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	
Title	Overview of the outbreak of **Meningococcal meningitis in Loreto region, Peru, August 2024.**
Authors	Nicholas Fairweather, Aye Moa and Ashley Quigley
Date of first report of the outbreak	21st August 2024 (1)
Disease or outbreak	Meningococcal meningitis caused by *Neisseria meningitidis* (Serotype B).
Origin (*country, city, region*)	The first recorded case was in San Antonio del Estrecho, a Northen village in the capital of the Putumayo Province, Loreto Region, Peru (2).
Suspected Source (specify food source, zoonotic or human origin or other)	Human to human transmission: *Neisseria meningitidis* (Serotype B) resides in the human nose and throat and can spread through close contact via respiratory secretions (3).
Date of outbreak beginning	21st August 2024
Date outbreak declared over	Last official reported case was on the 30th of August 2024 (4).
Affected countries & regions	Putumayo Province in the Loreto Region, Peru.
Number of cases (specify at what date if ongoing)	20 suspected, 7 confirmed, (and 1 fatality).

Clinical features	Meningococcal meningitis caused by *Neisseria meningitidis* presents with a range of symptoms that can develop quickly after infection (3,5). These symptoms include: - Fever - Headache - Neck and joint pain/stiffness - Rash (Characterised by red and purple spots) - Sensitivity to light (photophobia) - Nausea and vomiting Those infected may have body temperature fluctuations or leg pain before a noticeable decline in health occurs (5,6). Meningitis arises from the disease reaching the central nervous system, leading to inflammation of the brain and spinal column (Meninges) (6,7). Observations of symptoms related to the progression to blood infection (8) are: - Cold hands and feet - Fatigue - Rapid breathing - Severe aches and pains in muscles, joints or chest - Development of a dark purple rash Once this stage is reached the condition can escalate rapidly and the case fatality rate (CFR) can remain between 10-20% even with prescribed treatment. The biggest clinical challenge with this disease is in early recognition due to symptoms being common (5,6,8). There are 12 serogroups that have been identified with only 5 of those groups being the cause of infection. Groups A, B, C, W and Y have usually been the cause of dynamic and unpredictable spread dependant on region and time (9). Serogroups B and W are the leading causes of meningococcal outbreaks worldwide, with B primarily affecting infants and young children, and W affecting a broader age range (5,10–13). Serogroups C and Y are more common in adolescents and adults across Europe and the Americas (10,13,14). Historically, Serogroup A caused major epidemics in Africa's "Meningitis Belt" and parts of Asia, but targeted vaccination programs have reduced its spread (12,13). Young children are especially susceptible to infection from meningococcal meningitis (3,12), and their symptoms often differ compared to adult or teenage patients. Behavioural changes such as irritability or moodiness can also occur, combined with difficulty in waking up as well as high pitched crying (5,15). With the potential for invasive blood infection from *Neisseria meningitidis,* long-term effects and health complications can arise even with treatment and catching the infection early (5,16,17). Some of those long-term health issues are:

	- Hearing loss - Seizures - Cognitive decline - Blood infections can cause the need for limp amputation, as well as damaging the walls of blood vessels (3)
Mode of transmission (dominant mode and other documented modes)	Primarily transmitted through respiratory droplets and throat secretions (3), the bacteria can be spread person to person through close or prolonged contact, such as through kissing, sharing of drinks/food or utensils (5,6,18,19). *Neisseria meningitidis* bacteria is present in an asymptomatic form in a population prevalence of 5-10% (11,19).
Demographics of cases	This outbreak of Serotype B (13,14) infected the ages of between 13 to 18, the index case being an 18 year old female. One fatality was recorded in a 16 year old (20,21).
Case fatality rate	Case Fatality Rate (CFR) = 14.2%. The global CFR of meningococcal meningitis is 10-20% (10,22).
Complications	Complications associated with meningococcal meningitis are significant and multi-faceted. Initial diagnosis may be challenging due to common symptoms with other illnesses (fever, muscle aches or headaches) and therefore may not be recognised early without either prior knowledge of the illness or immediate testing capabilities (3,5,6). In children, post-infection of Serotype B has the potential for deficits in executive function due to neurological damage, seen in between 10-20% of patients that survive infection (11,16,22). Adolescents' post-infection may display greater fatigue and depressive symptoms, and it is recommended that follow-up consultations are provided to assess these potential deficits (23). Further risk factors of meningococcal disease increase when discovered in lower-socio economic areas, as well as presence of other immune compromising conditions (12).
Available prevention	Swift recognition by medical staff and isolation within a hospital setting of potential cases can inhibit the spread of the disease. Respiratory spread can be prevented by mask wearing, quarantine measures as well as contact tracing to ensure potential cases are contained and recognised early (19,24). Vaccination is available for meningococcal strains, including Meningococcal ACWY and Meningococcal B (11,25,26). There is no singular all-encompassing

	vaccine, so vaccine decisions are based on Health Ministry/Health Department recommendations/World Health Organization (WHO) recommendations. Currently there are multiple types of vaccinations, including a polysaccharide vaccine used in outbreak response, conjugate vaccines used for both prevention and outbreak response and protein-based vaccines specifically for *Neisseria meningitidis* Serotype B (19). Many countries do have vaccination programs however across South America currently it is not recommended by WHO, therefore, not part of childhood vaccination (2,20). This is a similar position of the health ministries in Colombia, Ecuador, Bolivia, Venezuela, Uruguay and Paraguay.
Available treatment	The Centres for Disease Control and Prevention recommends beginning antimicrobial chemoprophylaxis of all suspected cases and close contacts of those cases if meningococcal disease is suspected (6,24,27).
Comparison with past outbreaks	As of 2024 this is the first reported outbreak that has multiple confirmed cases and 1 death in the Loreto region. Prior outbreaks have impacted those 11 years and under (28). Incidence rates data in Peru and surveillance data on the disease is limited from 2020 as COVID took precedence (12). Available data shows a large decrease in the number of reported cases or outbreaks of meningococcal meningitis (28) from the year 2000 until now.
Unusual features	In prior outbreaks, adolescents or young adult outbreaks would be associated with Serotype C, Y and W. Serotype B is more associated with younger children or infants under the age of 1 (10,11,13,14,18).

Critical analysis	Vaccination Programs: Despite existence of comprehensive meningococcal vaccination programs in many parts of the world, Peru's current immunisation program doesn't provide one for meningococcal (20,25). Lack of structured vaccination program leaves the population vulnerable to outbreaks such as this one, and at current there are only 5 hospitals and 2 health departments that are part of the sentinel surveillance system in Peru for meningitis (28). This raises an issue with the lack of available surveillance for future outbreaks as well as consolidation of past data. The absence of these prevention measures significantly increases the risk of further spread and potential fatalities in the event of future outbreaks (4,5), and as seen in this outbreak of Serotype B in teenagers aged 13-18 years. This further shows the need for vaccination of all ages and not just infants, as well as the need to vaccinate against all serotypes to prevent further outbreaks (10). Reporting and Surveillance: The ability to detect meningococcal outbreaks relies heavily on healthcare facilities capacity to recognise symptoms, test and report cases accurately. In this instance it wasn't until the Ministry of Health of Peru (MINSA) became involved and 6 cases were confirmed that an epidemiological alert was made (1,2,20). This outbreak highlighted gaps in public awareness regarding initial diagnosis as well as the significance of opportunity the disease may have had on the population had it not triggered an investigation by MINSA and their rapid deployment and control of the situation (5,24). Many South American countries rely on passive surveillance for many diseases, so this may be a critical factor when considering the true incidence of meningococcal meningitis outbreaks over the last 20 years (2,28,29). Peru currently only has 5 hospitals, and 2 health departments involved in the sentinel surveillance of meningococcal meningitis for the entire country, so this may have to be increased significantly to ensure future data is more reliable and reported more frequently (2,28), as well as giving a true incidence of the disease. Considering data available, there appears to be a large decline in reported cases around the country from 2000 onwards (28) however as there have been no immunisation changes due to the low incidence rate of the disease across not just Peru, but most of South America, one could stipulate that the lack of reporting or surveillance of the disease is the cause of such a decline (29). This latest outbreak however raises further questions about whether other outbreaks have gone unreported, or haven't been caught by current surveillance systems. Response Measures: Rapid isolation, contact tracing and antibiotic prophylaxis employed by the health authorities during this outbreak was crucial in containing the spread, and proper guidance by MINSA in management of cases allowed for patients to be taken to the regional hospital for further and more comprehensive treatment that wouldn't have been available in the rural village (2,30).

	However, due to the low incidence rate of the disease, there may have been low awareness among doctors and medical professionals. Outbreaks of this nature will keep happening until this changes, or further deployment of vaccination programs are installed in Peru (4,21). Future Implications: The lack of childhood vaccination programs against any type of meningococcal disease poses significant health risks to the populations of Peru, and as seen in this particular case the expected Serotype saw a jump from age groups, which poses a significant risk in communities in the Loreto region, as many are large populations densely packed into small areas (9,27). There is however a roadmap that has been established by the Pan American Health Organization (PAHO) and WHO that seeks to reduce meningitis outbreaks in the Americas by 50%, and deaths from the disease by 70% by 2030 (17) Currently only Brazil, Chile and Argentina have routine immunisation programs for meningococcal meningitis due to bad outbreaks as well as the introduction by WHO and PAHO, especially in Chile where a recent outbreak of Serogroup W was the catalyst for the implementation of a routine immunisation program (10,17).
Key questions	1. Should the World Health Organization's recommendation for meningococcal vaccinations in Peru be reconsidered? 2. Should enhanced training programs for healthcare professionals on diagnosis, testing and detecting meningococcal meningitis be implemented in hospitals throughout Peru? 3. How effective are current surveillance systems in Peru at identifying and tracking outbreaks of meningococcal meningitis caused by *Neisseria meningitidis* Serotype B, and what improvements could enhance early detection and response? 4. What are the predominant risk factors and transmission patterns associated with *Neisseria meningitidis* Serotype B in Peru, and how might these influence targeted vaccination and prevention strategies in high-risk populations? 5. What genetic variations of *Neisseria meningitidis* Serotype B are prevalent in Peru, and how might these affect vaccine efficacy and the development of new preventive strategies?

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