

Vaccination and surveillance: Two basic tools for a final poliomyelitis eradication

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Over the past 3 decades, the Global Polio Eradication Initiative (GPEI) has strived to achieve a poliomyelitis (polio)-free world. Wild poliovirus (WPV) types 2 and 3 were eradicated in 2015 and 2019, respectively. The World Health Organization (WHO) South-East Asia Region was declared free of poliovirus in 2014, and the WHO African Region was certified free of WPV in August 2020. However, new barriers have risen, hampering the final steps to eradication.¹

As the world—and health systems—adjusted to the latest global health threat posed by COVID-19, GPEI launched the Polio Eradication Strategy 2022–2025, which integrates the approaches needed to deliver on the promise of eradication.

Five mutually reinforcing objectives were set to achieve 2 elemental goals, namely, to permanently interrupt all poliovirus transmission in the remaining WPV-endemic countries of Afghanistan and Pakistan; and stop circulating vaccine-derived poliovirus (cVDPV) transmission and prevent outbreaks in non-endemic countries. The 5 strategic objectives are (1) to generate greater political will by re-envisioning GPEI's relationship with governments and systematising political advocacy; (2) to generate vaccine acceptance through community engagement that reduces refusals to vaccination and increases childhood vaccine coverage; (3) to expand integration efforts with a broader range of partners in immunisation, essential health care and community services; (4) to improve frontline success through changes to campaign and outbreak response operations, including the recognition and empowerment of the frontline workforce; and (5) to enhance detection and response through sensitive surveillance that provides the programme with critical information for action.¹

In alignment with the WHO's Immunization Agenda 2030 (IA2030) and the Global Alliance for Vaccines and Immunization's 5-year strategy for 2021–2025 (GAVI 5.0), this new strategy by GPEI offers a more holistic approach to immunisation and shares the IA2030 principles of being people-centred, country-owned,

partnership-based and data-guided.

In this issue of the *Annals*, Chong et al.² describe the polio vaccination and epidemiologic surveillance strategies carried out in Singapore and stress the importance of the GPEI objectives mentioned above. Singapore was declared polio-free by WHO in 2000, and the country reported its last imported polio case in 2006. The use of combined vaccines in the national immunisation programme and sustained coverage rates of >95% were crucial in achieving this goal. Although the fall in vaccination uptake peaked at about 10% at the beginning of the COVID-19 pandemic in 2020, major efforts were undertaken to recover high pre-pandemic levels. This accomplishment must be underscored since many countries and regions worldwide suffered dramatic declines in immunisation rates, as vaccine hesitance and antivaccine groups advanced to discredit immunisation programmes.³ Finally, the authors highlight a new vaccination tool, the novel oral poliovirus vaccine type 2 (nOPV2), approved by WHO under its Emergency Use Listing for use in countries affected by cVDPVs.

Why the need for a new oral vaccine to prevent polio? We know the live-attenuated Sabin oral poliovirus vaccine (OPV) virus can revert to the virulent phenotype following replication in the human intestine. In environments with poor sanitation and low immunisation coverage, these cVDPVs can lead to paralysis outbreaks. From 2016 to 2020, the number of cVDPVs increased dramatically, particularly in Africa. In response, a scientific consortium was set up, funded by the Bill & Melinda Gates Foundation. The mission was to explore the development of more genetically stable nOPVs, which would maintain the advantages of Sabin OPV (with ease of delivery and mucosal immunogenicity) but decrease the risk of VDPV. The initial focus of this consortium was type 2 poliovirus, as WPV type 2 was no longer circulating, and the imminent global withdrawal of Sabin type 2 from trivalent OPV increased the risk of outbreaks of cVDPV type 2 (cVDPV2). Subsequently,

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it was found that cVDPV2 was the predominant strain causing paralytic polio outbreaks; from 2020 to 2022 this vaccine strain was responsible for 97–99% of all polio cases globally.

Results of phases 1 and 2 studies on nOPV2 showed that the candidate vaccine was safe, immunogenic and genetically stable in all age groups tested from the age of 18 weeks to 50 years. These results allowed the WHO Prequalification Team to authorise this candidate vaccine through their Emergency Use Listing procedure in November 2020.⁴ Since March 2021, approximately 450 million doses of nOPV2 have been distributed for deployment in field settings to combat cVDPV2 outbreaks in 21 countries. More than 80% of countries where the vaccine was used did not show evidence of breakthrough cVDPV2 cases to date, confirming the safety and stability of the new vaccine.⁵ After this success, nOPV types 1 and 3 are currently under development.

Chong et al. also emphasise the importance of epidemiologic surveillance. While clinical surveillance—through the reporting, follow-up and microbiological study on all cases of acute flaccid paralysis—is critical, environmental surveillance of polioviruses in sewage systems and molecular epidemiology involving genetic sequencing of detected polioviruses are also crucial. This approach has been used by the Global Polio Laboratory Network in support of GPEI, to determine the relationship between polioviruses in various chains of VDPV transmissions.⁶

Two incidents in 2022 impressed the importance of environmental surveillance. The first was the report on the presence of VDPV2 in multiple sewage samples taken from London, UK. The second was the confirmation of

a case of paralytic polio due to VDPV2 in an unvaccinated young adult from an under-vaccinated community in New York, US. Although both countries exhibit high overall inactivated polio vaccine coverage, the absence of OPV use in the UK and US since 2004 and 2000, respectively, yields limited intestinal mucosal immunity. Indeed, the risk of further spread and persistent transmission of poliovirus is not trivial, particularly among immunocompromised populations.⁶

The use of novel oral vaccines and accessibility to vaccines, together with new epidemiological surveillance tools, are crucial in the final steps to eradicate polio—a disease that has afflicted humanity for centuries.

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