Poliomyelitis outbreak in Papua New Guinea: health system and health security implications for PNG and Australia

To help PNG prevent and respond to infectious disease outbreaks of domestic and international concern, Australia must continue to provide high level technical and financial support.

On 21 May 2018, the World Health Organization (WHO) confirmed a case of vaccine-derived poliovirus type 1 in a child with acute flaccid paralysis in Lae, Morobe Province, Papua New Guinea. The onset of paralysis occurred on 24 April 2018. As a result of active case detection, on 20 June 2018 the WHO regional reference laboratory confirmed vaccine-derived poliovirus type 1 in stool samples from two close and otherwise healthy contacts of the index case, confirming a polio outbreak. On 27 June, the PNG Government declared a national emergency, establishing a National Emergency Operations Centre to coordinate the polio response. The first component of the response was the roll-out of a nationwide supplementary polio vaccination campaign targeting children aged <5 years. Four polio vaccination campaigns targeting all children <15 years of age followed. By the end of 2018, 97% of children <15 years of age had reportedly been vaccinated. The second component of the response was community-focused risk communication using both media and social mobilisation approaches to increase population awareness and understanding of polio and the risks posed, and to generate demand for the polio vaccination campaigns. The third component was enhanced surveillance for acute flaccid paralysis. This resulted in 25 additional polio cases being identified (ie, 26 cases in total: six in Eastern Highlands Province; five in Enga; four in East Sepik; three in Morobe; three in Madang; two in Jiwaka; and one case in each of Southern Highlands Province, the National Capital District [Port Moresby] and Gulf Province).

With the Asia–Pacific Economic Cooperation Summit in Port Moresby in 2018, the polio outbreak generated much international attention. The estimated budget for the response was US$18 million, much of which was provided by international donors, including Australia. While PNG was declared polio-free in 2000, longstanding low vaccine coverage, poor environmental conditions conducive to the spread of poliovirus, and inadequate surveillance for acute flaccid paralysis means that the risk of an outbreak was known.

Polio prevention and control

Poliovirus is an RNA enterovirus from the family Picornaviridae with three serotypes: types 1, 2 and 3. Poliovirus is spread predominantly via the faecal–oral route. Most cases are asymptomatic or present with non-specific symptoms. About 0.5% of those infected develop a permanent asymmetrical flaccid paralysis, most often of the legs. The development of inactivated polio vaccine in 1952 and an oral polio vaccine in 1959 resulted in a 99% reduction in cases since 1998. Wild poliovirus is now endemic in Afghanistan, Pakistan and Nigeria. Since 2017, vaccine-derived poliovirus cases have been reported in the Democratic Republic of the Congo, Indonesia, Mozambique, Niger, Nigeria, Somalia, Syria, and now PNG.

Vaccine-derived poliovirus poses a major threat to polio eradication. Oral polio vaccine contains live but attenuated poliovirus that replicates in the gastrointestinal tract for a short period, leading to an immune response. In settings with poor sanitation, such as PNG, excreted virus can circulate for extended periods, allowing genetic changes to occur and, in less than one in 17 million cases, develop into a form that can cause paralysis. In 1999, the last case of wild poliovirus type 2 was identified. In 2016, the global eradication of poliovirus type 2 was declared and the trivalent oral polio vaccine was reformulated to a bivalent vaccine. The eradication of poliovirus type 2, and the level of global coordination required for its achievement, is a significant public health success.

As of 2016, 155 countries, including PNG, continue to use oral polio vaccine as it offers a cost-effective and relatively easily administered vaccine given the implementation challenges faced in many developing settings. Oral polio vaccine and inactivated polio vaccine provide the same level of protection and are complementary tools used to implement the global polio eradication strategy.

By the early 2000s, the risk of vaccine-derived poliovirus posed by oral vaccine was considered too high by many countries, including Australia, and these countries switched to inactivated vaccine use. Inactivated polio vaccine is not a live vaccine so it does not pose the risks associated with the oral vaccine.
**Papua New Guinea context**

Although PNG has immense natural wealth, it is ranked 153 of 189 countries on the Human Development Index. Challenging environmental conditions, poor infrastructure, inadequate numbers of trained staff, and lack of reliable medical supplies contribute to a weak health system. Life expectancy stands at 62 years and under-5 mortality is 61 per 1000 live births. The combination of a weak health system, low immunisation rates (66% of children aged < 1 year receive the combined diphtheria, tetanus and pertussis vaccine — a standard marker for immunisation coverage), and low coverage of improved water supply (40% population coverage) and sanitation (19% population coverage) provide optimal conditions for the spread of polio. These same conditions have resulted in outbreaks of other infectious diseases such as cholera. To compensate for low immunisation coverage, PNG has implemented supplementary immunisation activities; however, it remains unclear how successful these have been.

**Australian context and response**

By contrast, Australia has a diphtheria, tetanus and pertussis immunisation coverage rate of 94% by the first year of life and almost 100% of Australians have access to improved water and sanitation. With the last domestically wild poliovirus case in 1972, Australia was declared polio-free in 2000. The most recent reported polio case in Australia was in 2007 in a traveller returning from Pakistan; no secondary cases were identified. With the risk from oral polio vaccine no longer considered acceptable, in 2005 the National Immunisation Program commenced use of inactivated polio vaccine at 2, 4 and 6 months, with a booster at 4 years of age given in a combination single dose with diphtheria, tetanus and pertussis. Even with possible waning vaccine effectiveness, the risk of an imported case leading to the local acquisition of polio is mitigated by Australia’s high quality acute flaccid paralysis and sentinel enterovirus and environmental surveillance programs, which give confidence that imported cases will be detected and responded to quickly.

In response to the PNG polio outbreak, the Australian Government issued a health warning noting that the threat to Australia was low due to high immunisation coverage and improved water supply and sanitation conditions. The warning, echoing those of the WHO, recommends that Australians planning to visit PNG (and/or Papua Province, Indonesia) for less than 4 weeks should be up to date with their polio vaccination. For adults, this is a three-dose primary course, with a booster within the past 10 years. For children, a three-dose primary course with a booster at 4 years of age is currently recommended. These recommended vaccines may be given before arrival in PNG or Papua Province. Australian residents travelling to PNG or Papua Province who intend to stay longer than 4 weeks should have a documented polio booster within 4 weeks to 12 months before the date of departure from PNG or Papua Province. The booster may be given before arrival in PNG or Papua Province.

**Implications for Australia’s development assistance**

While the contribution of Australia, and other countries, in response to the polio outbreak in PNG was warranted, assistance program managers must not lose sight of the bigger picture. Aid program investments in PNG’s health sector must work to address underlying issues that inhibit national health authorities’ ability to independently implement effective health protection actions. To prevent future polio outbreaks, investments supporting routine immunisation programs to meet national and international targets and ensuring that emergency polio campaigns are implemented in a fashion that bolsters, rather than compromises, routine services must be a priority. These recommendations align with the World Health Assembly call for renewed global commitment to immunisation and surveillance system strengthening in order to meet the Global Polio Eradication Initiative goal of eradicating polio.

Taking a longer term perspective, a comprehensive health system strengthening approach is needed to ensure that budget allocations are distributed as planned; provincial and district health services receive adequate resources; chronic insufficiencies in the workforce are addressed; health leadership is strengthened; health information systems are built and maintained and information generated used; medical supply systems are strengthened; and innovative approaches to reach disparate populations are explored.

To help PNG implement such an agenda, Australia must continue to provide the high level of technical and financial support it has in the past. We note that while Australia has significantly reduced its foreign aid budget since 2014, PNG has largely been spared. However, in real terms, the $572 million of Australian development assistance allocated to PNG in 2018–19 is half that provided in 1975, at the time of the country’s independence. It is expected that Australia’s aid to PNG will increase with the Australian Government (along with those of the United States, Japan and New Zealand) pledging $1.7 billion at the 2018 Asia–Pacific Economic Cooperation Summit for delivery of reliable electricity and internet access to 70% of the PNG population by 2030. If PNG is to develop the capacity required to prevent and respond to infectious disease outbreaks of domestic and international concern, such as polio, similar levels of support are required for its health system.

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