

Feedback from operational stakeholders who manage or respond to outbreaks is that they are often too busy to review literature or obtain relevant background information to assist them with acute response. Unlike a traditional analytical outbreak investigation report, **Watching Briefs** are intended as a rapid resource for public health or other first responders in the field on topical, serious or current outbreaks, and provide a digest of relevant information including key features of an outbreak, comparison with past outbreaks and a literature review. They can be completed by responders to an outbreak, or by anyone interested in or following an outbreak using public or open-source data, including news reports.

Watching brief	
<b>Title</b>	<b>Polio program security in Pakistan and Afghanistan – finally legal but not safe</b>
<b>Authors</b>	Braidy Sutton, Atalay Goshu Muluneh, Anjali Kannan, Ashley Quigley
<b>Date of first report of the outbreak</b>	In Pakistan, first reports of wild poliovirus type 1 (WPV1) emerged on November 02, 2023 (1), while in Afghanistan, first reports of WPV1 emerged on May 13, 2023 (2).
<b>Disease or outbreak</b>	Disease is unspecified poliomyelitis in two clusters, with the Pakistani cluster confirmed as genetically linked to the earlier-emerged Afghan cluster (1).

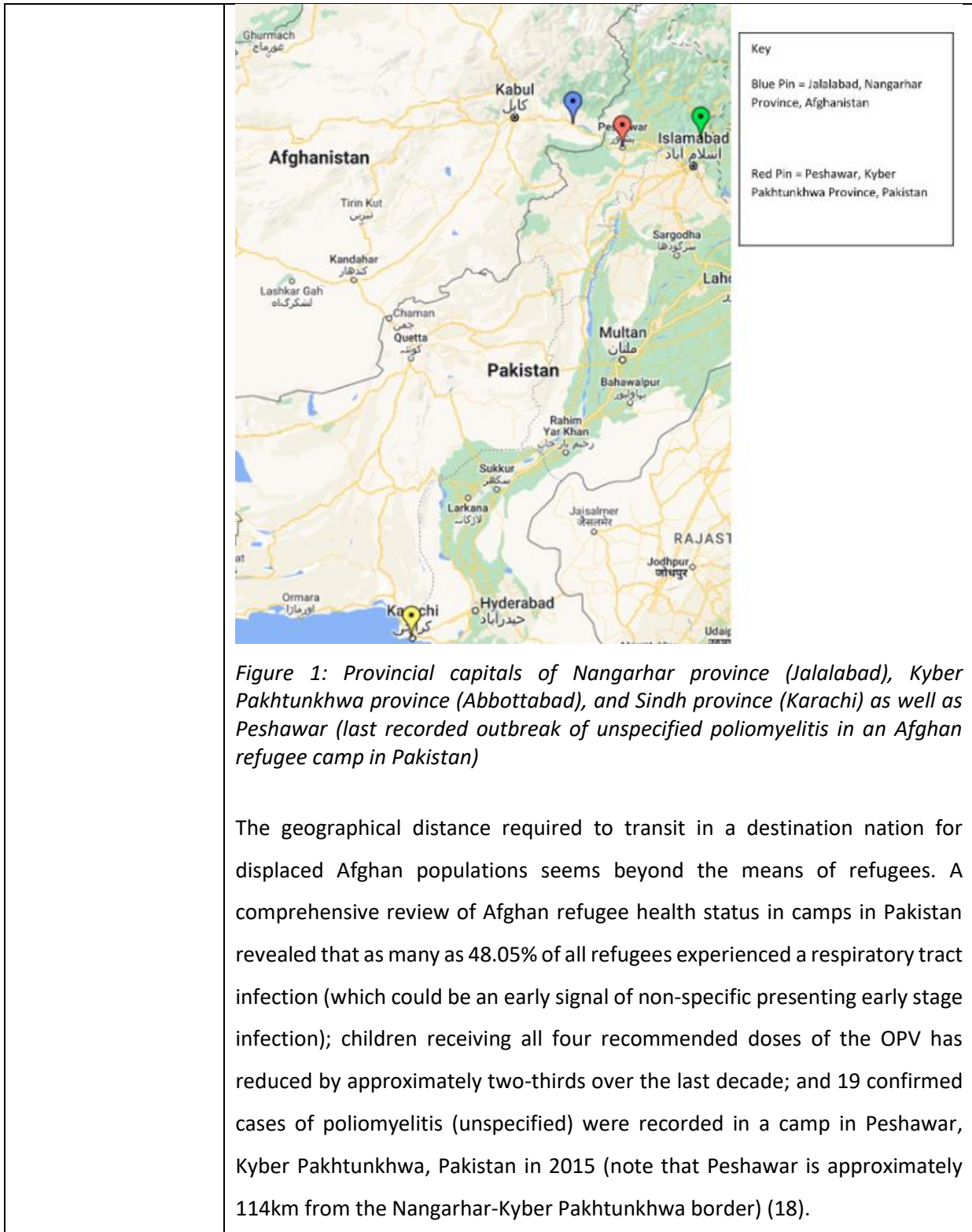
<b>Origin (country, city, region)</b>	Afghanistan and Pakistan.
<b>Suspected Source (specify food source, zoonotic or human origin or other)</b>	Humans are the only reservoir of poliovirus (either wildtype or vaccine-derived) with no identified vector or confirmed cases in other animals (3).
<b>Date of outbreak beginning</b>	In Pakistan, reports emerged in November 2023, whereas in Afghanistan, reports emerged in May 2023 (1, 2).
<b>Date outbreak declared over</b>	Outbreaks are ongoing as of November 2023 (1).

<b>Affected countries &amp; regions</b>	<p>Wild type poliovirus is currently endemic in two nations, Afghanistan and Pakistan, while vaccine-derived poliovirus is currently experiencing an increase in incidence in multiple nations (4, 5).</p>						
<b>Number of cases (specify at what date if ongoing)</b>	<p>As of September 2023, 5 cases of WPV1 have been detected in Afghanistan (2). Meanwhile, Pakistan has reported 5 cases of WPV1 year-to-date (2023) (2). As of November 2023, these numbers are stable.</p>						
<b>Clinical features</b>	<p>The incubation period for non-paralytic symptoms ranges from just 3 to 6 days, though it can commonly extend up to 35 days, while if paralysis is to occur, weakness and then paralysis will onset between 7 and 21 days following successful infection in the oropharynx or gastrointestinal tract (though it has been noted to occur within hours of an infection as well) (5-7). Up to 90% of all infected individuals are asymptomatic or experience mild non-specific symptoms (Table 1) (5).</p> <p><i>Table 1: Initial symptoms of poliomyelitis infection(5)</i></p> <table border="1" data-bbox="488 1223 1417 1384"> <tr> <td>Fever</td> <td>Fatigue</td> </tr> <tr> <td>Headache</td> <td>Emesis</td> </tr> <tr> <td>Stiffness in the neck</td> <td>Pain in limbs and extremities</td> </tr> </table> <p>Initial symptomology persists for between 2 and 10 days, and recovery is usually complete for many cases (5). However, paralysis can occur in a small proportion of cases and often begins in the legs. If this does occur, paralysis may be permanent (5). The more severe the acute phase of the infection, the greater the likelihood of lifelong deficits and permanent paralysis (8). The non-specific initial presentation of infection can present differential diagnoses such as enteroviruses A71 and D68, both of which cause acute flaccid paralysis, as well as rabies, and syndromes such as Guillain-Barre (8, 9).</p>	Fever	Fatigue	Headache	Emesis	Stiffness in the neck	Pain in limbs and extremities
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<b>Mode of transmission (dominant mode and other)</b>	<p>Wildtype poliovirus (WPV) is transmitted predominantly through the faecal-oral route, and, less commonly, through a common shared vehicle (such as contaminated food or water sources) (10). Poliovirus can be quickly</p>						

<p><b>documented modes)</b></p>	<p>transmitted in areas with low vaccination rates, poor hygiene practices and inadequate sanitation infrastructure (4, 5).</p>
<p><b>Demographics of cases</b></p>	<p>All cases are confirmed in children, with an age range of at least 2.5 years to 6 years (1, 2). At least one case is confirmed to have permanent paralysis, and no fatalities are currently recorded. Other demographic information is currently unavailable, though geographic information has been ascertained. In Afghanistan, the cluster is centred in several different districts of Nangarhar province, which shares an international border with the refugee-hosting Pakistani province of Khyber Pakhtunkhwa (701,358 Afghan refugees) (11). The cluster in Pakistan, though is located in Sindh province, which is significantly removed from the Afghani border and hosts a far smaller Afghan refugee population (73,789) (11). How these clusters are genetically and epidemiologically linked are key unanswered questions.</p>
<p><b>Case fatality rate</b></p>	<p>Traditional outbreaks of poliomyelitis will result in a case fatality range ranging from 5% to 10% in those who are paralysed (asphyxiation occurs when the breathing muscles are paralysed and cease functioning) (5).</p>
<p><b>Complications</b></p>	<p>The current geopolitical context, and the effects of reduced access and reduced quality of sanitation and hygiene services (4) complicate active and passive surveillance as well as case identification.</p> <p>If the infection enters the central nervous system and replicates within motor neurons, paralytic poliomyelitis may ensue (12). Permanent paralysis is dependent on the degree and extent to which motor neurons are infected. The typical clinical manifestation of paralytic poliomyelitis is acute flaccid paralysis (AFP), which usually affects the legs, though it can affect other limbs as well (12). Long-term sequelae can include persistent paralysis and deformity of affected limbs. Joint contractures around paralysed muscles can also be experienced, resulting in further complications (8).</p>
<p><b>Available prevention</b></p>	<p>A number of preventative measures exist for poliovirus eradication and generally encompass improving water sources, creating and encouraging effective sanitation practices, and educating communities on hygiene</p>

	<p>practices (1). Additionally, robust and comprehensive surveillance programs are seen as key to detecting viral particles in the environment (13). Any detection in the environment or through laboratory confirmation of vaccine-derived poliovirus (Type 2) should trigger a thorough outbreak investigation alongside a localised vaccination campaign (14). The cornerstone of preventative therapy is the administration of vaccines: oral polio vaccine (OPV), a live attenuated vaccine, and an inactivated polio vaccine (IPV) (4).</p> <p>The OPV is highly effective in inducing humoral immunity and when compared to the IPV, has significant health system advantages in terms of ease of administration, low cost per dose, and efficacy (4). Despite these advantages, individuals administered the OPV can shed the virus in faeces for up to six weeks following the dose (and potentially up to several years if they are immunocompromised) (6). To counter this, the World Health Organisation's vaccine schedule for Pakistan and Afghanistan indicates that the vaccine should be administered at birth, six weeks, ten weeks, and fourteen weeks (15, 16).</p> <p>However, as noted in literature and practice, if viral particles are allowed to be shed and circulated, the vaccine virus has a high chance of mutating and developing sufficient transmissibility and neurovirulence to cause symptoms of paralysis (4). To achieve the eradication of polio (including vaccine-associated paralytic polio), the use of OPV must eventually be ceased globally and replaced with IPV (12).</p>
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<p><b>Available treatment</b></p>	<p>There is no approved antiviral medication for poliomyelitis. Rather, treatment is supportive and encompasses a range of measures (Table 2) which are specific to the stage of the infection (8).</p> <p><i>Table 2: Supportive treatment for acute and convalescent phase of poliomyelitis infection</i></p> <table border="1" data-bbox="488 741 1417 1144"> <thead> <tr> <th data-bbox="488 741 951 813">Acute Phase Supportive Measures</th> <th data-bbox="951 741 1417 813">Convalescent Phase Supportive Measures</th> </tr> </thead> <tbody> <tr> <td data-bbox="488 813 951 922">Management of fever</td> <td data-bbox="951 813 1417 922">Supportive osteopathic and physiotherapeutic exercises to regain use of paralysed limbs</td> </tr> <tr> <td data-bbox="488 922 951 996">Surveillance of and management for respiratory tract infections</td> <td data-bbox="951 922 1417 996">Use of orthoses for all previously paralysed limbs</td> </tr> <tr> <td data-bbox="488 996 951 1070">Mechanical ventilation for respiratory paralysis</td> <td data-bbox="951 996 1417 1070"></td> </tr> <tr> <td data-bbox="488 1070 951 1144">Splints to relieve myalgia and spasm in legs</td> <td data-bbox="951 1070 1417 1144"></td> </tr> </tbody> </table>	Acute Phase Supportive Measures	Convalescent Phase Supportive Measures	Management of fever	Supportive osteopathic and physiotherapeutic exercises to regain use of paralysed limbs	Surveillance of and management for respiratory tract infections	Use of orthoses for all previously paralysed limbs	Mechanical ventilation for respiratory paralysis		Splints to relieve myalgia and spasm in legs	
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<p><b>Comparison with past outbreaks</b></p>	<p>The WHO has a target for eradication of polio. Whilst most of the world has eliminated polio, Pakistan and Afghanistan remain hot spots for wild polio (1, 2). In line with a recent descriptive analysis (4), the current clusters are in children. There are likely a far greater number of asymptomatic or mildly symptomatic infections that have not been detected. The minimum age reported in the descriptive analysis was 2 months, while the maximum was 13 years, with a median of 2.3 years. These figures align well to the confirmed age range of the clusters (2.5 years to 6 years) (1, 2). The current outbreaks are in areas with low gross domestic product per capita, a low adult literacy rate, and high levels of conflict, all of which contribute to reduced vaccine coverage in these areas (4, 12, 17).</p>										
<p><b>Unusual features</b></p>	<p>The most unusual feature of these clusters is the geographical distance between them, some 1,569km.</p>										



	<p>How the clusters are genetically linked is not adequately explained or investigated in detail by either governmental or non-governmental sources, and it could indicate undetected forward transmission in vulnerable populations from unexpected sources, exposing those populations, all workers with Afghan refugees (paid, volunteer, governmental, non-governmental), and local Pakistani communities. A high proportion of undetected asymptomatic cases are likely and may be an epidemiological link.</p>
<p><b>Critical analysis</b></p>	<p>Afghanistan faces significant challenges to its health system when attempting to implement an effective, robust, and routine polio vaccination campaign. Geographically, it is estimated that up to 74% of the total population live in rural areas where basic health-care services and vaccination services are not readily available, presenting a significant access barrier (19).</p> <p>Afghanistan is also facing a backlog of missed vaccinations where it is estimated that up to 3.4 million children missed routine vaccinations in 2018 alone (19). Since then, the Afghanistan Polio Eradication Initiative (PEI) has struggled to achieve vaccination targets month-on-month, further exacerbating reducing vaccine coverage (20). Interestingly, the PEI reported 100% vaccine coverage in Nangarhar province in both 2020 and 2021 (20)—the emergence of a cluster throughout the province indicates coverage is clearly not universal, or an infectious but asymptomatic carrier was introduced to susceptible and immunologically naïve populations and further investigation is warranted to determine causality and incorporate this event into PEI's strategic planning.</p> <p>The major concern is health worker security (19, 20). The PEI reported in 2021 nine confirmed health worker deaths, and four seriously injured health workers in Nangarhar. Additionally, Kyber Pakhtunkhwa also reported the deaths of policemen providing security to health care workers in 2021, while the Kandahar-Afghan border crossing reported one death of a health worker,</p>

and the Balochistan-Afghan border region recorded the abduction of a vaccination team (21, 22). The Taliban, pushed to Pakistan during the American-led invasion and occupation of Afghanistan, responded negatively to the continued occupation, and banned the OPV from being received from non-Islamic sources and from women of any religion in Taliban-controlled regions of both Afghanistan and Pakistan – notably the border regions where health worker security was least enforced(21). The Taliban initiated targeted executions of health workers, and improvised explosive devices targeting vaccination convoys resulting in governmental and non-governmental partners ceasing vaccination efforts in an attempt to protect health workers (21).

This strong resistance to vaccination is more than expected for typical vaccine hesitancy and can be traced back to the United States' Central Intelligence Agency's (CIA) covert program of surveillance to locate Osama bin Laden (23). Extensive local investigations revealed that a senior Pakistani doctor was employed by a CIA-supported shell company to administer hepatitis B vaccines in (24) areas identified by drone footage as being likely to be the residence of Osama bin Laden or his family (24). This program was started in Abbottabad, the capital of Khyber Pakhtunkhwa province, with local residences who received the first dose confirming that follow-up doses were not administered by the program (24). The program did gain access to the compound that ultimately contained Osama bin Laden, which enabled the CIA to plan the raid on the compound and execute Osama bin Laden (23). This program was in conjunction with the repeated incursions and drone strikes into Afghan and Pakistani border regions by United States forces occurring from 2004 (23), which only served to unite Al-Qaeda and Taliban forces against any 'Western' supported initiative and directly jeopardised the safety of health workers. It is clear that any vaccination effort therefore faces significant and widespread challenges to legitimacy and utility.



	<p>The PEI claim a national refusal rate of the OPV of just 1%, rising to 3% in tribal areas (20). With clear evidence of targeted hostility, coordinated cross-border attacks, ongoing security threats from two groups, the propagative epidemic curve of cases in Afghanistan and Pakistan, a failure by the PEI to achieve vaccination targets, and continuing accessibility issues, this refusal rate is potentially under-reported and adds to an extremely complex and sensitive geopolitical situation. Further complicating this is the ongoing trending increase in positive environmental samples – such programs require consistency, laboratory confirmation, and linkage with epidemiological services and the security of those involved in these programs is currently not known (25). With the Taliban recently permitting vaccination efforts to resume following a ban in 2018, security concerns are potentially addressed, but the geopolitical situation warrants further surveillance, investigation, education, and support to achieve control and eradication (26).</p>
<p><b>Key questions</b></p>	<ol style="list-style-type: none"> <li>1. Is there an epidemiological link or travel history between the cluster in Nangarhar province, Afghanistan, and Sind province, Pakistan?</li> <li>2. Are there any epidemiological or geographical links between the Afghan refugee camps in Kyber Pakhtunkhwa and Sindh provinces in Pakistan?</li> <li>3. What security precautions are currently in place before a vaccination campaign?</li> </ol>
<p><b>References</b></p>	<ol style="list-style-type: none"> <li>1. Mbaeyi C BS, Safdar RM, et al. Progress toward poliomyelitis eradication—Pakistan, January 2022–June 2023. <i>MMWR Morb Mortal Wkly Rep</i> 2023;72:880–885. 2023;72.</li> <li>2. Bjork A AI, Chaudhury S, et al. Progress Toward Poliomyelitis Eradication—Afghanistan, January 2022–June 2023. <i>MMWR Morb Mortal Wkly Rep</i> 2023;72:1020–1026. 2023;72.</li> <li>3. Centers for Disease Control and Prevention. Poliomyelitis: Clinical Presentation: Centers for Disease Control and Prevention(United States); 2022 [Available from: <a href="https://www.cdc.gov/polio/us/hcp/clinical-presentation.html">https://www.cdc.gov/polio/us/hcp/clinical-presentation.html</a>].</li> <li>4. Lai YA, Chen X, Kunasekaran M, Rahman B, MacIntyre CRJE. Global epidemiology of vaccine-derived poliovirus 2016–2021: a descriptive analysis and retrospective case-control study. 2022;50.</li> </ol>

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