF POLIO OUTBREAKS

The scale of the polio problem in Africa is unprecedented in modern eradication history. It has plunged the polio eradication initiative into doubt and uncertainty about its core purpose and the achievability of its targets and timescales. It is consuming precious resources at ferocious rates.

In its mid-term review, the IMB pointed to a number of past decisions that can, in retrospect, be seen as interlinked and causative of the huge surge in vaccine-derived polio.

These include the timing of, and preparation for, the implementation in 2016 of the decision to remove the trivalent oral polio vaccination (the switch), the progression of polio transition-driven staff reductions without taking into account the epidemiological situation, and how the novel oral polio vaccine was secured and deployed.

All of these factors have contributed to the heavy burden of vaccine-derived paralytic polio and the scale and geographical distribution of outbreaks.

The headline statistics alone are quite chilling:

- The global type 2 vaccine-derived poliovirus case burden increased approximately 10-fold compared to the pre-switch era;
- 53 countries were infected or reinfected with type 2 vaccine-derived poliovirus after the switch;
- More than 3,300 children were paralysed by type 2 vaccine-derived poliovirus across 43 countries;
- The GPEI has spent over $1.8 billion on its outbreak response;
- Between January 2010 and April 2016 (pre-switch), a total of 318 type 2 vaccine-derived poliovirus cases were detected globally in 15 countries;
- In year five post-switch, a peak of over 1,000 polio cases was observed across 24 countries.

These statistics paint a sobering picture of the failure of the trivalent oral polio vaccine withdrawal and the immense challenges the GPEI now faces in securing a polio-free future. However, they also serve as a powerful motivator for renewed focus and improved strategies in the ongoing fight against polio.

There have been improvements in the levels of types 1 and 2 vaccine-derived poliovirus during 2024 compared to the previous year, though more countries in Africa are affected by outbreaks of the latter.

Weaknesses in levels of immunity in almost all areas remain. Outbreak response is essentially supplementary immunisation. It assumes a certain baseline of immunity. If that baseline level of immunity is not there, then it really does add complexity to the response.

Almost all participants at the IMB meeting, one way or another, argued for rapid response, careful geographical sizing of campaigns, more targeted preventive action, and adapting strategies based on surveillance data. Such an approach must underpin the pragmatic steps necessary to address the complexities of the task in different country contexts across the continent of Africa.

The timeliness of response connects with the urgent need to stop the "pumps" of poliovirus transmission. Otherwise, there will simply be an oscillation where immunity levels rise, and fall, leading to recurring outbreaks, as has so often been the pattern in the past.

In March 2022, in southern Africa, there was a detection of type 1 wild poliovirus in an acute flaccid paralysis case in Mozambique. By the end of May that year, Mozambique, despite being one of the poorest countries in the world, had already conducted two rounds of vaccination with bivalent oral polio vaccine. This very rapid response, combined with its broad scope, effectively contained the problem and prevented further spread. It was a lesson in the importance of timeliness, right-sizing, and preventive rounds in achieving polio eradication. It was a lesson in the benefits of an emergency mindset.

Another recent example in the Africa region, is the reaction to the emergence of one polio case due to wild poliovirus in Malawi. There was an immediate, aggressive and wide-ranging response. The actions taken with this one case were in marked contrast to the weak response made to hundreds of vaccine-derived cases in Nigeria over a long period of time.

The approach to the wild poliovirus with its sense of immediacy and full engagement is so different to the way that outbreaks of vaccine-derived poliovirus are handled.

The definition of a new vaccine-derived poliovirus outbreak is usually by country, while, with wild poliovirus detections, country borders are of secondary importance. The Polio Programme looks at a wild poliovirus detection as belonging to an epidemiological bloc, and plans the geographical scale of the response accordingly.

The polio team tackling the wild poliovirus thinks about this bloc in the round: how to address the surveillance gaps, the immunity gaps, the vaccination strategy, the communication and social mobilisation. In other words, it seeks to ensure a holistic response that stops the wild poliovirus getting out of the hotspot where it emerged.

In comparing the Polio Programme's reaction to the wild and vaccine-derived polioviruses, there is a two-tier attitude and a two-tier response.

The vaccine-derived poliovirus outbreak should also be addressed by geography, not country. The response should also be matched to the epidemiological bloc. It should also be treated as an emergency. It should be as if the threat is a wild poliovirus. This is currently the opposite of what happens.

Preventive rounds should be integral to outbreak management. They are not and this is another fundamental programmatic weakness.

So, the polio situation in Africa demands harmonisation of vaccination in relation to timeliness, scope, and, above all, targeted preventive rounds in order to reach zero.

Slow and delayed response in an outbreak, the limited geographical scope of that response, and insufficient preventive rounds are a critically intertwined causal triad fuelling the persistence of vaccine-derived poliovirus outbreaks. Failure in one aspect of this leads to failure in the others, and enables the poliovirus to burst out of the "bulging triangle" that is trapping it and trying to close it down.

Vaccine supply is often seen as a behind-the-scenes aspect of the Polio Programme, but it must be a visible and integral part of the strategic planning required.

Vaccine supply problems, too, are part of the causation web of the burden of polio disease in Africa. There have been problems with availability of the novel oral polio vaccine since it was introduced.

This led to campaigns being delayed and cancelled. Poorly sized, managed and delivered campaigns wasted vaccine. The IMB was told that supply problems would not constrain the Polio Programme during 2024, but there were supply difficulties in 2024, even after the passage of five years since its introduction. There was continued reliance on a single supplier.

As a result, the position of the regional teams was made very difficult. They are responsible for coordination, for planning the best way to make interventions, and for choosing where to take action. They then work with the countries to deliver the necessary vaccination rounds.

It is clear that, in 2024, with pressure from the failure to meet the GPEI's strategic goals, there needed to be intensive campaign activity if the vaccine-

derived polioviruses were to be brought under control.

Tough decisions were taken by the regional polio team because of budgetary constraints. These decisions of prioritising some geographies over others were very painful in humanitarian terms, because it meant leaving outbreaks to run, knowing that children would be paralysed. The right response could not be made because of limited financial resources, but also a shortage of vaccines. This was a bitter pill for dedicated regional and frontline staff to swallow.

Clearly, managing a continent-wide outbreak of type 2 vaccine-derived poliovirus, without enough vaccine to mount campaigns of sufficient size and intensity and without the capacity to undertake preventive work in contiguous areas is a dreadful situation.

The IMB has learned that the problems of the programme were compounded by a "budgetary ceiling" approval rule whereby money was available but could not be spent.

The GPEI has specific budget ceilings that are approved for each area of work over a period of time. Every three or four months the GPEI Strategy Committee has to meet to review and increase the ceiling of the budget. So this means that, if the polio teams in Africa have campaigns planned to take place over the several months in different countries, and they are moving above the ceiling, they are forced to delay or restructure some campaigns.

What happens is that the government will not commit unless the GPEI has given approval. This is despite money being there.

This is a technical problem. The IMB believes it should not be there.

In an emergency, polio teams should have maximum flexibility to use available funds.

Notwithstanding having enough vaccine, the strategy in dealing with these outbreaks is affected by the position taken by some governments. Many countries turned against the existing monovalent oral polio vaccine, preferring to wait for sufficient supplies of the novel vaccine.

Now that Africa has been certified as wild poliovirus-free, the vaccine-derived poliovirus is not seen as a comparable threat. Governments in Africa have to deal with the competing priorities of other epidemic diseases like measles, diphtheria, cholera, yellow fever, with other types of health emergencies and now with Mpox. They do so with starkly inadequate resources.

Treating polio as an emergency is particularly problematic at levels of government below the national tier. Even when national government buys into global polio priorities and recommended action, at provincial and community levels attitudes and perspectives may be very different. Countries struggle with prioritisation. Global health architecture struggles with prioritisation.

Ironically, the GPEI, which for wild poliovirus has exerted an iron-clad "command and control" influence over country polio programmes' policy, has failed to "call the shots" on vaccine strategy in Africa.

The IMB learned that the GPEI was having to resort to advocacy because of the failure urgently to deploy the monovalent outbreak vaccine rather than wait for the novel vaccine. This undoubtedly worsened the problem of polio in Africa.

Polio eradication in Africa is now a hugely complex programme because of: the breadth of partners involved; the intricacies of governance; the policy and quality of programmatic response; the priorities of individual governments and subnational jurisdictions; the need to ration resources; and uncertainty about financial flows. Programmatic bureaucracy is often a barrier too. It hampers the speed and complexity of decision-making. It slows and complicates funding flows. Bureaucracy is the poliovirus's friend.

It is essential that the leadership of the Polio Programme at global, regional and country levels collectively steps back and asks, "What is our strategic plan to stop transmission in Africa within a reasonable time frame of two to three years?" There is a scarcity of resources globally, and polio-specific donors are becoming tired of extensions and lack of progress. Immediate progress is necessary, but it must be practical, realistic and goal-oriented.

NIGERIA: A PROGRAMME THAT HAS LOST ITS WAY

The polio context in Africa is complex, multi-dimensional and affects different countries in different ways. Many of these countries carry polio risks for their own populations and for those of their neighbours. The capacity and capability of in-country polio programmes varies greatly, as does the level of political commitment.

Among all the African countries, Nigeria stands out. It was central in ridding the continent of wild poliovirus. Yet, its lack of follow-through to build resilience after this achievement has led to high levels of paralytic polio in Nigeria and many other African countries.

Nigeria has not interrupted vaccine-derived poliovirus transmission since the Switch in 2016 and before. If population immunity was good enough, this would not be happening.

Nigeria has fallen a long way. It may have reached its nadir in late August 2024 when three orphan viruses were detected that have been circulating for two or three years.

Nigeria has used 60% of the world's supply of novel oral polio vaccine. Yet polio cases continue to occur and surveillance systems are untrustworthy.

After considering the many observations that were made in the extensive discussions at its July 2024 meeting, together with insights provided by others with deep system knowledge of Africa, the IMB has concluded that the Nigeria Polio Programme is dysfunctional. It is also not taking the polio threat to its own child population and to children of other African countries seriously enough.

At the heart of this polio debacle in Nigeria is poor management, a serious failure of corporate memory and learning, not paying attention to the importance of getting the right people in mission-critical posts, an obsession with new initiatives while tried and trusted "shoe leather" methods of polio surveillance and control are less valued.

The polio partners are not blameless in this. The IMB sees no evidence that they are sharing in tackling the true fundamentals of this situation.

There are multiple players in Nigeria. Establishing what specific roles each has, where they fit into strategic and operational delivery, who is coordinating all their diverse activities is baffling.

If Florence Nightingale walked into Nigeria holding her lamp, she would not be able to find who was in charge of eradicating polio in this big country. The mechanisms of accountability are vague and too informal.

The political commitment from the top is unambiguous but the political alignment from federal, to state, to local government level is not strong enough.

When wild poliovirus was eliminated from Nigeria, it had this political alignment and complete political ownership at all levels. This needs to be restored and the energy and confidence that flowed from it recreated.

Nigeria also used to have a well connected polio system at the technical level. The National Emergency Operations Centre was in daily contact with others across the country. All of the action was well coordinated, with facilitation from federal level as and when necessary. There was a laser focus on poor performance and interventions to correct it. The technical axis of the Polio Programme in Nigeria needs to consult the circuit layout of the previous programme and rewire the present one.

In the previous Nigeria Polio Programme, insecurity was never used as an excuse for programmatic failure. Ways were found to achieve access, including the creation of a network of confidential informants and the use of skilled civil society organisations. Traditional and religious leaders played a crucial role in communities. Today the IMB is told that insecurity is the biggest problem. The old Nigeria Polio Programme did not have a "too difficult" box. The new one

apparently does. Where is the learning from past successes? Where is the discomfort with current failures?

The Nigeria Polio Programme is at rock bottom. It needs to start climbing, and quickly. In so doing, it will have the support of the IMB and all other members of the global polio family in reviving its can-do programmatic ethos.

LESSONS OF THE "SWITCH" AS SIMILAR VACCINE WITHDRAWAL DECISIONS LOOM

The so-called switch has been the subject of an excellent expert review commissioned by the GPEI. The IMB commends the GPEI's courage and transparency in doing so. The IMB meeting heard from the experts who did the review about their work and had a full discussion of their findings and recommendations.

Participants at the meeting were profoundly disturbed and shocked as the switch story was forensically laid out before them. Away from the meeting room, in informal discussions, delegates were heard using words like "disaster", "car crash", "omnishambles", and "never again".

The failure of the switch has provided valuable lessons for the global health community. It has highlighted the importance of thorough planning, effective outbreak response and the need for continuous

evaluation and adaptation. The experience has also emphasised the essential role of strong leadership and coordination to address emerging challenges in global health initiatives.

Complex failure never has a single cause. It always has multiple causes. To avoid history repeating itself, the root causes of the failed switch need to be comprehensively understood. This is because other important vaccine switches need to be made and the systemic issues will be much the same.

It was not the job of the expert report of the switch to investigate the policy-making, governance and organisational culture factors causing the failure, but these deeper contributory factors were without doubt a powerful element in what went wrong.

It is vital that the Polio Programme learns the lessons from these deeper forces that shaped and failed to shape decisions at the time.

Commentaries on the switch debacle often begin by stating: "A World Health Assembly decision…"

Yet the World Health Assembly was provided with what was essentially a "done deal" on the proposal to switch from using trivalent to bivalent oral polio vaccine and the timing of it.

The Assembly is not the best forum for technical debate about a risk-laden policy decision.

Members of the Assembly's policy-making committee would have assumed that the issue had been deeply considered before it came to them. Therefore, it would not have been customary or appropriate to challenge or stress-test a major policy recommendation, especially since it seemed to offer a clear, simple and logical path to early completion of polio eradication, a key goal of the World Health Assembly dating back to the late 1980s.

Even SAGE (The Strategic Advisory Group of Experts on Immunisation) may not have been made aware of the full range of concerns. In future, the process of gathering broader-based, unbiased technical input needs to change so as to avoid major policy decisions being based on flawed or over-optimistic assessments.

Those who were at key policy meetings at the time of decisions about the switch concede that a strong current of optimism was running through all the discussions. Removing the attenuated type 2 poliovirus was perceived as a foundational step towards the eradication goal. The leadership was itching to make rapid progress on the eradication journey.

Optimism has been an important part of driving forward the Polio Programme to its current position. It is necessary to motivate a tired workforce, often working in difficult and dangerous conditions. It is vital to encourage ongoing financial donations that keep the programme in business. Yet, misplaced or misguided optimism can slide into "optimism bias" that, in turn, leads to poor decision-making, errors of judgement, and group-think.

There were elements of this in the process for agreeing the switch.

Next time, policy-makers must be aware of the risk of optimism bias and the importance of being mindful of the words of Italian philosopher Antonio Gramsci (1891–1937) on the need to balance "the pessimism of the intellect with the optimism of the will.".

Another area that has been under-discussed in considering the causation of the switch failure is the lack of decisive decision-making by the group controlling the supply of monovalent oral polio vaccine type 2 to respond to the vaccine-derived detections in the early post-switch phase. They generally did not go with big enough interventions, presumably because of concern about seeding further outbreaks. In retrospect, this is another area where there was insufficient broad-based policy-making and not enough reflection and healthy external challenge.

Nor were there valid quantifiable targets set for global immunity levels (administrative coverage data are not reliable for this purpose). Both the pre-switch decisions and the post-switch activities and policies provide lessons. These will come into play again in judgements on certifying the world polio-free and for the forthcoming oral polio vaccine to inactivated polio vaccine switch. These considerations need to be taken very seriously.

A key lesson is to listen to experts and others who sit outside the "polio bubble", even if their views do not fit the GPEI's narrative. There should be no reluctance to change course if strong and convincing arguments are made.

Better surveillance will be needed in places where vaccine-derived polioviruses may emerge or be hard to detect. Extensive use of all currently available tools (e.g. community-based surveillance, bag-mediated filtration, healthy children samples) will improve confidence that transmission (endemic or not) is stopped. Better diagnostic methods are also needed.

Then, rigorous attention to the timeliness of outbreak detection and response, addressing reasons for delay and strengthening enablers of progress will be essential.

Ultimately, the experience of the switch is a test of the Polio Programme's ability to learn.

THE CONSEQUENTIAL GEOGRAPHIES POLICY AND PREVENTIVE CAMPAIGNS

Some within the GPEI leadership told the IMB that prevention is a "luxury" because the Polio Programme does not have enough money to do preventive as well as outbreak responses, so it prioritises outbreak responses. Polio outbreaks on this scale in Africa were never expected and that is why so much unplanned use of resources has been needed.

The Polio Programme's focus has been on stopping the outbreaks in the consequential geography countries but doing much less to raise the immunity levels in the surrounding countries. The programme is short of resources to do both, but outbreak response without rigorous preventive activities will not stop poliovirus transmission.

Consequential geographies cannot be the only thing that matters. To achieve eradication, all geographies are consequential. This is a global programme. So, even though some geographies are more important and are the weaker links with respect to stopping transmission, the entire world has to get to the same place at the same time to be successful. Or, at the very least, everywhere has to stop transmission at the same time.

The IMB firmly believes that prevention is essential for an eradication programme. Every case is a failure. A programme design dominated by outbreak response creates a vulnerability for the next round of outbreaks. Resources have to be found to build the capacity for higher coverage.

Focusing on the areas where there are immediate problems, believing that, once the poliovirus is stopped

there, a clean-up job can be done everywhere else does not work.

For example, in Pakistan last year, when attention was tightly focused in south Khyber Pakhtunkhwa and responding aggressively to detections there, it was assumed that the other reservoirs, having been apparently cleared, would self-sustain resilience. They did not.

During late 2023 and the first part of 2024, it was difficult to persuade the leaders of the Polio Programme in Pakistan and the GPEI to intervene with anticipatory vaccination campaigns. There are practical examples of how misguided such a strategy actually is.

The outbreak-only response a few weeks after the IMB's mid-term review is illustrative of this. In September 2023, there was a detection in Pishin. This is a district in Balochistan with 67 union councils. It is located 50 km away from the provincial capital – Quetta.

Looking at the pattern of movement of people, it was pretty obvious that the same population would have also entered Karachi. However, there was no interlinked preventive response in Karachi, only an outbreak response in Pishin. Shortly after this, there were seven poliovirus detections in Karachi, something of an explosive outbreak.

This is typical of the Polio Programme's modus operandi: risk response, instead of risk anticipation. Whilst the poliovirus found in Pishin was not genetically linked to the subsequent Karachi polioviruses, both were undoubtedly carried in the same population from Jalalabad flowing across the border.

At that point, in the Polio Programme's operating model in Pakistan, it would have been difficult to win the argument in favour of having anticipatory campaigns in high-risk parts of Karachi. It would not have been considered necessary from a disease epidemiology point of view. On the other hand, and frustratingly for some in the polio teams, known population movements are quite reliable predictors of where the poliovirus will appear next.

There was similar developments in advocacy for a preventive campaign in Shikarpur, a city in northern Sindh province. Such a proposal was denied

and then the next month there was an outbreak response required there too.

In Africa, in 2024, all polio vaccination campaigns have been outbreak responses with no companion preventive campaigns in high-risk geographies.

INTEGRATION: BEYOND CALENDARS

Integrated methods of Polio Programme delivery are a key shift that has been advocated by the IMB and demanded by informed observers, particularly sovereign donors and wider partners, for more than a decade. It is only in the last few years that the Polio Programme has begun to see integration as "mission-critical".

Deeply ingrained within the psyche of the Polio Programme is the assumption that supplementary immunisation activities will do everything.

Delivering the oral polio vaccine along with other vaccines and services has, for most of the lifetime of the Polio Programme, been seen as an unnecessary and less efficient way of reaching the eradication target than the campaigning, outreach, door-knocking polio-vaccine-only strategy.

This view was no longer sustainable when it became clear that the approach was not working in a substantial number of areas where the vaccine was most needed. From around 2010 onwards, in many parts of the endemic countries, hostility to the oral polio vaccine in communities was growing and in some places running at high levels. So much so, that conventional social mobilisation campaigns were not going to gain acceptance in all the most difficult places. At least, not on the scale required to achieve immunity levels sufficient to interrupt poliovirus transmission.

Alternatively, when the oral polio vaccine is "packaged" with other health services and amenities that are perceived as beneficial to children by families, its profile as a source of anger, protest and politically motivated boycotts is reduced. It is then delivered.

The difficulty is that the optimum way of reaching the most children, with the frequency of doses required, is through house-to-house visits, not in fixed site facilities.

So while polio vaccination rounds remain the mainstay of the Polio Programme, they will not deliver on their own. The programmatic pressure to do more and more rounds in the endemic countries is growing as the finishing line again comes into sight. In turn, as is made clear earlier in this section of the report, a major problem is community resistance generated by too many knocks on the door. There is often acceptance for a couple of rounds, but if the necessary higher frequency pattern is sustained for a year or more, doors will start to close, more and more often.

If integrated delivery activities are not scaled up at a faster rate, especially in western Pakistan and in parts of Afghanistan, regular access for polio vaccination will become more and more problematic.

Integrated delivery is also key to achieving the immunity levels necessary to stop circulation of the vaccine-derived poliovirus, now endemic in Africa, and a threat to the journey to a polio-free world.

One of the biggest of all the challenges is maintaining immunity levels in difficult-to-access areas.

The Polio Programme needs a differentiated approach that includes both campaign responses and essential immunisation systems.

The mutual benefit of focusing on identifying, and reaching, zero-dose children is well recognised by both programmes and there are many examples of successful synchronised activities doing this. The biggest challenges are to be able to do so at the scale and urgency required and in a way that sustains momentum rather than in a series of one-off interventions.

At the July 2024 IMB meeting, the metaphor "low hanging fruit" was frequently used in discussions about delivering integrated polio vaccination. The view of delegates was that there are currently far too many missed opportunities.

The most obvious starting point is a strong routine of synchronising different programmes' calendars and schedules so as not to miss those opportunities. This is not always easy. Within countries, it means different teams being fully committed to working together.

Sometimes there are tensions, sometimes territorialism, sometimes a reluctance to depart from traditional ways of doing things. Global, regional and country leadership teams must immediately seek to pick the low hanging fruit.

The relationship between the WHO headquarters polio and essential immunisation teams, UNICEF and Gavi is crucial to get right. A strong unified commitment to finishing polio at global level will legitimise the granular activities at the frontline needed to synchronise calendars and campaigns. This may sound simple, but it is far from it and is an urgent task.

The same global relationship-building is necessary to unlock opportunities from different planning cycles, different funding mechanisms, different vaccine approval mechanisms, different board level policies and priorities, and different country level performance and accountability processes.

The urgency of stopping polio means addressing these complexities with a strong and combined will of all the partners.

There are opportunities also for the Polio Programme to share in approaches beyond even essential immunisation, for example neglected tropical diseases and malaria. These programmes in their work also plan, coordinate, undertake surveillance, map local populations, reach communities, socially mobilise, innovate and monitor impact.

The Polio Programme's opportunities for linkage to these well-developed areas of global health are very seldom taken at the moment.

Integration at the point of delivery is important now for the interruption of poliovirus transmission and will add impact to particular campaign interventions. However, done episodically, it is not a style of integration that creates and leaves delivery infrastructure for sustaining high levels of polio immunity for the period necessary to deliver a polio-free world.

The biggest challenge of the work to secure integrated delivery of the Polio Programme's goals is to move beyond simple calendar synchronisation and use the power of integrated delivery models to build strong health systems. And to build them in the many places that they are most needed.

SUCCESS AND FAILURE DEPEND ON THE HUMAN FACTORS

The Polio Programme must also balance achieving good performance in the technical side of its work with the people side.

The people factors flow right across and through everything that is planned and done: the quality of frontline staff, the capability of leadership of local teams, the meticulousness with which training is planned and provided, the attitudes of communities, and the people who are setting up boycotts and threatening security. Those are the human factors and they must be integral to the Polio Programme's thinking at global, regional, country and delivery team level.

The Polio Programme cannot be run on technical excellence alone. If the vaccinators are not well-trained, if the leadership of the local teams is not good, if the communities are hostile, then the technical programme, no matter how good, will fail. The poliovirus will thrive.

This often means digging deeper and looking for new ideas to deal with some of the deep underlying dysfunctions that are to do with human factors and people management.

With new leadership in place in both endemic countries, it is important that the GPEI at global and regional levels adapts its own style of leadership to fully empower the polio programmes in the countries as well as encouraging them to take ownership of the necessity to stop poliovirus transmission as a matter of urgency.

At times over the last decade, the IMB has found that the global and regional oversight and technical support functions can become overbearing and autocratic.

The leaders at the top of country programmes must select good managers in key positions at the frontline, encourage them, develop them and empower them to lead their teams.

There is the need for much more emphasis on the training, support and engagement of frontline workers. Their knowledge and capacity and interpersonal skills to communicate with families determine the quality of the vaccine rounds, particularly in their ability to reach all eligible children.

More than their training, the effectiveness of frontline workers relies on their motivation and willingness to continue to seek out such children.

They need to be equipped with the right communication skills with a focus, not on asking one-way polio-related questions, but rather on listening and engaging with the caregivers based on a genuine dialogue.

If frontline workers are treated badly, with lack of training, inadequate remuneration, poor working conditions or having to endure punitive supervision it is likely that their performance will fall below its potential. To interrupt transmission for good it will be critical for the programme to take seriously the frontline workers, value them and give them all the necessary support to do their difficult, sometimes dangerous, jobs.

RECOMMENDED ACTION

RECOMMENDED ACTION

1. Broadening the focus from consequential geographies

The Polio Programme's focus has been on stopping the outbreaks in what it has designated as the "consequential geographies" (countries and areas), but not systematically taking action to raise the immunity levels in the surrounding countries and areas. This applies to the strategy in Pakistan and Afghanistan where the priority focus has been on the endemic zones. It also characterises the approach to dealing with type 2 vaccine-derived poliovirus outbreaks in Africa, where it seems that the Polio Programme is short of resources to do both. In neither the wild poliovirus endemic countries nor the continent of Africa will outbreak response alone stop poliovirus transmission. Consequential geographies must not be the only thing that matters. To achieve eradication in a global programme, all geographies are consequential.

Recommended action 1.

In its last report, the IMB recommended action to strike a better balance of campaign strategy to enable more preventive campaigns. This is still the major strategic policy decision (risk anticipation versus risk reduction) that the GPEI should be taking in the endemic, as well as in the outbreak, countries.

2. Urgently reboot the Nigeria Polio Programme

The Nigeria Polio Programme has reached rock bottom with the arrival of three orphan polio viruses in a week with two to three years estimated circulation histories. The programme is dysfunctional at all levels and in key areas of activity. A more detailed assessment is in the conclusions of this report.

Recommendation 2.

The Nigeria programme has a sizeable workforce but more attention needs to be given to staff quality and experience rather than quantity. A staffing review should be undertaken urgently and changes made to improve quality in key posts and roles covering team leadership, oversight and polio-essential functions.

The GPEI Strategy Committee should carefully examine the role of their own staff in Nigeria with the aim of improving coordination, improving the quality of contributions and simplifying areas of complexity. Polio partners should immediately be attending the Emergency Operations Centre meetings on a regular basis. The clue to the correct tone, content, attendance and orientation of those meetings is in the name of the centre: "emergency". If there is no emergency mindset, nothing will change.

A great deal of money goes into the Nigeria Polio Programme. The IMB saw little evidence of value-for-money analyses. The GPEI should produce a value-for-money assessment quickly.

There should be a major high-level, forensic discussion between the WHO Deputy Director-General and the Government of Nigeria as to how and why Nigeria has three orphan polioviruses in the last weeks of August 2024. This is the sign of a very poor programme not commensurate with how the engine of transmission of vaccine-derived poliovirus for Africa should be. This should be followed by a rapid, published report with expert input as appropriate.

The Nigeria Government should produce a clear, comprehensive and enforceable accountability mechanism for polio eradication performance.

3. Deep system understanding of the Pakistan Polio Programme and intensive tracking of performance over the coming 12 months

The Polio Programme in Pakistan has several times come near to eliminating polio and would benefit from fresh thinking.

Recommended action 3.

The GPEI should commission experts (possibly the same as those who conducted the switch review) to carry out an in-depth analysis of the reasons that the Polio Programme in Pakistan has not yet interrupted transmission of wild poliovirus. This should be conducted as quickly as feasible. In the meantime, the new polio team in Pakistan should carry on with their work to strengthen the programme. There should be no sense of "wait and see". There should be no delay or diminution of commitment and innovation. In addition, there must be the most rigorous monitoring of the programme performance in real time, with rapid course corrections as soon as plans are going off track.

4. Removing the fear factor from polio team culture in Pakistan

Strong, high-level government commitment is essential. In Pakistan, recently this has had unintended consequences. It has been helpful that the district commissioners and chief secretaries have been personally driving the Polio Programme. Unfortunately, at key moments, when it seemed that stopping poliovirus circulation was imminent, the pressure was felt all the way down through the management structure to the frontline. There it generated fear and staff dared not report bad news to their bosses. Then there were false data returns and fake finger marking.

Polio will not be eliminated in these circumstances because the falsity and deception within the programme erodes immunity levels.

Recommended action 4.

The Pakistan provincial chief secretaries should remove the conditions for the propagation of fear at any level in their polio programmes. They should encourage and welcome bad news as a sign of an open, learning, non-hierarchical team structure.

5. Creating space for continuous quality improvement in campaign timing

The GPEI aims for frequent, high-intensity, high-quality campaigns in polio-endemic areas of Afghanistan and Pakistan. This does not give the teams on the frontline time to address problems creatively in between vaccination rounds and continuously improve quality.

The next polio vaccination round must always be better than the current one. Otherwise, the programme will not succeed. Local team insights and views must be carefully weighed in campaign policy decisions.

Recommended action 5.

The GPEI should agree, with the national and provincial Polio Programme leadership in Afghanistan and Pakistan, a more participative approach to deciding on vaccination campaign frequency. The emphasis should be on seeking, and giving more weight to, the views of frontline teams. The aim should be to create more time and space between rounds for active, quality improvement work. The approach should be closely monitored, and a clear judgement made after each campaign as to whether it was better than the last one.

6. House-to-house campaign modality in Kandahar City

The lack of adequate polio vaccination coverage in the southern Afghanistan city of Kandahar because of the use of an internationally substandard campaign modality leaves the country, as well as Pakistan and other countries, vulnerable to large outbreaks of paralytic polio. This would be disastrous to the childhood populations of Afghanistan, Pakistan and the other surrounding countries.

Recommended action 6.

Afghanistan should immediately move to house-to-house polio campaign modality for the whole country.

7. Stronger communication and social mobilisation in Afghanistan and Africa

With the change in policy to adopt house-to-house polio vaccination campaigns in most parts of Afghanistan, it is important to ensure that the rationale for the change in policy is clearly communicated to the population, as it may seem counterintuitive to them. Also, there is strong anecdotal evidence from multiple sources that many government workers are refusing the vaccine for their own children. In so doing, they are not providing a good example to communities and this may lead to more families copying them and also refusing.

There is growing concern in the Africa region about persistently high refusal rates, particularly in the big cities and especially in Nigeria and Democratic Republic of the Congo. There is a familiar mixture of reasons: mistrust of the authorities, false rumours, religious orthodoxy, and negative information and adverse advice about polio vaccination being disseminated in communities. There is every chance that this could be consolidated into a regional trend. Currently social mobilisation planning, coordination and action is too weak and slow-moving to combat this major problem.

Recommended action 7.

The leadership of the Afghanistan Polio Programme should work with UNICEF and civil society organisations to ensure that they have a good understanding of families' attitudes towards the oral polio vaccine in different parts of Afghanistan and follow through with communications and social mobilisation activities to address suboptimal vaccination uptake. Separately, the government should establish how many of their workers are rejecting the vaccine and why, and, as other countries have done, ensure that leaders publicly vaccinate their children.

The GPEI, with UNICEF leading, should make a rapid appraisal of the scale and nature of the problem of vaccine refusal in Africa, particularly the most polio-affected and polio-vulnerable conurbations, and work with the WHO regional office, country and subnational leadership and civil society organisations to mount a large-scale coordinated social mobilisation response.

8. Expanding the female public health workforce

Women polio workers have shown not just their value, but their necessity, to successes in the Polio Programme. When parents have doubts reassurance can be given mother-to-mother. Women have access to the inside of houses that male vaccinators do not, and they are generally trusted. It is a reality that children are taken care of by mothers, yet decision-making for the refusal or acceptance of polio vaccine is often done by men in the household. This is a very hard and important truth on the ground. The huge potential for women to take a role in health more widely within communities is not being realised. With proper training opportunities created, their skill base is easily broadened. With frequent complaints from political leaders of the difficulty of establishing stronger primary health care services, a career structure for women public health workers would meet many gaps in provision and support the medical and nursing workforce.

Recommended action 8.

A full-scale, coordinated initiative should be taken by the national and provincial governments in Afghanistan and Pakistan to build a female public health workforce, not just to be part of the Polio Programme, but to form a cadre of skilled staff for primary health care more broadly in the future. The GPEI partners should help to provide training programmes and a career development structure. Priority should be given to working with tribal, religious and community leaders in the most socially and religiously conservative areas of the endemic countries.

Similar action should be taken in parts of Africa where such conditions also prevail.

9. A true emergency response for vaccine-derived poliovirus

The causes of polio in endemic and outbreak countries are different viruses (wild and vaccine-derived), but the outcome of the infection is identical: a paralysed child, who sometimes dies. Currently, there are many more cases of paralytic polio in the world due to the vaccine-derived, rather than the wild, poliovirus.

Entirely illogically, the less frequent cause of polio is treated as an emergency that people run to respond to, while the commoner cause receives a response at walking pace, and often even slower.

The timing of a response is key. Over so many outbreaks and years, it has become quite obvious that, in a polio-free area, the important factors that reduce the duration and the height of the outbreak curve is the speed of the response, the size of response, and then the campaign quality is subsequently more and more important. Initiating even a small-scale response within hours of the detection helps, sets the emergency tone and puts the infrastructure in place to launch a scaled-up response.

Recommended action 9.

The WHO Regional Office for Africa should ensure that each government that currently has vaccine-derived poliovirus transmission (or has had it recently) makes a declaration at head of state level that this is a national public health emergency. In addition, the regional polio team should provide a public-facing report frankly explaining the reasons for each suboptimal 2024 outbreak response.

This report should then be used to define measurable, ambitious, achievable timeline targets for detection; confirmation; zero, first, and second vaccine responses; and

measures of the effectiveness of these responses. Each outbreak should be publicly determined to have met or not met all of the timeline benchmarks and each outbreak response should guide continuous quality improvement for the next outbreak response.

10. Fast-tracking new methods for detection and differentiation of polioviruses

Newer methods for detection of polio and sequencing to differentiate types of poliovirus can accelerate identification of polio and thereby shorten outbreak control by several weeks. In turn, the resulting faster initiation of vaccination campaigns would increase the success ratio, while reducing the extent and cost of campaigns.

Improvements in specimen transport and laboratory timeliness, even without direct detection, would substantially improve the time from specimen collection to species identification and outbreak declaration. Adding direct detection to these improvements could quite substantially reduce turnaround times and increase the quality of the Polio Programme.

Details of the new technologies can be found earlier in the report.

Recommended action 10.

At least two specific areas require urgent attention: timeliness of transport of specimens in Democratic Republic of the Congo and elsewhere, and roll-out of direct detection laboratory methods. Ambitious, achievable targets should be set and met to roll out direct detection to Afghanistan, Pakistan, Nigeria, and Democratic Republic of the Congo (including at subnational level), and other priority areas defined by the programme. Time frames to accomplish this should be agreed and met, ideally within this calendar year.

11. Enhancement of integrated delivery systems

The immediate goals of the Polio Programme cannot be delivered without a strong element of integration, especially in the complex environments where polio immunity is low and zero-dose children are commonly found. Once the interruption of poliovirus circulation has been achieved, it will not be sustained without major investment and coordinated action to build strong integrated systems with essential immunisation and primary care at their heart. The safe removal of oral polio vaccine cannot be achieved without building high, sustainable levels of polio immunity; this is only possible through strong integrated systems.

There is evidence of good short-term work on polio integration in some parts of the programme. Integration of this kind tends to focus on the service-delivery point, to put antigens together with finding zero-dose children.

There is not enough of this type of integration, even to capture the plentiful "low hanging fruit" opportunities, let alone to address the need to build stronger systems for the post-certification period and beyond.

An enormous amount of work is required between key partners at global, regional and country levels. This ranges from different frontline teams being motivated to make common cause and deal with the practicalities of close working, for example, always checking and synchronising calendars. Underpinning this is the urgent necessity to ensure a systematic and comprehensive focus on planning, coordination, financing, supply chain and data monitoring.

It is within the powers of the WHO polio and essential immunisation teams, UNICEF and Gavi to make integrated services for polio work, short- and long-term. They urgently need to do so.

Recommended action 11.

The key partners for integration (WHO, UNICEF and Gavi) should urgently design and implement an approach to ensuring that their in-country teams miss no opportunity to take a combined approach to boosting polio immunity in the places where this is most necessary. They should also seek urgently to understand and address lost opportunities from organisational and programmatic differences in planning cycles, funding mechanisms, priority-setting and accountability processes. At a minimum, the appropriate polio vaccine should be incorporated into all Gavi-funded campaigns in polio risk areas. This global multi-agency leadership solidarity will model team behaviour at regional and country level. Beyond this, the GPEI should have a focal point within its senior leadership team whose "day job" it is to build relationships widely to encourage and establish mechanisms for integrated service delivery for immediate polio gains and also sustainable system level strengthening.

12. Greater integration of civil society organisations' work

Civil society organisations play a vital role in ensuring that polio-essential functions are delivered in difficult-to-access and conflict-affected areas. They build trust in communities when governments and official agencies are not respected or trusted. Some donors and polio partners have fully engaged them, recognising their enormous value. The Polio Programme has not always fully integrated them into their work.

Recommended action 12.

The GPEI should meet urgently with the civil society organisations and the sovereign polio donors to agree ways to maximise the skills and experience of these organisations to contribute to achieving the polio goals, both short- and longer-term.

13. Performance management of inactivated polio vaccine coverage

Very deep reflection is needed on the coverage rates for inactivated polio vaccine. Broadly, about 39 countries in the world have yet to introduce two doses of inactivated polio vaccine.

The introduction of a hexavalent vaccine is a welcome step, but it must be recognised that it will take a number of years to build up supplies and roll-out at scale. Unless there is a clear and agreed policy, inactivated polio vaccine (and later hexavalent vaccine) will not consistently be targeted to the areas of lowest performance. There needs to be an agreement to deliver it in these zero dose communities first and urgently.

Recommended action 13.

The GPEI, working with Gavi and the Essential Programme on Immunization, should actively manage the increased uptake of inactivated polio vaccine coverage, ensuring that it goes preferentially to the areas with the lowest levels of immunity and most zero-dose children. Clear targets should be set. In support of a performance management culture for this vaccine, the GPEI should monitor monthly coverage with the second dose of inactivated polio vaccine in all zones of polio interest, and publish the league table data in the weekly Polio Bulletin. Every effort should be made to ensure that countries do not defer its introduction to await the arrival of hexavalent

vaccine (mirroring the disastrous impact of deferring use of monovalent oral polio vaccine in outbreaks while awaiting the novel form of the vaccine).

14. Establishing a polio subcommittee for the WHO Regional Committee for Africa

A Regional Subcommittee for Polio Eradication and Outbreaks was established by WHO's Regional Director in the Eastern Mediterranean Region. It has played a vital role in ensuring collective ownership of the priority for action on the polio-endemic status of Pakistan and Afghanistan, as well as the outbreak countries in the region. Member states' health ministers form the membership and have been very influential in creating a sense of urgency and supporting the rigorous focus on the Polio Programme's goals.

Recommended action 14.

The WHO Regional Director for Africa should establish, as soon as possible, a Regional Subcommittee for Polio Eradication and Outbreaks.

15. Introducing modern management, accountability and quality improvement

For many years, the IMB has found a reluctance to accept that there is anything more to do to achieve polio eradication than purely to deliver the technical programmes.

As a result, management especially the areas of accountability and performance management, have fallen well short of a 21st century level of quality management.

Recommended action 15.

The GPEI Strategy Committee should look critically at the performance management and accountability mechanisms throughout all levels of the Polio Programme. This should be linked to a consideration of how to adopt more modern management methods (including continuous quality improvement). This should not be done by an expensive and lengthy external review. The Strategy Committee members, as individuals, should take ownership of this priority need. They should consult widely in their current networks, and with country teams, then come together with the information they have gathered for a one-day workshop to hammer out a proposed improved way of working.

The Polio Programme should also review, refresh and improve the indicators tracked, disseminated and used for programme management and quality improvement to make them simple, meaningful and useful.

16. Speeding up funding flows and vaccine supplies for outbreaks and stripping out bureaucracy that is slowing effective action

The Polio Programme in Africa has been badly disrupted and disadvantaged by slow and uncertain funding and vaccine flows. This can lead to larger and more expensive outbreak responses downstream. Every opportunity should be taken to streamline and speed up delivery to the frontline.

Recommended action 16.

The GPEI should seek honest and frank feedback (via an independent person on condition of anonymity) from Polio Programme staff to identify reasons for bottlenecks and delays in the provision of money and vaccines. In acting on the findings, there should be an immediate removal of unnecessary processes in the chain

of approval and delivery. Specifically, the "budgetary ceiling" rule should be changed because it is leading to delays and restructuring of polio campaigns in Africa as well as potential general underutilisation of resources.

17. Closing important gaps in surveillance quality

In one of its earlier meetings, the IMB explored the problem of gaps in surveillance caused by hospital staff being unaware of the polio surveillance function. It is not clear whether any action was taken at the time. The importance of strengthening all possible gaps in surveillance is now more important than ever. The IMB believes that there is a systemic weakness in surveillance relating to the big cities in Africa, and in Pakistan as well.

Larger hospitals, especially teaching hospitals, receive cases and referrals from a very large geographical area. Specialists such as paediatricians and neurologists in these hospitals will often be unaware of the polio surveillance system. They may not be familiar with the acute flaccid paralysis concept. A specialist, far removed from contact with polio-affected communities, will often make a diagnosis of Guillain-Barré syndrome when encountering non-specific paralytic neurological signs. They will not have the diagnostic skill of an experienced polio surveillance officer. Yet the surveillance officer, not usually being medically-qualified, often does not have the status to enter a hospital and interact with senior clinicians.

One frontline IMB source spoke of an ad hoc visit to a group of city hospitals and finding 50 undiagnosed acute flaccid paralysis cases.

On a separate point about the accuracy of surveillance, much data is now captured in digital form, based on geolocation of the cases. However, it is clear that in some cases the geographical data relate to the place where the case investigation was held, and the case was being notified from. Information on where the onset happened, the incubation period of the poliovirus and the travel history of the patient is not captured. Particularly in a cross-border situation this error may lead to misreading of the epidemiological trend.

Recommended action 17.

The GPEI should work with countries to rapidly review practice for identifying acute flaccid paralysis in city hospitals. It should take action to raise awareness, issue guidance and ensure that the authorities in every hospital give freedom of access to polio surveillance officers. It should also assess and correct weaknesses of digital surveillance systems that give misleading geolocation data thereby impairing accurate tracking of the poliovirus.