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.

Watching brief	
Title	Unknown skin disease among Senegalese fishermen
Authors	Mohana Kunasekaran, Danielle Hutchinson, Haley Stone, Xin Chen
Date of first report of the outbreak	First media report of outbreak was on 20 November 2020 (1). There were two distinct outbreaks both occurring in November over two consecutive years, 2020 and 2021 (2).
Disease or outbreak	Unknown cause. Initial media report quoted national director of health information and education referring to it as “dermatitis associated infectious disease” (1).
Origin (country, city, region)	Dakar Region, Senegal
Suspected Source (specify food source, zoonotic or human origin or other)	Varicella was initially suggested by a local doctor based on appearance of skin lesions (3). In the November 2020 outbreak, health authorities ruled out “bacterial or virological contamination” and concluded that the source was not viral (4). It is not clear if this was through laboratory confirmation or clinical diagnosis (4). The fishermen who presented with symptoms all tested negative for COVID-19 (5). The possibility of a marine toxin (3-5), namely *Pfiesteria,* was raised in a ProMed report (7).
Date of outbreak beginning	The first known case was a 20-year-old male on 12 November 2020, reporting symptoms including a blistered rash, swelling of the face, dry lips and redness of the eyes according to a Ministry of Health report released on 17 November 2020 (1). Similar symptoms were reported a year later in November 2021 in fishermen in the same area (2).
Date outbreak declared over	Ongoing
Affected countries & regions	Senegal
Number of cases (specify at what date if ongoing)	November 2020 outbreak: Approximately 500 fishermen located between the port cities of Rufisque and M’bour in Dakar region of Senegal contracted an unknown skin disease, with the source of infection believed to be linked to seawater (1). At least 18 hospitalizations were initially reported during the 2020 outbreak (4), with later media reports stating that all infected were hospitalized (8). The reasons for hospitalization were not mentioned in the report.

<table>
<tr><td></td><td>November 2021 outbreak: At least 80 fishermen reported to be affected by disease in the initial media report in 2021 (2).</td></tr>
<tr><td>Clinical features</td><td>Similar symptoms in fisherman in the same area were reported in November 2020 and November 2021 (around the same seasonal period). Symptoms include pimples, fever, itching, conjunctival swelling and headaches (Table 1). Patients report that parts of the body that have been in contact with ocean water are most affected with lesions that cause pruritus (itchy skin). In the 2020 outbreak, all infected were hospitalized (8). Of the articles related to this outbreak, 50% reported fever or elevated temperatures as a symptom (Table 1). It is uncertain if fever is a primary symptom or if the rash appears first. As fever can occur secondary to bacterial infection of skin rash, further information such as timing of when fever starts could be useful in ascertaining the source of infection.

Table 1. Symptoms reported in the media

<table>
<tr><th>Outbreak Year</th><th>Article publication date</th><th>Article title</th><th>Symptoms reported</th></tr>
<tr><td rowspan="3">2020</td><td>20 November 2020</td><td>Over 500 fishermen hit by mysterious skin disease in Senegal (1)</td><td>Non-generalized vesicular rash, swelling of the face, dry lips and redness of the eyes.

Lesions on faces, extremities and for some on their genitals (eg. painful boils, swollen and blistered lips, large pimples on hands), headache, elevated temperatures</td></tr>
<tr><td>20 November 2020</td><td>200 Senegalese fishermen diagnosed with unknown disease (8)</td><td>Covered with ulcers that itch. According to the fishermen themselves, the parts of the body that have come into contact with the water in the ocean are most affected.</td></tr>
<tr><td>20 November 2020</td><td>Senegal: the number of fishermen affected by a mysterious dermatological disease has increased from 200</td><td>No symptoms reported</td></tr>
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		to over 300 (official) (6)	
	21 November 2020	Hundreds of fishermen contract mysterious skin disease in Senegal, suffer from lesions on the face, extremities and skin rash (5)	Non-generalized vesicular rash, swelling of the face, dry lips and redness of the eyes. lesions on the hands and face, swollen lips and a severe rash.
	23 November 2020	Senegal, Illness of fishermen in Thiaroye: the mystery solved? (3)	No symptoms reported
	24 November 2020	Senegalese officials to ascertain cause of mysterious skin disease (9)	No symptoms reported
2021	7 November 2021	the “mysterious disease of fishermen” reappears in Thiaroye (2)	Pimples, fever, itching, among others (not specified).
	8 November 2021	Senegal: The "mysterious disease of fishermen" reappears in Thiaroye (10)	Pimples, fever, itching, among others (not specified)
Note: A Google search was conducted using the terms, “Senegal” AND “fisherman” AND “mystery disease” and news articles reported in English are presented in this table. Titles were translated to English for those that were published in other languages.			

Mode of transmission (dominant mode and other documented modes)	The cases of the November 2020 outbreak increased from 60 to 200 within 48 hours, indicating that the condition may be highly transmissible (3). The incubation period of the disease is estimated to be several days (8). Mode of transmission seems to be through physical contact with sea water, with no human-to-human transmission reported or confirmed (8). However, precautionary quarantine measures were used during the initial stages of outbreak (7).
Demographics of cases	Symptoms have been localised in fisherman aged between 13 and 46 years old (11) in three cities (Rufisque, M'bour; Tharoye-sur-Mer), Dakar region, Senegal (5,8). No further information of cases is provided.
Case fatality rate	0%. No deaths reported in current and previous outbreak.
Complications	Possibility for severe bacterial infection of skin from ulcerating skin lesions.
Available prevention	Avoid contact with sea water and contact with infected fisherman. The measures taken were quarantine of affected fisherman and ban on going out to sea for several days during the 2020 outbreak (12).
Available treatment	Treatment is for symptoms with topical antiseptic and antihistamines. Prophylactic antibiotic treatment has been used to prevent bacterial infection.
Comparison with past outbreaks	There were no previous media reports of an outbreak among fishermen with similar symptoms in Senegal prior to 2020.
Unusual features	The key features in this outbreak are that it affects only fisherman in specific area, three cities in Dakar region, in Senegal during the November period in two consecutive years from 2020 to 2021.

Critical analysis	Senegal is a country in West Africa, with a land area of about 197,000 square kilometres and a population of around 16 million. According to the United Nations' Food and Agriculture Organization (FAO), there was approximately 6.1 million fishermen in 2017, with about 600,000 in Senegal (13). Previous studies have shown an increased risk of skin infections among fisherman (14), including those due to poor personal hygiene or poor working conditions (15). Skin diseases among fishermen with infectious origin is a documented occupational hazard in many countries, including those in the African continent (16-18). The seasonality (both outbreaks occurring during the same month of consecutive years), demographics of cases (fishermen in certain area), and spread (no household contacts) is not explained by viral infections with either monkeypox or chickenpox. This suggests a possibility of non-infectious cause such as toxin exposure. However, visual inspection of skin lesions and patient interviews may not be sufficient to exclude diagnosis. Laboratory testing is required to rule out orthopox virus as a cause of this outbreak and further rigorous study of other causes beyond infection should be considered. This analysis presents some possible differential diagnosis that could match the outbreak profile. One possible infection that could be of interest in this outbreak is Fish Handler's disease, a syndrome that occurs after handling aquatic organisms (19). Pathogenic organisms, such as Erysipelothrix rhusiopathiae and Myobacterium marinum, can enter the skin through breaks caused by handling and preparing fish, resulting in cellulitis in areas in contact with the fish (19). However, the lesions among the fisherman have been reported on faces, extremities and genitals, and along with other symptoms such as redness of the eyes, swelling of face and slight fever, are not consistent with this diagnosis (4). Based on the symptom profile, it is unlikely that Fish handler's disease could have caused the outbreak. Orthopox virus infections such as monkeypox were investigated as a possible cause of this outbreak. Other than the skin lesions, the occurrence of the other systemic symptoms such as fever and headaches are consistent with this diagnosis. Since 1970, human cases of monkeypox have been reported in 11 African countries, excluding Senegal, with the largest documented outbreak in Nigeria in 2017 (20). The virus has been exported from Africa a few times, reported in the United States in 2003, and more recent years, the United Kingdom in 2018 and 2019, Israel in 2018, and Singapore in 2019 (20). Infection of the index case usually results from direct contact with bodily fluids, or cutaneous or mucosal lesions of infected animals, such as squirrels, rats and different species of monkeys with previous evidence of the virus infection (20). Eating inadequately cooked meat and other infected products of animals is a potential risk factor, which could be identified through interviews of patients (20). Secondary transmission (human to human) of monkeypox is relatively limited but infection can result from close contact with respiratory secretions or skin lesions of infected person or recently contaminated objects (20). The overall case fatality rate of monkey pox is approximately 10%, however this disease has a CFR of 0% (21). An alternative

	possibility is that this is another or unknown strain of monkeypox (21). Monkeypox infections have not been specifically reported in fisherman, and there were no household or community contacts involved in this outbreak. Therefore this diagnosis, although concerning, also remains an unlikely cause. In the absence of further laboratory confirmation and genotyping of strain, it will be challenging to verify this diagnosis as well. Other infectious pathogens such as varicella-zoster are also being investigated as a causative organism. Varicella (chickenpox) is characterised by a vesicular rash which arises mainly in young children, although older adults can be affected (22, 23). Varicella is highly infectious, with attack rates in susceptible contacts ranging from 61% to close to 100% (23-26) and therefore may also be excluded considering the lack of spread to household or community contacts of the fishermen involved in this outbreak. As varicella is endemic in Senegal, it is likely that the fishermen have been exposed to this virus as children and have developed immunity either from prior infection or from varicella immunisation. From the aforementioned points, it seems unlikely for the cause of outbreak to be due to monkeypox, varicella or Fish handler's disease. However, best practice would require laboratory confirmation and whole genome sequencing to rule out these diagnoses and explore other potential infectious sources that are not known to us (novel pathogen). With consideration to non-infectious causes of the outbreak, the Senegal Ministry of Environment has excluded chemical pollution as a potential causative factor (11). However, some analyses by the Environmental Chemistry Unit of the Regional Centre for Research in Ecotoxicology and environmental safety indicate that toxins such as phthalic acid, sulfur, benzene dicarboxylic acid, and hexadecanoic acid may be present in the water (11). The nets used by the fishermen is another exposure which is being investigated and no conclusions have been released (28). This outbreak presents an opportunity to address the occupational health and safety standards, and access to healthcare among fishermen (for example to varicella vaccination), which are important factors in preventing further outbreaks. Multiple local agencies, such as the Ministry of Fisheries and the Ministry of Health, need to be involved in the investigation process and carry out appropriate measures to control the current outbreak and to prevent further occurrences. This could be supported by international agencies, such as the WHO Regional Laboratory in Dakar, Senegal.

Key questions	1. What is the cause of this outbreak? 2. What is the risk of monkeypox outbreak in Senegal? 3. What are varicella zoster vaccination rates in Senegal? 4. What are the ages, gender, medical and vaccination history of cases involved in this outbreak? 5. What are the intervention measures implemented by the local health agencies to prevent and control the outbreak? 6. If this is a seasonal condition, what public health measures can be put in place prior to November 2022?
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