

Global poliovirus risk management and modeling

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Launched in 1988, the Global Polio Eradication Initiative (GPEI) stands out as one of the largest, internationally coordinated global public health major projects conducted to date, with cumulative spending of over \$16.5 billion for 1988-2018, according to the World Health Organization (WHO). More than 30 years later, stubborn outbreaks of wild poliovirus still occur in Afghanistan and Pakistan, where cases have been increasing since 2018. The global eradication of polio continues to be an elusive goal.

A special issue of the journal *Risk Analysis*, titled "Global Poliovirus Risk Management and Modeling," looks at the current status of [polio](#) eradication efforts and evaluates the GPEI strategies from its 2019-2023 strategic plan. The February 2021 issue includes 13 [research papers](#) published within the last year in *Risk Analysis* along with an introductory Perspective written by Dr. Kimberly Thompson, an expert on modeling polio and founder of Kid Risk, Inc., a non-profit organization focused on pediatric [risk analysis](#). This is the third special issue on poliovirus published by *Risk Analysis*, with prior issues in

2006 and 2013.

"With each special issue, we have expected a successful polio endgame within a few years of publication," says Dr. Thompson, who led several of the studies. "But challenges remain." The first paper in the special issue offers a reflection on prior modeling that delves into the differences between model projections for 2013-2020 and what actually occurred. Dr. Thompson highlights that "in contrast to prior modeling that focused on identifying the best strategies, the modeling in the current special issue focuses on actual practice and GPEI plans, and it assumes realistic, non-optimal GPEI and country performance based on recent experience." The second paper in the special issue shows the estimated cases for 2019-2023 with these assumptions and demonstrates the GPEI was off track even before the COVID-19 pandemic disrupted polio immunization activities.

There has been some positive news in the last few years. The GPEI certified the global eradication of type 2 wild poliovirus (WPV2) in 2015 and type 3 (WPV3) in 2019. In August 2020, the World Health Organization's (WHO's) African Region certified the regional elimination of all wild polioviruses in Africa. But type 1 (WPV1), the most transmissible and virulent type of poliovirus, continues to transmit in parts of Pakistan and Afghanistan.

With respect to the situation for vaccine-derived poliovirus cases of type 2, the special issue includes papers that show the increasing risks of globally needing to restart the use of OPV in preventive immunization and the potential impacts of using new OPV strains for type 2 outbreak response. In addition, the last paper of the special issue provides an updated health and economic analysis of the GPEI, which shows that it still promises substantial incremental net benefits compared to the counterfactual of no GPEI. However, delays in achieving polio eradication and the adoption of expensive immunization strategies

have taken a toll. In contrast to a 2011 analysis that suggested incremental net benefits on the order of \$40-50 billion in 2008 US dollars, which would be equivalent to \$48-59 billion in 2019 US dollars, the updated economic analysis suggests incremental net benefits of the GPEI of around \$28 billion 2019 US dollars if the GPEI partners can finish the job.

The COVID-19 pandemic has further complicated projections as population mixing changed and polio vaccinations were delayed. "Future analyses will need to explore the implications of the COVID-19 pandemic on polio eradication and other disease control and elimination efforts," adds Dr. Thompson. For those who may recall the media blitz last summer related to a suggestion to use OPV to respond to COVID-19 while waiting for COVID-19 specific vaccines, the special issue includes a study that characterizes the substantial risks and costs of reintroducing OPV in the US.

In alignment with the GPEI's strategic plan for 2019-2023, the studies included in the *Risk Analysis* issue focus on the status of polio eradication efforts at the beginning of this plan and the expected trajectory of the disease prior to the onset of the COVID-19 pandemic. "Future analyses will need to explore the implications of the COVID-19 pandemic on polio eradication and other disease control and elimination efforts," adds Dr. Thompson.

Research topics in the special issue include:

- Updated modeling of the polio endgame
- A health economic analysis for oral poliovirus vaccine to prevent COVID-19 in the United States
- An updated characterization of the risk of type 2 outbreaks four years after cessation of OPV type 2 use
- An updated characterization of outbreak response strategies using novel OPV type 2 strains for 2019-2023
- Potential future use, costs, and value of poliovirus vaccines
- Health and economic outcomes associated with polio vaccine policy options for 2019-2023
- An updated economic analysis of the GPEI

- Strategies for supplemental immunization campaigns in Pakistan and Afghanistan to stop WPV1 transmission
- Modeling wild poliovirus transmission in northeast Nigeria, the last known reservoir country in Africa, and confidence about its disappearance given available surveillance data
- Expected implications of the global cessation of type 3 oral vaccine before type 1. (Globally coordinated cessation of all three serotypes of OPV represent a critical part of the GPEI strategy for the polio endgame.)

Integrated risk, economic, and dynamic transmission modeling offers a tool to support national and global health leaders as they evaluate the increasingly complicated choices in the polio endgame. "While we optimistically believe that polio eradication remains possible and that it should be done, we also believe that the GPEI is not on track to achieve it," says Dr. Thompson. "Modeling can identify strategies that could still be implemented to finish the job more cost-effectively."

More information: Kimberly M. Thompson. Modeling and Managing Poliovirus Risks: We are Where we are... *Risk Analysis* First published: 15 February 2021 doi.org/10.1111/risa.13668

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