# Papua New Guinea Innovates Poliovirus Outbreak Response Strategies


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**First-ever use of intramuscular administration of fIPV in outbreak response**

## Summary

In this brief report, we describe benefits and challenges of using intramuscular (IM) fractional dose of inactivated polio vaccine (fIPV) in response to a poliovirus outbreak in Papua New Guinea (PNG). This is the first time that IM fIPV has been used on a large scale since the recommendation from SAGE and it sets a precedent for future poliovirus outbreak responses integrating IM fIPV. [1]

Intradermally administered fIPV has been widely adopted during polio outbreak response in Afghanistan, Pakistan, Nigeria and other countries. In March 2024, based on review of immunological and safety data from clinical trials, the Strategic Advisory Group of Experts on Immunization (SAGE) recommended that fractional inactivated poliovirus vaccine (fIPV) can be administered either intradermally or intramuscularly (IM) as part of polio outbreak response. [1] Since intradermal administration is difficult, requiring skilled administration, this recommendation widened the outbreak response toolkit by enabling IM administration of fIPV, simplifying training and supply handling – important in remote and low-resource settings.

**Key Strengths: PNG's Landmark Use of IM fIPV in Outbreak Response**

- **Global first:** First-ever operational use of intramuscular fIPV for polio outbreak response following March 2024 SAGE recommendation, expanding response options beyond intradermal administration.
- **Feasibility proven at scale:** Successfully deployed combined nOPV2 + IM fIPV campaign nationwide despite complex geography, remote terrain, and low baseline immunity.
- **High Coverage Achieved:** Second round reached 82-84% coverage for both nOPV2 and fIPV in children <10 years, proving comparable uptake is feasible in integrated campaigns.
- **Operational Innovation:** Simplified training and supply handling vs intradermal route. 98.4% correct IM administration technique observed during supportive supervision.
- **Strong Impact:** No cVDPV2 detected through AFP or environmental surveillance since round two. Marked decline in transmission within 7 months of outbreak onset after just 2 vaccination rounds.
- **Strategic Differentiation:** Tailored SIA design protected New Guinea Islands from unnecessary type 2 vaccine virus seeding while maximizing protection with fIPV.
- **Supply Chain Success:** Fast-tracked procurement and regulatory approval of 3.97million fIPV doses + 3.32 million 0.1mL AD syringes, and diversified distribution strategies using multimodal transport (air, sea, and land) enabled on-time nationwide rollout.
- **Community Acceptance:** No major vaccine hesitancy reported for fIPV. Leveraged routine IPV familiarity and extensive school/education sector engagement.
- **Precedent** Setting: Provides operational evidence that IM fIPV is safe, scalable, and viable for future outbreak responses, especially where ID delivery is impractical.

PNG's experience demonstrates the feasibility of rapidly deploying a combined (nOPV2+fIPV) vaccination campaign in a context of high risk of sustained type 2 poliovirus transmission owing to complex geography, minimal mucosal immunity against poliovirus type 2 among post-2016 birth cohorts, and low routine IPV2 coverage due to chronic program weakness.

Following an initial large-scale response using nOPV2 in August 2025, the second response immunization round commencing in October successfully combined fIPV with nOPV2 for children <10 years, achieving comparable coverage (82-84%) for both antigens and proving high coverage is feasible in a combined campaign. Impact was substantial: as of 1 May 2026, no cVDPV2 has been detected through AFP or environmental surveillance since round two, indicating a marked decline in transmission within 7 months of outbreak onset after just two large scale vaccination rounds.

## Issues identified

- **Training needs:** Specialized training and supervision for IM fIPV increased operational demands.
- **Syringe Procurement:** Timely acquisition of 0.1 mL auto-disable syringes required effective coordination and management of campaign supplies.
- **Community Engagement:** The micro-planning and social mobilization plans had to be adapted to ensure maximum community participation in the outbreak response while fIPV IM was used for the first time, and fixed-site vaccination strategy was planned.
- **Extended Campaign duration:** Combining injectable fIPV with oral nOPV2 prolonged the campaign duration, stretching resources. The campaign duration in PNG was also affected by difficult terrain and in reaching the communities in remote areas. National holidays for 50th anniversary of independence and school closures also caused delays.
- **Multi-antigen Vaccine Handling:** Concurrent use of vaccines with different temperature sensitivities, including frozen nOPV2 and freeze-sensitive fIPV, increased the risk of inadvertent exposure of IPV to freezing conditions during transport and storage, requiring careful handling and segregation at all levels of the supply chain.

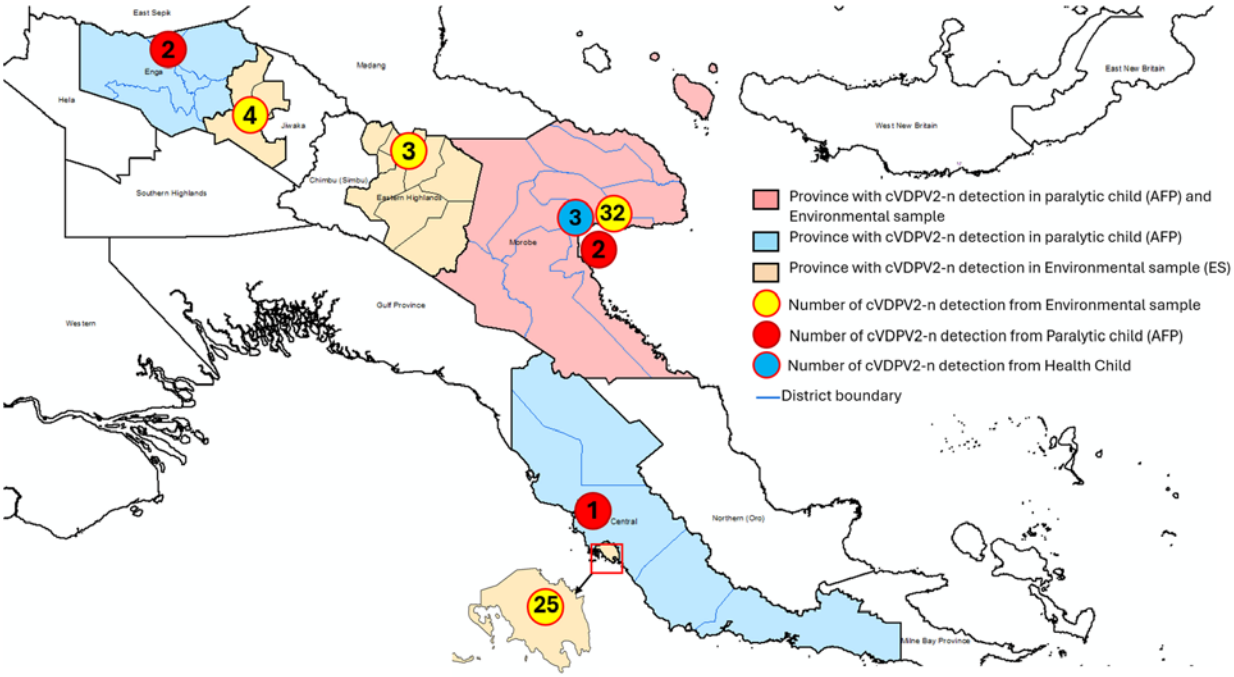
# 1. Overview of the outbreak

PNG retains its certified polio-free status since 2000 as part of the WHO's Western Pacific Region [2], however, the country has remained vulnerable to reintroduction of poliovirus transmission due to persistently low immunisation coverage, particularly at sub-national level. In 2024, national coverage for the third dose of oral polio vaccine (OPV) was 44%, while Morobe province remains lower ranging from 28-37% in the last 5 years. [3] Specifically regarding type 2 poliovirus immunity, persistently low IPV1 coverage for the past decade has accumulated a pool of susceptible children for type 2 poliovirus, particularly those born after 2016 due to the shift from trivalent to bivalent OPV. [4] IPV2 was only introduced in PNG in 2021 with sub-optimal coverage oscillating between 23%-36%. [5] The Regional Commission for Certification of Polio Eradication of the Western Pacific has classified PNG as high-risk for poliovirus outbreaks for several years. This is previously evidenced by the 2018-19 outbreak of type 1 circulating vaccine-derived poliovirus (cVDPV1); which adversely impacted the health system and required resource intensive, wide age ranged, eight rounds of vaccination campaigns (five NIDs and three SNIDs). A national serosurvey just after vaccination response demonstrated the high coverage achieved through the bOPV response through type 1 and 3 immunity levels reaching ≥95% yet also highlighted concerningly low type 2 immunity at 63% which is a testament of low routine immunization coverage with IPV as noted above. [4, 6]

cVDPV type 2 (cVDPV2) was first isolated from environmental surveillance (ES) and circulation was confirmed after detection from stool of two healthy children from Morobe Province in PNG in April 2025. [3] Further detections in both environmental samples and healthy children confirmed community transmission and, as per GPEI criteria, this was classified as a polio outbreak. [7] Genetic sequencing revealed that the isolates are genetically linked to the INO-PAP-2 emergence from an outbreak previously circulating in Indonesia. On 15 May 2025, the Minister of Health officially declared public health emergency for the poliovirus outbreak. The country was assessed as having high risk of widespread type 2 poliovirus transmission with potential of becoming reservoir of type 2 poliovirus spread to other countries within the region. Based on experience 2018-19 cVDPV1 outbreak, it was anticipated that PNG would require multiple rounds of vaccination response before successful closure of outbreak.

This prompted a nationwide response led and coordinated by PNGs National Department of Health and Provincial Health Authorities with support from WHO, UNICEF, the Australian Department of Foreign Affairs and Trade, New Zealand Ministry of Foreign Affairs and Trade, Gavi, and other partners.[8] To date, there have been 5 paralytic cases and 64 environmental detections, with the date of the most recent cVDPV2 isolation in October 2025 (**Figure 1**).

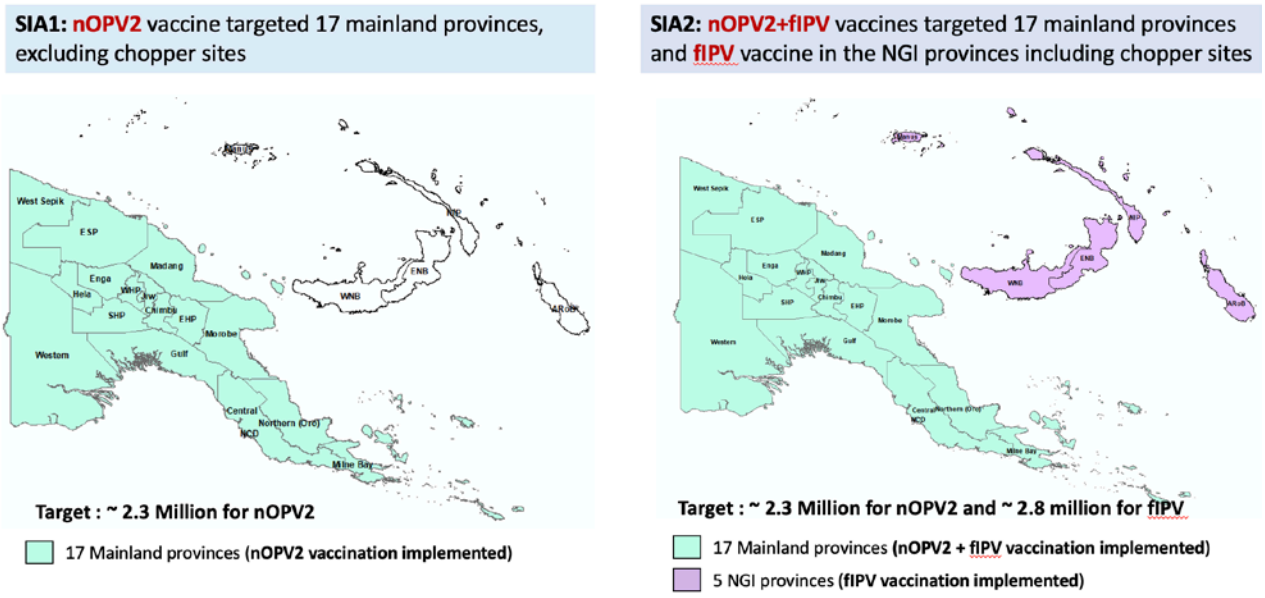
**Figure 1**. cVDPV2-n detections in Papua New Guinea, 2025




## 2. Vaccination response conducted

A rapid response round was conducted immediately after the first detections utilising full dose IPV in Lae City, Morobe Province, and National Capital District as a catch-up immunization for children aged less than 2 years of age having incomplete or no IPV vaccination. In collaboration with GPEI immunization and Polio outbreak response team, and a rapidly constituted Technical Advisory Group (Polio TAG PNG), integrated polio outbreak national SIAs were planned with novel type 2 OPV (nOPV2) and fractional-dose (0.1 mL, one fifth of the full dose) inactivated poliovirus vaccine (fIPV) targeting all post-2016 birth cohorts (aged up to 10 years). Expected outcomes included (1) achieving 95% coverage with outbreak response vaccines in every district regardless of polio immunization history, (2) vaccinating with routine immunization vaccines all eligible un- and under-immunized children, and (3) administering vitamin A supplementation and deworming tablets to eligible children. The first and second rounds of the campaign were marked by distinct polio vaccination strategies: SIA1 included nOPV2 targeting all 17 mainland provinces, and SIA2 included nOPV2 and fIPV targeting the 17 mainland provinces and fIPV-only in New Guinea Island (NGI) provinces (**Figure 2**). This distinction of SIA strategies between mainland provinces and NGI is due to past polio outbreak experience in 2018-2019 where the islands remained unaffected by mainland outbreaks and was meant to avoid seeding of type 2 vaccine virus in those populations unless indicated. The integration of fIPV was planned for the second response round, in order to reduce operational complexity for the first round, and to ensure the highest possible number of children were exposed to nOPV2 in advance of receiving fIPV.

**Figure 2**. National outbreak response in PNG to cVDPV2-n detections. SIA1 was implemented August-September 2025 and SIA2 October-December 2025




It was expected that the program would benefit from the operational lessons learnt in the first round to inform planning for the second integrated round where fIPV was used for a crucial boosting role on immunity among populations that have already been "primed" through oral polio vaccine. In both response rounds, nOPV2 was administered from birth up to 10 years of age, and in the second round fIPV from 3 months to 10 years of age. Health workers were deployed by foot, boat, helicopter, and vehicle to reach children in even the most remote villages. Rapid convenience monitoring was conducted during and after the SIAs to identify missed areas for mop-up campaigns. The result of the second round was an estimated national coverage of 84% forOPV2 and 82% for fIPV (below the aspirational target of 95% but similar to the coverage of nOPV2 achieved in the first response round). Of note, all provinces' fIPV coverage was similar or close to their nOPV2 coverage.

## 3. Field experience with fIPV in outbreak response

**Trainings:** Incorporation of injectable vaccine (in addition to oral polio vaccine) into the outbreak response strategy required careful planning and specialized training of skilled health care workers, increasing the costs of implementation. Following the completion of National Training of Trainers (TOT) for all 22 provinces in July 2025, special emphasis was placed on sub-national supervision in NGI to maintain precise intramuscular (IM) dosing and manage the logistics of five-dose extraction from single IPV vials in high-transit and remote mobile sites.

IM fIPV administration experience showed adequate vaccine administration techniques were deployed during the SIA. The supportive supervision data for SIA2 indicated that 98.4% (306 out of the 311 sessions) of the vaccination sessions observed showed correct fIPV administration technique.

**Microplanning consideration:** Health workers administered fIPV to target age group children through a variety of strategies: fixed site (i.e., health facility), mobile (i.e., community vaccination sites >3-5kms from a health facility), outreach (i.e., targeting communities in hard-to-reach areas with some sites only accessed by choppers, small planes or boats), and special sessions (i.e., vaccination team posted at an area of high transit such as a school, national holiday celebration sites, highway checkpoints, etc.). Owing to programmatic feasibility PNG implemented a site-to-site approach as opposed to house to house, and this proved to be a favorable delivery method for the injectable vaccine (fIPV). The extended target age group (up to 10 years) required extensive engagement with the Department of Education, other education organizations and authorities, and the schools themselves, in arranging access to vaccination for school aged children.

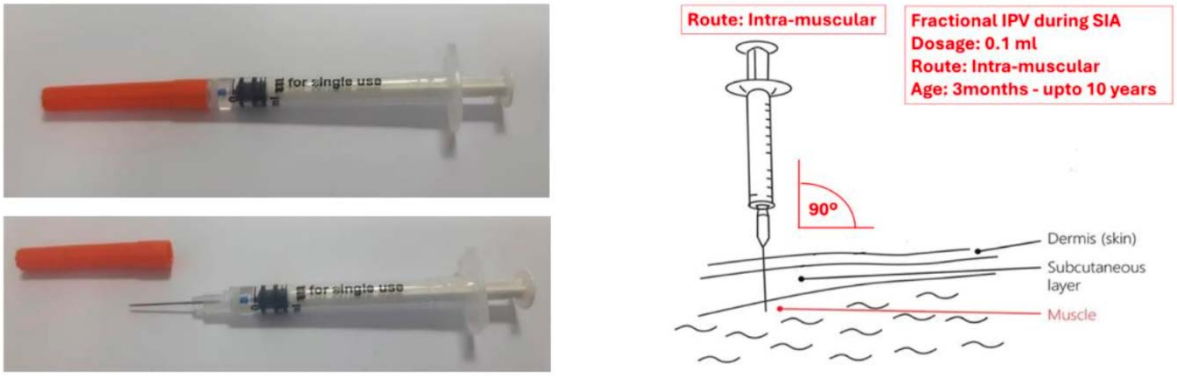
The campaign duration was initially planned for two weeks however a strategic decision was made to allow continuation of the campaign past this period to achieve maximum coverage with fIPV and nOPV2. Fixed site operations were complicated due to PNGs complex geography and related challenges for accessibility to all populations, with some communities relying on air transport or foot trails. Following several operational challenges including late commencement of the round in some provinces, national holidays and school closures for the 50$^{th}$ anniversary of independence celebrations in PNG, the fIPV + noPV2 vaccination campaign was completed across the country in 60 days.

Intra-campaign monitoring and supportive supervision (including Rapid Convenience Monitoring) was done daily, and summary vaccination reports were provided to the Provincial Health Authorities.

**Social mobilization and community engagement:** Fixed site operations meant heavy reliance on effective social mobilization activities to ensure that caregivers bring their children to the vaccination post. Regarding community acceptance, there were no specific or major reports of vaccine hesitancy for fIPV since IPV is part of the national routine immunization schedule.

**Vaccine logistics and procurement:** fIPV dosage was 0.1 mL administered intramuscularly utilising auto-disable syringes (AD) with 0.1 mL graduation (23–25-gauge x 1” needle), specifically procured for the campaigns from Abu Dhabi Medical Devices Company (**Figure 3**).

**Figure 3.** Auto-disable syringes with 0.1 mL graduation



The full-dose IPV vials used in the national EPI programme were utilised for the fIPV campaign. The rapid procurement, and in country logistics for 3,976,000 doses of fIPV and 3,320,000 pieces of 0.1 mL AD syringes was made possible through the timely financial support of GPEI and Gavi, whose approvals were critical to achieving one of the fastest large-scale emergency vaccine procurements undertaken for PNG. The preparation for this large-scale emergency procurement began as early as May 2025 through proactive engagement and supply planning with UNICEF Supply Division (SD). Given the urgent nature of the 2025 Polio response, both air and sea freight were coordinated to accelerate delivery, enabling all supplies to arrive on schedule for in-country distribution ahead of the integrated campaign. This exceptional turnaround, secured within a very short period, directly contributed to ensuring that all provinces and health facilities were prepared for the second round of integrated polio vaccination activities.

Because of lack of required specification of 0.1 mL syringes for fractional doses (IM use) in standard UNICEF catalogues or LTAs, intensive coordination across the regulatory and supply chain system was required. The National Regulatory Authority (NRA), supported with technical documentation and product specifications provided through UNICEF SD, completed its assessment and formally approved the 0.1 mL syringes for importation and use – a key milestone enabling legal entry of the devices into PNG. This regulatory clearance, combined with the accelerated procurement pathway and strong multisector coordination, ensured that both the vaccines and syringes were secured, cleared, and delivered within an exceptionally short timeframe to support the national polio emergency response.

The syringes were field-tested by UNICEF across multiple provinces to assess the syringe's performance under real vaccination conditions and to evaluate end-user acceptability. The testing involved 50–60 health workers, including CHWs, Nursing Officers, Health Extension Officers and OICs, who used the syringes during routine IPV sessions. Each facility completed quantitative questionnaires for every syringe used – covering functionality, defects, and manipulation issues – and one qualitative questionnaire after completing 50 injections, capturing ease of preparation, injection experience, visibility of marks, safety-feature activation, and disposal practices. This design ensured a comprehensive evaluation of both technical performance and user experience. In total, over 600 syringes were assessed, producing highly consistent results across provinces such as Western Highlands, Jiwaka, Enga, Southern Highlands, Madang, East Sepik, Morobe, Northern, and West Sepik. The quantitative tool captured isolated issues—such as occasional bended needles, difficulty drawing IPV, or soft plungers—while the qualitative forms demonstrated that vaccinators overwhelmingly rated the syringe as easy to use, safe, and acceptable, with strong performance in sterility, preparation, injection, and disposal. Together, these instruments provided UNICEF and WHO with a robust evidence base confirming the syringe's suitability for IPV campaign use in Papua New Guinea.

During Polio SIA Round 2, a total of 100,557 fIPV vials were utilized to vaccinate 2,283,160 children, resulting in a national wastage rate of 9.1%, which is within the acceptable campaign threshold of <15% as per fIPV guidelines. Post-campaign stock was reported at 112,894 vials, including 42,000 vials at PVS level.

Vaccine accountability was maintained through the use of standardized daily reporting forms and tally sheets, which facilitated systematic tracking of vaccine utilization and wastage throughout the campaign.

At sub-national level, variability in wastage rates was observed, with approximately 30% of vaccination teams operating within the acceptable threshold, while around 45% reported wastage exceeding 15%, including some outliers with substantially higher levels. This variability occurred within the context of a multi-antigen campaign, where concurrent administration of vaccines—including frozen nOPV2 and freeze-sensitive fIPV—required careful handling and added operational complexity at service delivery level. Minor inconsistencies in recording and reconciliation of vaccine use were also observed in some settings, which may have influenced the reported variability.

## Conclusions

PNG's implementation of intramuscularly administered fIPV in response to cVDPV2 transmission represents a significant operational innovation in global polio outbreak response. This first-ever application following SAGE recommendations demonstrated that IM fIPV can be safely, rapidly, and feasibly deployed at scale, even in settings characterized by challenging geography, suboptimal routine immunization coverage, and complex logistics. While the approach required enhanced planning, training, and resource investment, the absence of major acceptability issues and the achievement of comparable coverage to oral vaccine delivery underscore its programmatic viability. PNG's experience offers valuable operational evidence to inform future outbreak responses, particularly in contexts where intradermal vaccine delivery is impractical. As the global polio eradication program adapts to evolving epidemiological and supply realities, the successful integration of IM fIPV in PNG provides an important precedent and expands the available toolkit for achieving rapid population immunity against poliovirus.

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