

Polio Virus History And Recent Outbreaks

Posted on September 13, 2019

View this essay online:

<https://academic-master.com/polio-virus-history-and-recent-outbreaks/>

Introduction

Poliomyelitis is an infectious disease caused by poliovirus, a positive-sense RNA enterovirus that spreads mainly through the fecal-oral route. Most infections produce no symptoms, yet a small proportion invade the nervous system and can destroy motor neurons, causing irreversible flaccid paralysis or death. The history of polio demonstrates both the extraordinary effect of vaccination and the difficulty of eradicating a virus that often circulates silently. Wild poliovirus types 2 and 3 have been eradicated, leaving wild poliovirus type 1 as the remaining wild strain. Transmission is now concentrated primarily in Afghanistan and Pakistan, while circulating vaccine-derived polioviruses continue to cause outbreaks in under-immunized populations elsewhere. According to the Global Polio Eradication Initiative's 23 September 2026 update, Afghanistan had reported 32 WPV1 cases in 2026 and Pakistan four, with environmental surveillance continuing to detect circulation. The remaining challenge is therefore not discovering a vaccine but reaching every child repeatedly, maintaining sensitive surveillance, protecting health workers, and stopping both wild and vaccine-derived transmission (Global Polio Eradication Initiative, 2026).

Transmission, Pathogenesis, and Clinical Disease

Poliovirus enters through the mouth, replicates in the throat and gastrointestinal tract, and can be shed in stool for weeks, including by people who never develop recognizable illness. This silent transmission explains why case counts alone cannot measure circulation accurately. In most infections, the immune system controls the virus before neurological involvement occurs. Some patients develop a minor febrile illness or nonparalytic meningitis, while a much smaller group develops acute flaccid paralysis. When the virus reaches the central nervous system, it can injure motor neurons in the anterior horn of the spinal cord or brainstem. Spinal polio may weaken limbs and trunk muscles; bulbar disease can impair swallowing, speech, and breathing; and severe respiratory involvement can be fatal without support. Decades after recovery, some survivors develop post-polio syndrome involving new weakness, fatigue, pain, or reduced endurance. This syndrome is not renewed contagious infection but a late consequence of earlier neuromuscular damage and compensation (Mehndiratta et al., 2014).

Diagnosis of suspected paralytic polio is a public-health emergency because one clinical case can represent much wider undetected transmission. Stool specimens collected promptly are central to

testing, and molecular sequencing can determine whether an isolate is wild, vaccine-derived, or genetically related to viruses found elsewhere. Environmental surveillance adds another layer by testing sewage for poliovirus excreted by infected people before paralysis appears. The September 2026 GPEI update illustrates the importance of this approach: Pakistan reported no new WPV1 case that week but continued to detect a WPV1-positive environmental sample, while Afghanistan's newly reported cases reflected paralysis onsets from August. A country can therefore appear to have few clinical cases while still showing evidence of transmission in wastewater. Eradication requires both acute-flaccid-paralysis surveillance and environmental sampling, supported by laboratories capable of sequencing isolates quickly enough to guide vaccination campaigns and trace cross-border transmission (Global Polio Eradication Initiative, 2026).

IPV, OPV, and Vaccine-Derived Poliovirus

The inactivated polio vaccine developed by Jonas Salk contains killed virus and is administered by injection. It provides strong protection against paralytic disease and cannot cause vaccine-associated poliomyelitis. The oral polio vaccines associated with Albert Sabin contain weakened live virus and have played a different but essential role because they generate strong intestinal immunity, are inexpensive, and can be delivered rapidly during campaigns. Their major advantage is interruption of person-to-person transmission. Their major limitation appears when attenuated vaccine virus circulates for an extended period in communities with low immunity. During prolonged transmission, the virus can accumulate genetic changes and become a circulating vaccine-derived poliovirus capable of causing paralysis. This does not mean the vaccine is more dangerous than uncontrolled wild polio; it means that low population immunity permits the weakened strain to continue circulating. Newer oral vaccine type 2 was developed to be more genetically stable, but high coverage and surveillance remain indispensable (World Health Organization, 2025).

From Global Epidemics to the Remaining Endemic Transmission

The Global Polio Eradication Initiative began in 1988, when wild polio paralyzed hundreds of thousands of children annually across many countries. Vaccination, case investigation, laboratories, environmental surveillance, and repeated campaigns reduced wild cases by more than 99 percent. India recorded its last wild-poliovirus case in 2011, and the WHO South-East Asia Region was certified polio-free in 2014. The WHO African Region was certified free of indigenous wild poliovirus in 2020 after Nigeria interrupted transmission. These milestones corrected an earlier period when India and Nigeria were still described as endemic. The remaining WPV1 transmission in Afghanistan and Pakistan is sustained by a combination of missed children, population movement, difficult terrain, insecurity, campaign fatigue, misinformation, and disruptions in routine health services. Cross-border mobility means the two countries cannot be treated as isolated epidemiological systems. Vaccination

points, campaign timing, surveillance, and data sharing require coordination so that mobile, refugee, nomadic, and border communities are reached without discrimination or fear.

Trust, Conflict, and Campaign Quality

The final stage of eradication is as much an operational and social challenge as a biomedical one. Rumors concerning fertility, religion, surveillance, foreign influence, or vaccine safety can weaken acceptance, while distrust may reflect broader experiences of political neglect or poor public services. Effective communication therefore relies on local clinicians, religious leaders, women, community organizations, and polio survivors who can answer questions in trusted settings. Conflict and humanitarian emergencies create additional risks by disrupting routine immunization, sanitation, transport, records, and laboratories while displacing families across borders. Campaign quality must also be judged by who is repeatedly missed rather than by national coverage averages. Teams need accurate household mapping, follow-up of absent or refusing families, independent monitoring, adequate pay, and physical protection. A campaign reporting high coverage can still fail if the same mobile, remote, or marginalized children are missed during every round. Eradication is achieved only when the last transmission chains are interrupted, not when administrative targets look satisfactory.

The Eradication Endgame and the Legacy of Polio Programs

Complete eradication requires more than ending visible WPV1 cases. Countries must stop circulating vaccine-derived outbreaks, maintain surveillance after transmission disappears, contain infectious poliovirus materials in laboratories and vaccine facilities, and eventually coordinate withdrawal of live oral vaccines when the epidemiological conditions allow. Stopping OPV too early could permit uncontrolled transmission; continuing it indefinitely preserves a small risk of seeding vaccine-derived strains. The transition therefore requires adequate IPV supply, outbreak stockpiles, laboratory containment, and international coordination. Polio programs have also created assets that should outlast the disease: laboratories, cold chains, community health networks, emergency operations centers, and trained surveillance staff have supported responses to other outbreaks. At the same time, survivors require rehabilitation, mobility devices, respiratory care, accessible education, and protection from discrimination. Eradication should not reduce people who live with paralysis to symbols of a past disease. Its legacy should include stronger routine immunization and health systems as well as respect for disability rights.

Conclusion

Polio is biologically eradicable because humans are its only long-term reservoir and highly effective vaccines are available, yet the remaining transmission demonstrates that technical possibility does

not guarantee operational success. IPV protects individuals from paralysis, while OPV has been indispensable for interrupting community spread but can generate vaccine-derived outbreaks when population immunity is insufficient. Wild types 2 and 3 are eradicated, and wild type 1 is now concentrated in Afghanistan and Pakistan. As of the 23 September 2026 GPEI update, Afghanistan had reported 32 WPV1 cases for the year and Pakistan four, with environmental surveillance still important in detecting transmission. The endgame requires repeated vaccination of missed children, trusted community engagement, cross-border coordination, protection of frontline workers, sensitive laboratory and sewage surveillance, response to vaccine-derived outbreaks, and safe containment of remaining poliovirus stocks. The history of polio therefore represents both a major scientific achievement and a continuing test of whether health systems can reach every community consistently enough to finish eradication.

References

Centers for Disease Control and Prevention. (2025). *Polio vaccination*.

Global Polio Eradication Initiative. (2026). *Polio this week: Country updates, 23 September 2026*.

Mehndiratta, M. M., Mehndiratta, P., & Pande, R. (2014). Poliomyelitis: Historical facts, epidemiology, and current challenges in eradication. *The Neurohospitalist*, 4(4), 223–229.

Nomoto, A. (2007). Molecular aspects of poliovirus pathogenesis. *Proceedings of the Japan Academy, Series B*, 83(8), 266–275.

World Health Organization. (2025). *Poliomyelitis and global eradication guidance*.