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A case report of Japanese encephalitis in Paracelis, Mountain Province, the Philippines

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On 12 September 2022, a 10-year-old female in Paracelis municipality, Mountain Province, the Philippines, without travel history outside the municipality, experienced acute onset of fever and a change in mental status with disorientation, an altered level of consciousness and new onset of seizures. She was hospitalized at the district hospital from 1 to 3 October 2022, before being transferred to the regional hospital. As diphtheria was originally suspected, the investigation team reviewed records and reports and interviewed key informants to gather additional information and organize case finding and contact tracing. The patient's condition was laboratory-confirmed for Japanese encephalitis virus infection. An environmental survey was carried out at the patient's residence to check for the presence of vectors and contributing factors. Exemplifying inadequate vaccination coverage for Japanese encephalitis virus in Mountain Province, the patient had not been vaccinated against the disease. It is recommended that vaccination campaigns be immediately implemented in the affected area and the surveillance system be strengthened for early detection and prompt response to the emergence of cases and outbreaks. Overall, the investigation highlighted the importance of strong surveillance and response systems for early detection and control of diseases, such as Japanese encephalitis virus. It also underscores the need for comprehensive vaccination programmes to prevent outbreaks and protect vulnerable populations.

On 3 October 2022, a suspected case of diphtheria from the district hospital in Paracelis municipality was referred to the regional hospital in Mountain Province, the Philippines. An event-based surveillance and response report was forwarded to the Provincial Health Office of Mountain Province. On 10 October, a team from the Philippines Field Epidemiology Training Program (FETP) began an investigation, during which laboratory testing confirmed that the patient was infected with Japanese encephalitis virus (JEV).

Paracelis is one of 10 municipalities of Mountain Province, situated within the Cordillera Administrative Region in Luzon, the largest and northernmost island group of the Philippines. Paracelis is a border town of Mountain Province, sharing borders with the provinces of Kalinga, Isabela and Ifugao. The municipality has a land area of 570 km^2, with nine barangays (villages). According to the Philippine Statistics Authority, as of 2020, Paracelis had a population of 31 168.[1] The population's main livelihood activity is farming. Paracelis has one district hospital with a 25-bed capacity, one Rural Health Unit and nine barangay health stations.

The first recorded case of Japanese encephalitis (JE) was in the 1870s in Japan.[2] Since then, the disease has been found across Asia and has become the most common cause of epidemic encephalitis globally.[2] JEV has four currently recognized genotypes, but the origin of the virus remains unknown. The JE serogroup belongs to the genus *Flavivirus*, family *Flaviviridae*. The virus is found in pigs and birds and is transmitted by mosquitoes, principally by *Culex tritaeniorhynchus* when they bite infected animals, which then act as vectors to end hosts such as humans.[2,3] Transmission occurs most commonly in agricultural areas such as farms and rice paddies but

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may also occur in urban areas where flooding irrigation attracts wading birds.[4] The incubation period averages 6–8 days but can range from 4 to 15 days. The most common signs and symptoms are fever, nausea, vomiting, diarrhoea and myalgia, which may last for several days. Neurological manifestations may include altered mental status, agitation, confusion, psychosis, headache, seizure and flaccid paralysis.[4]

The global incidence of JE is unknown, but the World Health Organization (WHO) estimates that there are approximately 68 000 clinical cases and approximately 13 600–20 400 deaths from the disease per year globally.[5] The Philippines is endemic for JEV, with cases recorded in every region in the country. JEV is the cause of 15% of all acute encephalitis cases in the Philippines.[6] According to WHO data, 988 JE cases were recorded in 2021 and 1532 in 2020.[7] The incidence in the Philippines is around 0.7/100 000 in children aged <15 years, with the incidence higher in the northern region of the country.[8] In Mountain Province, cases have been reported each year since 2015 from the municipalities of Natonin and Paracelis.

In 2019, a JE vaccination programme was undertaken for children aged 9–59 months in the northern regions of the Philippines – Regions 1, 2 and 3, and the Cordillera Administrative Region. The Mountain Province was selected for this supplemental immunization activity within the Cordillera Administrative Region, with the Paracelis municipality among the 10 provinces of Mountain Province.

CASE REPORT

The case investigation objectives were to: (1) confirm the diagnosis; (2) profile the case; (3) identify the source and mode of transmission; and (4) recommend control and prevention measures.

Informed consent was obtained from the patient's parents at the start of the investigation. As part of the FETP team's investigation, the medical records of the patient at the district and regional hospitals were reviewed to establish a timeline of events. The 10-year-old female patient had been residing in Paracelis since 2020 and had reportedly been fully immunized. However, no vaccination records were found in her medical records or at the Municipal Health Office. The patient would not have been vaccinated against JE during the vaccination roll-out in 2019 since she was not in the target age group of 9–59 months at that time.

Timeline of events

During the second week of September 2022, the patient reported pain during swallowing, which was relieved by drinking vinegar. On 29 September, the patient reported a febrile episode accompanied by headache and poor oral intake. Her caregiver opted for home management. It was noted that 1–2 years before this episode, the patient had experienced recurring boils on her head and had constantly reported abdominal pain. However, no medical consultation was made then; rather, traditional healing methods were used, which included applying a chewed betel nut on the affected area.

On 1 October 2022, due to persistent fever and headache, accompanied by abdominal pain, malaise, dizziness and poor oral intake, the caregiver took the patient to the district hospital. During admission, the patient had bouts of vomiting, was non-conversant, showed decreased response to stimuli, and was ambulatory but needed assistance. Upon assessment, she had dry mouth, enophthalmos, and was febrile. No inspection of the patient's oral mucosa was made. In the ward, the patient was observed to have weakness in her lower extremities and needed full-time assistance from the caregiver for daily activities.

On the afternoon of 2 October, the patient experienced a sudden decrease in sensorium with a Glasgow coma scale assessment of 5/15. A referral was made to the attending paediatrician, who recommended transferring the patient to a facility that could provide a higher level of care.

While being transported to the hospital emergency department, the patient had an episode of seizure and decorticate posturing of the extremities. On admission, the patient was unresponsive, with fixed dilated pupils and a Glasgow coma scale assessment of 6/15. The patient was intubated, during which a whitish biofilm on her tonsillar area was noted. She was admitted for 41 days and was discharged from the facility on 13 November, with a Glasgow coma scale score of 6/15.

The patient had spontaneous eye opening, no motor reflexes, and needed a full-time caregiver.

Laboratory confirmation

On 5 October, throat swab and serum samples were collected from the patient for diphtheria and JEV confirmatory tests, respectively. Stool specimens for an acute flaccid paralysis (AFP) confirmatory test were collected on 15 and 16 October and sent to the Research Institute for Tropical Medicine. A cerebrospinal fluid sample was not collected, as performing a lumbar tap was deemed by her physicians to be detrimental to the patient.

On 12 October, a negative *Corynebacterium diphtheriae* isolate was received and on 3 November, a negative result for AFP was received. Finally, on 4 November, JEV infection was confirmed by the presence of JEV-specific IgM in the serum sample.

FIELD INVESTIGATION

Review of records

A review of records at the Rural Health Unit and the Provincial Health Office was conducted to determine the JE vaccination coverage within the municipality and in Mountain Province, respectively.

Key informant interview

A face-to-face interview was conducted with a municipal health officer at the Rural Health Unit and a nurse at the district hospital. The municipal health officer reported that from 2015 to 2022 there had been two additional confirmed JE cases in the municipality. The nurse reported that no JE cases had been seen at the hospital except for the current case. The timeline of events reported by the patient was validated during these interviews.

Active case finding

To determine if there were other cases, the patient's siblings were interviewed together with their aunt, and the patient's teacher and classmates. Informed consent was obtained from all adult interviewees and the parents or guardians of all child interviewees. A standard questionnaire was used to determine if these individuals had the same signs and symptoms presented by the patient that met the case definition. A suspected case was defined as a previously well individual residing in Paracelis, Mountain Province, who had an acute onset of fever and a change in mental status (including symptoms such as confusion, coma or an inability to talk) and/or new onset of seizures (excluding simple febrile seizures) from 24 September to 1 October 2022. A confirmed case was defined as a suspected case with JEV-specific IgM antibody present in a blood sample. No additional cases were found during active case finding.

Vaccine coverage and other cases

Among the 10 municipalities of Mountain Province, the coverage of the JE vaccination programme in 2019 for children aged 9–59 months ranged from 87% to 99%. Paracelis had one of the lowest vaccination rates at 88% (**Table 1**).

There were six laboratory-confirmed cases of JE in Mountain Province between 2015 and 2022, of which three were in Paracelis municipality and the other four were in Natonin municipality.

Environmental investigation

A visual survey was conducted at the patient's residence to check for the presence of vectors and any contributing factors regarding other diseases being considered. A larval survey was conducted in two villages in Paracelis municipality on 17 November, during which 44 larvae and 23 pupae were collected from 323 containers in 100 households.

During the visual survey at the case's residence, a pig was observed inside the house, along with carabaos and ducks nearby. Natural and artificial breeding sites were also observed around the house.

The larval survey found that most of the larvae (27/44, 61.4%) and pupae (13/23, 56.5%) that were identified were *Aedes albopictus*. The second most abundant species was *Aedes aegypti* (13/44, 29.5%). Small numbers of *Culex* larvae and pupae were also found (4/44, 9.1% and 1/23, 4.3%, respectively) (**Table 2**).

Table 1. Japanese encephalitis vaccination coverage by municipality among children aged 9–59 months, Mountain Province, Philippines, 2019

Municipality	No. eligible for vaccine[a]	No. of children immunized[b]			Vaccination coverage (%)	Vaccination target	
		9–11 months	12–59 months	Total		No.	%
Besao	620	21	453	474	76.5	475	99.8
Natonin	904	25	667	692	76.6	703	98.4
Sagada	979	25	822	847	86.5	861	98.4
Sabangan	820	31	659	690	84.2	715	96.5
Tadian	1706	66	1132	1198	70.2	1253	95.6
Bauko	2734	76	2067	2143	78.4	2329	92.0
Bontoc	2169	67	1292	1359	62.7	1490	91.2
Barlig	424	23	198	221	52.1	247	89.5
Paracelis	2475	97	2271	2368	95.7	2686	88.2
Sadanga	774	16	462	478	61.8	552	86.6

[a] Based on the projected population from the Philippine Statistics Authority.

[b] Based on the number of children immunized compiled by health-care workers.

Table 2. Results of the larval survey conducted in Paracelis, Mountain Province, 17 November 2022

Mosquito species	Larvae		Pupae	
	No.	%	No.	%
Aedes albopictus	27	61.4	13	56.5
Aedes aegypti	13	29.5	9	39.1
Culex	4	9.1	1	4.3
Total	**44**	**–**	**23**	**–**

DISCUSSION

This is a report of a case of laboratory-confirmed JE in a 10-year-old female from Paracelis, Mountain Province, the Philippines. The signs and symptoms presented by the patient were strong indications of this disease, which was further confirmed by laboratory testing of a serum specimen for the presence of JEV-specific IgM.

The field investigation was able to identify a plausible cause of transmission, which was directly related to the natural and artificial breeding sites around the house. *Culex* and *Aedes albopictus* larvae and pupae were detected in the environmental investigation, and these are both competent vectors to transmit JEV.[9] The fact that the investigation did not include the identification of *Culex tritaeniorhynchus* is a limitation of the study. However, the presence of a pig inside the case's residence strengthened the evidence for the diagnosis of JE, as pigs are its natural amplifying host, while mosquitoes are the vectors to both animals and humans, who are dead-end hosts for JEV.[10]

Vaccination has dramatically reduced the number of JE cases. A study conducted in Yunnan province, China, showed a decrease in incidence rate per 100 000 population, from 1.16 in 2009 to 0.17 in 2017, with the introduction of a JE vaccination programme.[11] However, as the virus is maintained in animal reservoirs, non-immune individuals remain at risk of infection. In the Philippines, the JE vaccine is not widely available to the public and is only available through private clinics. Additionally, the case was not in the age group that was covered during the 2019 vaccination programme in Mountain Province.

JE usually affects children with low socioeconomic status. In one study conducted in a hospital in India, the age group that was predominantly affected by JE was 5–12 years. Most cases were from rural areas belonging

to a low socioeconomic group, where most of the children were unvaccinated.[12] The present case belongs to the same age group.

The case manifested weakness in lower limbs earlier on, which fits the case definition of AFP and may be attributed to JE. One report from West China Hospital of Sichuan University described a case with an initial manifestation of AFP on the right upper limb, who was later confirmed to have JE.[13] In another report from Indonesia, a 29-year-old female also developed flaccid paralysis and was later laboratory-confirmed to have JE.

During the investigation, the team recommended the immediate implementation of JE vaccination campaigns in the affected area, strengthening of the surveillance system for early detection, prompt response to outbreaks, and for the local government to implement and sustain strategies to reduce mosquito breeding sites and mosquito avoidance measures. The investigation team also recommended that the municipal health office conduct a community-wide assembly to encourage the observance of "Oplan Taob", a campaign to encourage reducing mosquito breeding sites around the community, wearing long-sleeved clothes and using mosquito repellents. This campaign is part of the 4S Strategy (Search and destroy mosquito breeding sites, Self-protection, Seek early consultation, Support fogging in case of an outbreak).[14] These measures would help to reduce the risk of not only JE, but also dengue and other mosquito-borne diseases endemic to the area.

Overall, this investigation underscored the need for a comprehensive vaccination programme to prevent outbreaks and protect vulnerable populations, and the need for further training among health-care workers on the early detection of JE cases for prompt management. Further training of sanitary inspectors and other public health personnel on mosquito capture and identification is also recommended to improve vector control efforts.

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Conflicts of interest

The authors have no conflicts of interest to declare.

Ethics approval

The need for ethics approval was waived as this investigation and key informant interviews were conducted as part of normal public health response activities under Republic Act No. 11332. No personally identifiable information about the case and close contacts is included in this article.

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References

1. Paracelis: province of Mountain Province. PhilAtlas [Internet]; n.d. Available from: https://www.philatlas.com/luzon/car/mountain-province/paracelis.html, accessed 1 May 2024.
2. Solomon T, Ni H, Beasley DW, Ekkelenkamp M, Cardosa MJ, Barrett AD. Origin and evolution of Japanese encephalitis virus in southeast Asia. J Virol. 2003;77(5):3091–8. doi:10.1128/JVI.77.5.3091-3098.2003 pmid:12584335
3. Overview: Japanese encephalitis. Leeds: NHS England; 2019. Available from: https://www.nhs.uk/conditions/japanese-encephalitis/, accessed 3 March 2023.
4. Simon LV, Sandhu DS, Goyal A, Kruse B. Japanese encephalitis. In: StatPearls. [Internet]. Treasure Island (FL): StatPearls Publishing; 2023. Available from: https://www.ncbi.nlm.nih.gov/books/NBK470423/, accessed 15 May 2024.
5. Japanese encephalitis. Geneva: World Health Organization; 2019. Available from: https://www.who.int/news-room/fact-sheets/detail/japanese-encephalitis, accessed 30 April 2024.
6. Marquez C. DOH rolls out JE vaccine in 4 regions. Inquirer.net [Internet]; 2019. Available from: https://newsinfo.inquirer.net/1097470/doh-rolls-out-je-vaccine-in-4-regions, accessed 15 May 2024.
7. Japanese encephalitis (JE) reported cases and incidence [online database]. Geneva: World Health Organization; n.d. Available from: https://immunizationdata.who.int/global/wiise-detail-page/japanese-encephalitis-(je)-reported-cases-and-incidence?CODE=PHL&YEAR=, accessed 30 April 2024.
8. Lopez AL, Raguindin PF, Aldaba JG, Avelino F, Sy AK, Heffelfinger JD, et al. Epidemiology of Japanese encephalitis in the Philippines prior to routine immunization. Int J Infect Dis. 2021;102:344–51. doi:10.1016/j.ijid.2020.10.061 pmid:33127505
9. Hernández-Triana LM, Folly AJ, Sewgobind S, Lean FZX, Ackroyd S, Nuñez A, et al. Susceptibility of *Aedes albopictus* and *Culex quinquefasciatus* to Japanese encephalitis virus. Parasit Vectors. 2022;15(1):210. doi:10.1186/s13071-022-05329-0 pmid:35710580
10. Redant V, Favoreel HW, Dallmeier K, Van Campe W, De Regge N. Japanese encephalitis virus persistence in porcine tonsils is associated with a weak induction of the innate immune response, an absence of IFNγ mRNA expression, and a decreased frequency of $CD4^+CD8^+$ double-positive T cells. Front Cell Infect Microbiol. 2022;12:834888. doi:10.3389/fcimb.2022.834888 pmid:35281443

11. Hu XT, Li QF, Ma C, Zhao ZX, He LF, Tang TT, et al. Reduction patterns of Japanese encephalitis incidence following vaccine introduction into long-term expanded program on immunization in Yunnan Province, China. Infect Dis Poverty. 2019;8(1):102. doi:10.1186/s40249-019-0608-7 pmid:31818328

12. Kakoti G, Dutta P, Ram Das B, Borah J, Mahanta J. Clinical profile and outcome of Japanese encephalitis in children admitted with acute encephalitis syndrome. BioMed Res Int. 2013;2013:152656. doi:10.1155/2013/152656 pmid:24490147

13. Shen Q, Li Y, Lu H, Ning P, Huang H, Zhao Q, et al. Acute flaccid paralysis as the initial manifestation of Japanese encephalitis: a case report. Jpn J Infect Dis. 2020;73(5):381–2. doi:10.7883/yoken.JJID.2019.332 pmid:32350214

14. Dequina V. ['Oplan Taob' effective DOH program against dengue – Occidental Mindoro PHO.] Manila: Philippine Information Agency; 2022 (in Tagalog). Available from: https://mirror.pia.gov.ph/features/2022/06/09/oplan-taob-epektibong-programa-ng-doh-kontra-dengue-occmdo-pho, accessed 1 May 2024.

COVID-19 preparedness and response in the Pitcairn Islands: keeping one of the world's smallest and most isolated populations safe in a pandemic

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Problem: While the COVID-19 pandemic threatened the entire world, the extremely remote Pitcairn Islands faced unique vulnerabilities. With only a physician and a nurse to care for an ageing population of fewer than 40 residents, and with very limited referral pathways, Pitcairn encountered distinct challenges in preparing for and responding to the COVID-19 pandemic.

Context: The Pitcairn Islands is an overseas territory of the United Kingdom of Great Britain and Northern Ireland consisting of four islands in the South Pacific: Pitcairn, Henderson, Ducie and Oeno. Pitcairn is the only inhabited island with a local resident population of approximately 31 people, around half of whom were over 60 years old in 2023. The islands are only accessible by sea and are located more than 2000 km from the nearest referral hospital in French Polynesia.

Actions: Pitcairn's Island Council took aggressive action to delay the importation of SARS-CoV-2, vaccinate its small population and prepare for the potential arrival of the virus.

Outcomes: As of May 2024, Pitcairn was one of the only jurisdictions in the world not to have had a single COVID-19 hospitalization or death. Nevertheless, the pandemic presented the islands' population with many economic, social and health challenges.

Discussion: Pitcairn's population avoided COVID-19-related hospitalizations and deaths despite its elderly population's vulnerability to COVID-19, a significant level of comorbidities, and limited clinical management capabilities and options for emergency referrals. The pandemic highlighted some of the population's health vulnerabilities while also underscoring some of their innate strengths.

PROBLEM

On 30 January 2020, the World Health Organization (WHO) declared a public health emergency of international concern (PHEIC) following increasing transmission of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the pathogen that causes COVID-19.[1] The COVID-19 pandemic threatened all countries and areas, but the Pacific islands, including the remote Pitcairn Islands, had particular vulnerabilities in terms of baseline population health, access to care and health logistics. With only one doctor and one nurse to care for its ageing population of 30–40 residents and with limited referral options, Pitcairn faced unique challenges in preparing for and responding to the COVID-19 pandemic (Pitcairn Islands Census. 2022. Unpublished). Simultaneously, the territory's extremely small size and strong community solidarity facilitated rapid decision-making and preparedness actions. This article describes Pitcairn's unique context and how it effectively managed its COVID-19 pandemic response.

CONTEXT

The Pitcairn Islands is an overseas territory of the United Kingdom of Great Britain and Northern Ireland (UKOT) in

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the South Pacific. In 2023, the local resident population, exclusive of short-term government and contracted personnel, comprised 31 people, approximately half of whom were over 60 years old (Pitcairn Islands Census. 2022. Unpublished). As of May 2024, one child lives on the island. Variations in Pitcairn's population are primarily due to deaths, schooling overseas, young adults working abroad, residents receiving long-term medical care overseas and occasional new settlers (**Table 1**).

Table 1. Pitcairn population census for 2020, 2021 and 2023

Age range	2020 (*N* = 34)	2021 (*N* = 34)	2023 (*N* = 31)
0–17	6	4	0
18–30	3	3	5
31–40	1	1	0
41–50	6	4	3
51–60	4	7	6
61–70	11	10	10
71–80	1	2	4
81–90	1	2	2
91–100	1	1	1
Total no.	34	34	31

Source: Pitcairn Island Censuses (unpublished).

The Pitcairn Islands group comprises four islands – Pitcairn, Henderson, Ducie and Oeno – only one of which, Pitcairn, is inhabited. Made famous as a refuge for mutineers of the HMAV ***Bounty*** in 1790, the Pitcairn Islands group has a land mass of 47 km^2. Only accessible by sea, the islands are located more than 2000 km from the nearest referral hospital in Tahiti, French Polynesia (**Fig. 1**).[2,3] Self-governance is enshrined in the territory's Constitution, with the United Kingdom retaining responsibility for defence, foreign affairs and the provision of significant financial subsidies. Pitcairn's local government is known as the Government of the Pitcairn Islands (GPI) and comprises an elected mayor and counsellors forming the Island Council (IC).[4]

The islands are some of the most remote in the world, with extremely challenging transportation logistics; for example, the nearest airport and seaport are 540 km away in Mangareva, French Polynesia, or approximately 36 hours by freighter ship. Pitcairn is currently served by a mixed passenger/cargo freighter chartered by the GPI. Capable of transporting up to 12 passengers per trip, it sails between Mangareva, French Polynesia or Tauranga, New Zealand and Pitcairn.[5] There are typically fewer than 20 passenger sailings per year.

Pitcairn has a health centre staffed by a local nurse employed by the Pitcairn IC and a medical officer (physician) contracted by the United Kingdom on rotation via the Pitcairn Island Office – an arrangement that has been in place since 2004.[6] The health centre is relatively well resourced in terms of medicines, medical equipment and supplies, which are procured from New Zealand or the United Kingdom. It operates primarily as an outpatient facility, with an examination room, radiographic imaging room, a resuscitation area, and a small area for overnight observation. Complex care, dental care and more advanced diagnostics are generally managed by referrals to French Polynesia or New Zealand.

While formal census data are not published, Pitcairn is probably the jurisdiction with the world's smallest and oldest mean population (Pitcairn Island Health Centre. 2023. Unpublished). As of mid-2023, the island's population included 31 adults, more than half of whom were over the age of 60, and nearly three quarters over the age of 50 (Pitcairn Island Census. 2022. Unpublished). With its rapidly ageing population, the health centre manages a high prevalence of chronic conditions, including asthma, chronic obstructive pulmonary disease, hypertension, diabetes, obesity and osteoarthritis. Nevertheless, given the island's remote location and the need for self-sufficiency, the population's lives are physically demanding. All residents engage in farming, transporting cargo to the island from the freighter ship, constructing and maintaining their homes and other structures, and helping maintain roads and other shared infrastructure.

The pandemic had a significant impact on Pitcairn's economy and the livelihood of its population, which is heavily dependent on tourism, such as the sale of stamps and handicrafts to visitors, and the transport of passengers and freight aboard the United Kingdom's MV *Silver Supporter*.[7]

The IC members were faced with the dual challenge of protecting the population's health while maintaining its economic viability. Yet, Pitcairn's small size and remoteness helped to delay the importation of SARS-

Fig. 1. **Map of the Pitcairn Islands**

Source: World Health Organization Regional Office for the Western Pacific.

CoV-2 and leveraged the time needed to achieve high vaccination coverage and to learn and adapt as the pandemic spread globally.

ACTION

Border and travel measures

Following WHO's declaration of a PHEIC in January 2020 and the expansion of global SARS-CoV-2 transmission in February and early March, Pitcairn's IC held a community meeting on 10 March,[8] and subsequently initiated strict border and travel measures on 12 March.[9]

From March 2020 to April 2022, Pitcairn's borders were mostly closed, with very limited travel permitted for medical referrals and returning residents. Strict pre-departure quarantine, pre-departure polymerase chain reaction (PCR) testing, at-sea and on-arrival quarantine, and on-arrival rapid antigen testing were required. Pitcairn's objective was to remain COVID-free for as long as possible, as there was very limited clinical management capacity on the island.

Pitcairn's COVID-19 travel measures evolved progressively from the beginning of the pandemic and throughout the island's multiple outbreaks.[10–12] These measures were based on the global epidemiological situation and the island's risk assessments, which considered restrictions enforced by French Polynesia and New Zealand, from where the MV *Silver Supporter* would travel. As elsewhere in the world, Pitcairn's leaders and community members discussed measures to balance the risks of COVID-19 importation, the arrival of vaccines and potential economic, social and other health impacts.

From early 2020 to mid-2022, overseas medical referrals were restricted, with only one referral to Tahiti in 2020. However, cargo shipping channels remained open.

SARS-CoV-2 testing

In October 2020, Pitcairn received a donation of its first SARS-CoV-2 rapid antigen tests (RATs) from the French Polynesia's Ministry of Health, facilitated by the WHO Regional Office for the Western Pacific's Division

of Pacific Technical Support and transported by Pitcairn Islanders returning from medical treatment in Tahiti. Subsequent supplies of RATs from the United Kingdom Foreign, Commonwealth and Development Office (FCDO) were delivered by the British Navy and later by freighter. Given the scale and staffing of its health centre and infection prevention and control requirements, Pitcairn residents were not able to access PCR testing on the island, although rapid antigen testing was initially carried out on all disembarking passengers. In late 2022 and early 2023, this was limited to those presenting with COVID-like symptoms. With support from WHO's Division of Pacific Technical Support, PCR testing on Pitcairn was introduced in 2024.

COVID-19 vaccine roll-out

The United Kingdom guaranteed delivery of COVID-19 vaccines to all UKOTs which, for Pitcairn, required a 15 000 km journey by air and sea. The IC anticipated the arrival of COVID-19 vaccines in January 2021, and arrangements were made for cold chain custody from ship to shore (Pitcairn Island Health Centre. 2021. Unpublished).

On 13 May 2021, a public meeting was held at Pitcairn's Public Hall with the IC and 22 residents in attendance. Pitcairn's Governor, Deputy Governor, and representatives of Public Health England (PHE) and the FCDO joined remotely via video link. The meeting informed the community on the incoming AstraZeneca vaccines, their safety and efficacy, vaccination requirements and other topics.[11]

COVID-19 vaccines arrived on Pitcairn on board the MV *Silver Supporter* on 17 May 2021. Initial uptake of the primary series of AstraZeneca vaccines was high at 37/44 residents. A second vaccine shipment arrived in February 2022 on board the Navy HMS *Spey* with Moderna vaccines, and 39/40 eligible persons were vaccinated, including three children. As of May 2023, nearly all of Pitcairn's residents had completed a primary series and received two booster doses (Pitcairn Island Health Centre. 2023. Unpublished).

Response support

Throughout the COVID-19 pandemic emergency period, Pitcairn's medical officer and administrator on the island remained in contact with experts from PHE and the FCDO, and sought guidance from WHO regarding testing, quarantine and clinical management protocols. COVID-19 measures were regularly updated from 2020 to 2022. PHE experts facilitated by the FCDO provided technical advice and support to Pitcairn's clinicians and the IC. Fortnightly or weekly telemedicine conferences were held with expertise shared between all UKOTs on SARS-CoV-2 testing, health policy, travel measures, quarantine, isolation, vaccination and response experiences, among others. Pitcairn's physician and nurse also sought guidance from WHO and regularly reviewed measures and advice from government health authorities in Australia and New Zealand.

Beyond the provision of vaccines, SARS-CoV-2 testing supplies, personal protective equipment and technical guidance, the United Kingdom also provided Pitcairn's residents with financial support through a COVID-19 debt support package to offset financial losses from the suspension of tourism. This fund, which also received a contribution from Pitcairn's IC, provided permanent on-island residents with monthly credits of NZ$ 555.55, which could be used for purchases from the island's general store, and for freight and general cargo shipping, loans and utilities.[12]

Introduction of COVID-19 and community transmission

After achieving high vaccination coverage, Pitcairn's borders were officially reopened on 31 March 2022 with regular travel resuming thereafter. After over 2 years of near-complete isolation, and gradual easing of border measures beginning in April 2022, residents faced their first cases of COVID-19 in July 2022 after two returning residents tested positive on arrival. Two close contacts were also infected. The passengers had tested negative before disembarking the MV *Silver Supporter* but tested positive later the same day on shore. All four patients were treated with antivirals (nirmatrelvir/ritonavir), and isolation protocols were established following consultation with the doctor, the IC and the administrator. No hospitalizations were required, and no deaths were recorded.

The Pitcairn IC adjusted measures to become COVID-safe rather than COVID-free, and regular passenger services resumed in July 2022 with 11 round-trip sailings

between July 2022 and February 2023. Cruise ships resumed visits to Pitcairn in August 2022.[13] In March 2023, all remaining vaccination and testing requirements were lifted. While some residents queried the decision to reopen the border, consensus was eventually reached by weighing the risks and benefits to the population and the economy.

In April 2023, following visits from multiple cruise ships and yachts, a second COVID-19 outbreak was confirmed on the island. Following identification of an initial case, voluntary community rapid antigen testing was initiated, which reached nearly every resident. Approximately half of the island's population tested positive, with 16 confirmed cases. Those presenting with symptoms, as well as older residents and those with comorbidities, were closely monitored by Pitcairn's physician and nurse.[14]

As was the case in many countries and territories, Pitcairn adapted to the arrival of COVID-19. During outbreak periods, masks and hand sanitizer were provided to all residents, and mask wearing was encouraged in public areas. Outdoor IC meetings were held in the town square, and the general store temporarily adopted an electronic order and home-delivery service. Throughout both outbreaks, Pitcairn's medical team communicated with all residents through the island's radio system, which is connected to all homes. Patients did not present at the health centre but were asked to call for advice. When necessary, the nurse or doctor visited patients in their homes wearing personal protective equipment. RATs were carried out in patients' homes or at an outdoor testing station next to the health centre.

In addition to radio communications, fact sheets based on New Zealand's Public Health guidance were posted on notice boards in the town square, at the health centre and outside the general store. Supplies of masks and hand sanitizer were also available where people would congregate, such as in the general store.

OUTCOMES

As of June 2024, Pitcairn was one of the only jurisdictions in the world not to have recorded a hospitalization or death related to COVID-19. This is attributed to: (i) the population's small size and low probability of severe cases among fewer than 40 persons; (ii) the early and strict application of border and travel measures, which provided time for the vaccination of the population before cases were imported; and (iii) a high level of compliance with COVID-19 public health and social measures.

COVID-19 presented many medical, economic and social challenges for Pitcairn's population. The long border closures had a significant impact on the island's economy, though this was partially offset by support funds provided by the United Kingdom. Medical referrals, which are commonly required by the island's ageing residents, became drastically more challenging. Many of the island's residents were separated for a very long time from their families due to border measures in Pitcairn and abroad.

DISCUSSION

The Pitcairn IC, with support from the United Kingdom and partners, took decisive action in early 2020 to delay the importation of COVID-19 and continued those efforts during the vaccination of the population and the gradual easing of travel and other restrictions. Years of investment in Pitcairn's health centre, the presence of a qualified physician and nurse on the island, and remote support from experts facilitated an effective response, which protected the health of the island's population.

While Pitcairn avoided any COVID-19-related hospitalizations and deaths, the pandemic had significant secondary impacts, including delays in routine or non-urgent care for the population. For 2 years, Pitcairn's population lacked access to offshore diagnostics and treatments, such as mammograms, joint replacements, chronic disease testing and cataract surgeries, among others.

While COVID-19 highlighted some of Pitcairn's health vulnerabilities and underscored some of its innate strengths, the island's ageing population and out-migration following the global easing of border and travel restrictions will continue to make population health risks more pressing. With fewer able-bodied residents and a physically challenging way of life, the continuity of the island's core functions and ability to provide adequate and affordable health care to the population will require continued adaptation and innovation.[15]

Key lessons identified through Pitcairn's COVID-19 preparedness and response efforts are listed below.

- The maintenance of strong contact with the United Kingdom and other partners for technical guidance and support is important. Pitcairn's remote location and isolation also underscore the importance of communications redundancy.
- Pitcairn's geographical isolation provided a degree of protection and permitted time for decision-making and the vaccination of most of the population before SARS-CoV-2 arriving on its shores.
- Residents are well prepared for the possibility of a supply ship not arriving on schedule and are accustomed to being self-sufficient through fishing and farming. They had fewer concerns regarding the availability of essential goods than some populations who might have relied on imported goods.
- Given the financial impact of the suspension of tourism for an extended period, the financial support of the United Kingdom was essential for the functioning of essential island operations and the well-being of the Pitcairn community.

Limitations and future research

This article was developed through the collaborative effort of Pitcairn's medical officer, on-island nurse and WHO's Pitcairn Islands focal point, based on available data and information as well as reflections from first-hand experiences of coordinating preparedness and response efforts. No novel data collection was undertaken for this article. Opportunities remain for further research on the social and economic consequences of the COVID-19 pandemic on the island, as well as on the unique vulnerabilities and strengths of very small island communities in the face of public health threats.

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Conflicts of interest

STC is an associate editor of the *Western Pacific Surveillance and Response* journal. He was not involved in the editorial decision to publish the manuscript. KW is Pitcairn Island's physician and DG is Pitcairn Island's nurse; both contributed to this article in their professional capacity.

Ethics statement

Ethical clearance was not required. No personal identifiable information was collected or reported. Prior to publication, this article was reviewed and cleared by Pitcairn's Mayor.

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References

1. WHO Director-General's statement on IHR emergency committee on novel coronavirus (2019-nCoV). Geneva: World Health Organization; 2020. Available from: https://www.who.int/director-general/speeches/detail/who-director-general-s-statement-on-ihr-emergency-committee-on-novel-coronavirus-(2019-ncov), accessed 4 June 2023.

2. Foreign travel advice: Pitcairn Island. London: Government of the United Kingdom; 2024. Available from: https://www.gov.uk/foreign-travel-advice/pitcairn-island, accessed 4 June 2023.
3. Pitcairn Islands. Langley (VA): CIA World Factbook; 2024. Available from: https://www.cia.gov/the-world-factbook/countries/pitcairn-islands/, accessed 4 June 2023.
4. The Pitcairn Constitution Order. 2010. UK Statutory Instruments. Legislation.gov.uk [Internet]. Available from: https://www.legislation.gov.uk/uksi/2010/244/contents/made, accessed 29 May 2024.
5. About MV Silver Supporter. Adamstown: Pitcairn Island Tourism; n.d. Available from: https://www.visitpitcairn.pn/mv-silver-supporter, accessed 29 May 2024.
6. Medical care on Pitcairn Island. Angwin (CA): Pitcairn Islands Study Center, Pacific Union College; n.d. Available from: https://library.puc.edu/pitcairn/pitcairn/medical.shtml, accessed 29 May 2024.
7. Summary financial statements for the year ended 31 March 2019. Adamstown: Pitcairn Islands Office; 2019. Available from: https://www.government.pn/government/financial-information, accessed 29 May 2024.
8. Public meeting notes held at the square, commencing 10:30am, March 10th 2020. Adamstown: Pitcairn Island Council; 2020. Available from: https://drive.google.com/file/d/1Q2IavE0Gsx6saWzZUdSFr_ONZtEdy9Ho/view, accessed 29 May 2024.
9. GPI Corona Virus Management Protocol Development Workshop, commencing 10.30am Thursday 12th March 2020. Adamstown: Pitcairn Island Council; 2020. Available from: https://drive.google.com/file/d/1kA7KuADTZzopHM8EBOXaQqSp5zZ6Zs4M/view, accessed 29 May 2024.
10. Minutes of the regular council meeting held at the public hall, commencing at 9.00am 13th Jan 2021. Adamstown: Pitcairn Island Council; 2021. Available from: https://drive.google.com/file/d/1ktlZRkHy-cM1RK2yHFeOmAkbOHVTQHy2/view, accessed 29 May 2024.
11. Public meeting notes held at the public hall, commencing at 10.30 am Tuesday, 13th May 2021. Adamstown: Pitcairn Island Council; 2021. Available from: https://drive.google.com/file/d/10FOFr8D-PdPq6XQjS3TOV3azKLoijqW9/view, accessed 29 May 2024.
12. Minutes of the regular council meeting held at the public hall, commencing at 9.30am 15th July 2020. Adamstown: Pitcairn Island Council; 2020. Available from: https://drive.google.com/file/d/1pI7kdrQEvve5ZhaxArNY1mXGofHeAgcT/view, accessed 29 May 2024.
13. The Pitcairn Miscellany. Sep 2022. Adamstown: Pitcairn Islands Tourism; 2022. Available from: https://www.visitpitcairn.pn/miscellany, accessed 29 May 2024.
14. The Pitcairn Miscellany. May 2023. Adamstown: Pitcairn Islands Tourism; 2023. Available from: https://www.visitpitcairn.pn/miscellany, accessed 29 May 2024.
15. Pitcairn Islands special council meeting, Wednesday 11 January 2023 – open (concluding council workshop), commencing 11.20am 11 January 2023, minutes. Adamstown: Pitcairn Island Council; 2023. Available from: https://drive.google.com/file/d/1XSSc3-dAf7VJsSnqgyDtVnUlPqA-CIuQ/view, accessed 29 May 2024.

Responding to COVID-19 on the outer islands of Tuvalu

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Problem: Coronavirus disease (COVID-19) reached Tuvalu's shores in November 2022, making Tuvalu one of the last countries in the world to experience community transmission of the disease. With minimal capacity to deliver critical care and a small health workforce that had been further depleted by COVID-19 infection, response priorities rapidly shifted to the outer islands.

Context: The outer islands are accessible only by boat, with travel taking from 6 to 24 hours. The return of high school students to their home islands for the Christmas holidays had the potential to place further pressure on the islands' medical facilities.

Action: A multiorganizational collaboration between the Australian and Fijian governments, the Pacific Community, the Tuvalu Ministry of Social Welfare and Gender Affairs (MoHSWGA) and the World Health Organization facilitated the deployment of two teams to the outer islands to provide support.

Outcome: The team worked with public health and clinical staff to provide technical support for clinical management, infection prevention and control, laboratory, risk communication, community engagement and logistics.

Discussion: The outer islands' response to the pandemic significantly benefited the island communities, the MoHSWGA and the team members who deployed. The key lessons identified relate to the need to strengthen the health workforce and supply chain.

PROBLEM

In November 2022, Tuvalu became one of the last countries in the world to experience an outbreak of coronavirus disease (COVID-19) when community transmission was detected on the main island of Funafuti.[1] With a land mass of 26 km^2 consisting of Funafuti and eight outer islands (OIs), Tuvalu is one of the smallest and most remote countries in the world.[2] Approximately 40% of Tuvalu's population of 11 000 live on the OIs.[2] In March 2020, with the primary objective of a COVID-19-free country, the Government of Tuvalu declared a state of emergency and initiated strict border measures.[3] As a precautionary measure to protect against the transmission of the virus to the OIs, the Government mandated the relocation of people from Funafuti back to their home islands and prohibited people returning to Funafuti.[3,4] This led to a 35% increase in the OI population.[5]

Shortly after a COVID-19 outbreak was reported in Funafuti, the OI of Nui detected COVID-19 in a traveller returning from Funafuti. This coincided with the end of the school year and the imminent return of nearly 500 boarding school students to their home islands. The possibility that the return of students could induce community transmission of COVID-19 across all OIs caused concern as health resources were likely to be rapidly overwhelmed. Estimations at the time suggested that a high percentage of the OI population had risk factors for severe COVID-19 disease, such as people aged over 60 years and those diagnosed with one or more noncommunicable diseases, in addition to pregnancy or smoking.[6]

Of particular concern was the potential for those with risk factors to develop severe or critical COVID-19 disease and requiring higher levels of treatment not

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available on the OIs. This prompted Tuvalu's Permanent Secretary for Health to make a formal request to the World Health Organization (WHO) for technical support. On 19 November 2022, Fiji, specialized agencies of the United Nations and partners deployed a chartered flight with medical supplies and health experts to Tuvalu.[1]

CONTEXT

Travel to the OIs and atolls from Funafuti takes at least 6 hours to reach the closest islands and up to 24 hours to reach Nanumea, the northernmost island. Travel to the OIs is only by government-run boat, which is costly and sometimes treacherous, resulting in injuries and fatalities when seas are rough. During the pandemic, the boat schedule was maintained so that fuel, food and medical supplies could be transported to the OIs. Each island imposed its own strict requirements such as pre-departure rapid assessment testing of passengers and crew, followed by quarantine measures on arrival. Some of the islands' authorities also imposed other travel restrictions such as not allowing people other than their own residents and health professionals to come to their islands.

The OIs have limited health resources. Apart from Vaitupu and Niulakita, all have just one health clinic served by a small team of health personnel, in most cases comprising a nurse, nurse's aide and sanitation officer.[2] Vaitupu, which hosts the only government-run high school in the country, has two clinics, one of which serves the transient high school population, which reaches 500 pupils during school terms. Currently, there is no purpose-built clinic on the island of Niulakita and the local nurse uses her own house as a makeshift clinic to serve a population of around 40. Critically unwell patients on OIs are reliant on transport to Funafuti by boat to Princess Margaret Hospital (PMH). The only hospital in Tuvalu, PMH is a 50-bed facility that provides primary- and secondary-level care and limited diagnostic services.[2,3] A significant amount of the health expenditure is spent on the Tuvalu Medical Treatment Scheme, whereby Tuvaluans are sent overseas to access specialty health care.[2]

ACTION

Multiorganizational collaboration between the Australian and Fijian governments, the Pacific Community, the MoHSWGA and WHO facilitated the deployment of two teams to the OIs to provide technical support.[1] Team members had expertise in care pathways and clinical management, environmental health, hospital management, infection prevention and control (IPC), laboratory and biomedicine, public health, risk communication and community engagement. Local doctors and nurses from the MoHSWGA travelled with the teams to strengthen the workforce on the OIs, which had been depleted due to COVID-19 infections.

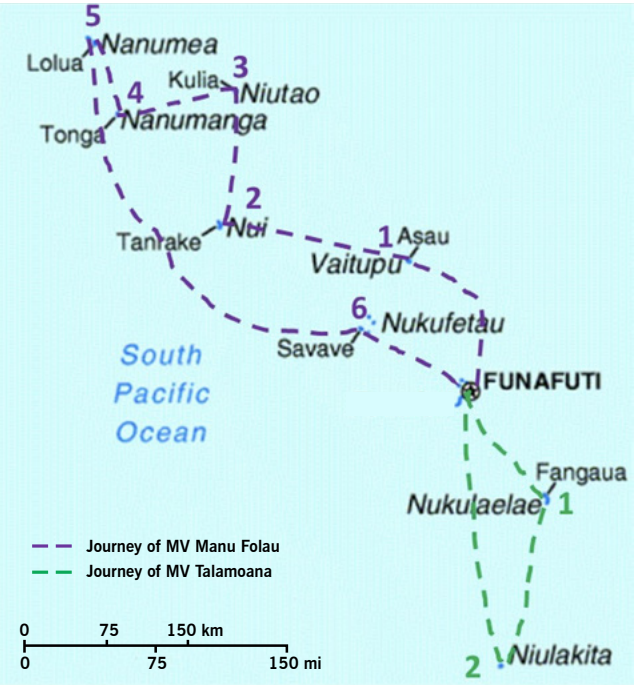
The first team who left Funafuti on the Marine Vessel (MV) Manu Folau on 4 December 2022 travelled for 6 days to the north and central islands (**Fig. 1**). A second team departed Funafuti on 13 December 2022, travelling by MV Talamoana on a 3-day journey to the southern islands of Nukulaelae and Niulakita (**Fig. 1**). The teams brought medical equipment, personal protective equipment (PPE), essential medicines and COVID-19 therapeutics, laboratory equipment and larger items such as hospital beds, oxygen concentrators, autoclaves and large oxygen tanks as well as fresh drinking water, as many of the islands were experiencing drought.

On each island, the teams spent considerable time at the health clinics redirecting and strengthening care pathways by providing technical assistance and refresher trainings in IPC, oxygen escalation, therapeutic management and clinical management; developing physical spaces for emergency management of severe and critical cases; performing maintenance and repair work on medical equipment; and providing clinical care such as treating outpatients and assisting with decision-making for complex cases. Team members also escorted local staff on home visits or mobile testing on some of the islands.

OUTCOME

By the time the teams arrived in December 2022, all the islands had reported COVID-19 cases but were at different stages in their response and had different COVID-19 measures in place. Most cases presenting to the clinics were non-severe, requiring outpatient treatment with medications for symptom relief such as paracetamol and ibuprofen or testing to confirm their COVID-19 status. Although manageable, this increased the workload at the clinics. The few critically ill patients (COVID-19 or non-COVID-19) were discussed with

Fig. 1. **Routes of two deployment teams on Marine Vessel (MV) Manu Folau and MV Talamoana from Funafuti to the outer islands, December 2022**



specialists on Funafuti and were medically evacuated by boat if deemed necessary.

Notable on all islands was the effect of drought, for which Tuvalu had declared a state of emergency on 8 November 2022.[7] The effects of drought were exacerbated on some islands where the desalination plants had malfunctioned. It was difficult to get the desalination plants fixed earlier due to the combined effects of geographical isolation and supply chain disruptions during COVID-19. All islands had broken or missing equipment important for health-care delivery such as thermometers, oxygen cylinders, electrocardiograph machines and sphygmomanometers (blood pressure monitors). In addition, some of the building infrastructure was in need of repair, such as air conditioning units and autoclaves.

As well as provisioning the islands with essential medicines, equipment and supplies, the deployment provided the health staff with face-to-face training in clinical care, IPC and sample collection. This training is rarely conducted due to the islands' isolation and distance from Funafuti and, more recently, due to the COVID-19 pandemic restrictions. Defective equipment was repaired, physical spaces were rearranged to optimize clinical care, and gaps were identified and reported to the MoHSWGA for action.

For the visiting teams, the journey to the islands was not without incident, with many team members experiencing seasickness particularly on the longer journeys. The MV Talamoana developed a fuel leak and was stranded for 12 hours until the engineers could fix it. Also, on that journey, it was not feasible to disembark on Niulakita due to rough seas. Instead, the community sent two members in a small vessel from the island to collect equipment and supplies from MV Talamoana and transfer a patient who needed to return to Funafuti.

DISCUSSION

Geographical isolation and supply chain disruptions presented a challenge for health workers who did not always have access to items such as PPE, testing kits, therapeutics or oxygen. They had to manage with broken, malfunctioning or missing equipment and infrastructure. The absence of alcohol-based hand rubs for hand hygiene on some OIs, combined with malfunctioning desalination plants and drought, had clear implications for effective IPC, making it difficult for health clinic staff and patients to adhere to hand hygiene principles.

Supply chain disruptions impacted many Pacific island countries and areas (PICs) during the COVID-19 pandemic, leading to an increase in the cost of products and difficulties in obtaining essential medical supplies.[8,9] The effect of COVID-19 on supply chains globally has been well reported, with the pandemic highlighting global supply chain vulnerabilities related to critical medical supplies.[9–11] This supports the implementation of strategies such as the pre-positioning of essential supplies to ensure that they reach remote communities and that access can be maintained during times of crisis.

During the outbreak, an increase in health clinic presentations placed pressure on the small OI workforce, which was not prepared to manage the large influx of patients. It was fortunate that very few people on the OIs required higher-level care as health workers on the OIs were not well equipped to manage critical patients. Currently, the Government of Tuvalu is building airstrips on each OI, which may reduce their geographical isolation and ensure that critically unwell patients have

faster access to higher levels of care. Lessons from this deployment emphasize that this project should be combined with strengthening maintenance schedules and supply chains for essential equipment and supplies, as well as providing appropriate training for health workers to utilize equipment safely and effectively. The need to strengthen critical care in the region was identified at the beginning of the COVID-19 pandemic, and nurses in many PICs, including Tuvalu, were upskilled in critical care.[12]

The deployment to the OIs was beneficial in terms of ensuring that technical support and medical supplies were delivered during a time when the OIs were experiencing uncertainty. The deploying teams also reassured OI communities by supporting and ensuring that health workers on the OIs were included in the MoHSWGA national COVID-19 response. The strengthening of care pathways and clinical processes, as well as the visiting teams' sharing of technical knowledge and skills with the local staff, helped improve confidence among local health workers. Upon their return, the teams were also debriefed by the MoHSWGA on the needs, strengths and gaps of each island. This was a unique opportunity for the international members of the deploying teams to exchange knowledge, as the OIs of Tuvalu are rarely visited by outsiders. The deployment also provided an opportunity for other team members with ties to the OIs to visit their friends and families and give back to their own communities.

This deployment is a good example of how regional and international cooperation has strengthened the networking and collaboration capacity of senior administrators in the MoHSWGA in preparation for future health emergencies. The lessons outlined in this paper provide points for consideration when preparing for future outbreaks in remote OIs or PICs. This experience highlighted two key areas of focus for future pandemic or outbreak preparedness for the OIs, namely, access to essential medical supplies during times of crisis and capacity strengthening to manage critically unwell patients in the OIs.

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Conflicts of interest

The authors have no conflicts of interest to declare.

Ethics statement

This report does not study the experiences of human participants; therefore, no ethics approval was sought. However, the appropriate approvals were sought from Dr Nuha Mahmoud of the WHO Division of Pacific Support in Suva, Fiji, and the Tuvalu Minister of Health, MoHSWGA.

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References

1. Fiji, the UN and partners deploy medical personnel and supplies in solidarity with Tuvalu's COVID-19 response effort. Manila: WHO Regional Office for the Western Pacific; 2022. Available from: https://www.who.int/westernpacific/about/how-we-work/pacific-support/news/detail/19-11-2022-fiji--the-un-and-partners-deploy-medical-personnel-and-supplies-in-solidarity-with-tuvalu-s-covid-19-response-effort, accessed 1 August 2023.
2. Borgelt K, Siose TK, Taape IV, Nunan M, Beek K, Craig AT. The impact of digital communication and data exchange on primary health service delivery in a small island developing state setting. PLoS Digit Health. 2022;1(10):e0000109. doi:10.1371/journal.pdig.0000109 pmid:36812579
3. Farbotko C, Kitara T. How is Tuvalu securing against COVID-19? Canberra: Devpolicy Blog, Australian National University; 2020. Available from: https://devpolicy.org/how-is-tuvalu-securing-against-covid-19-20200406, accessed 1 August 2023.
4. Kitara T, Farbotko C. How Tuvalu is doing repatriation. Canberra: Devpolicy Blog, Australian National University; 2020. Available from: https://devpolicy.org/how-tuvalu-is-doing-repatriation-20200817/, accessed 1 August 2023.
5. Migration 2018–2020. Funafuti: Tuvalu Central Statistics Division; 2021. Available from: https://stats.gov.tv/news/migration-2020/, accessed 1 August 2023.
6. Living guidance for clinical management of COVID-19: living guidance, 23 November. Geneva: World Health Organization; 2021. Available from: https://iris.who.int/handle/10665/349321, accessed 1 August 2023.

7. Lesa S. As world gathers for COP27, Tuvalu declares state of emergency for extreme droughts. Apia: Secretariat of the Pacific Regional Environment Programme; 2022. Available from: https://reliefweb.int/report/tuvalu/world-gathers-cop27-tuvalu-declares-state-emergency-extreme-droughts, accessed 1 August 2023.

8. Connell J. Double jeopardy: distance and decentralization in Tuvalu. In: Campbell Y, Connell J, editors. COVID in the islands: a comparative perspective on the Caribbean and the Pacific. Singapore: Palgrave Macmillan; 2021.

9. Jephcott G, Consultancy K. Investigation of the supply-chain disruption due to the pandemic and its economic impacts on business across the Forum Island Countries, including micro, small and medium enterprises. Suva: Pacific Islands Forum; 2022. Available from: https://www.forumsec.org/wp-content/uploads/2022/08/Attachment-PIFS-and-Kotamas-Study-of-COVID-19-Impact-on-Pacific-Island-Supply-Chains.pdf, accessed 1 August 2023.

10. Naidu S, Patel A, Pandaram A, Chand A. Global supply chain disruptions during COVID-19 health crisis. In: Leal Filho W, Azul AM, Brandli L, Özuyar PG, Wall T, editors. Responsible consumption and production. Encyclopedia of the UN Sustainable Development Goals. Springer, Cham; 2020. doi:10.1007/ 978-3-319-71062-4_122-1

11. Asia-Pacific trade facilitation report 2021: supply chains of critical goods amid the covid-19 pandemic disruptions, recovery, and resilience. Bangkok: Economic and Social Commission for Asia and the Pacific; 2021. Available from: https://www.unescap.org/kp/2021/APTF, accessed 1 August 2023.

12. Nurses trained for surge in critical care. Suva: Pacific Community; 2020. Available from: https://www.spc.int/updates/blog/2020/09/nurses-trained-for-surge-in-critical-care, accessed 1 August 2023.

Establishing an early warning surveillance system in jails in Calabarzon, the Philippines, 2021

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The Philippines' Republic Act 11332 (2020) mandates prisons, jails and detention centres to participate in disease surveillance, but currently no surveillance system exists in these facilities. This report aims to describe the piloting of an early warning disease surveillance system in 21 selected jails in Calabarzon from July to September 2021. Sites were selected based on congestion, proximity to health facilities and logistical capacity. Data sources, collection mechanisms and reporting tools were determined and health personnel were trained in the operation of the system. During the implementation period, the system detected 10 health events, with influenza-like illness and foodborne illness being the most common. Nine of these events were reported within 24 hours. The local health unit provided medications for clinical management and instructed jail nurses on infection prevention and control measures, including active case finding, the isolation of cases and the inspection of food handling. Twelve sites reported over 8 of the 10 weeks, with all sites reporting zero cases promptly. The challenges identified included insufficient workforce, slow internet speed and multitasking. It was concluded that the jail-based early warning surveillance system is feasible and functional, but the perceived benefits of jail management are crucial to the acceptability and ownership of the system. It is recommended to replicate the surveillance system in other penitentiaries nationwide.

Infectious diseases pose a significant global health concern.[1] Jail systems have particular challenges in controlling infectious diseases, as inmates are more vulnerable due to factors such as overcrowding and marginalized representation.[2–4] In the Philippines, jails were identified as potential hotspots for disease transmission when the COVID-19 pandemic struck the country. By March 2021, amidst the pandemic, 2416 detainees and 1295 personnel tested positive for COVID-19 within these facilities. Among those infected, 26 detainees and six personnel lost their lives to the virus (Bureau of Jail Management and Penology. Monthly health report on COVID-19, March 2021. Unpublished).

The Philippines' Republic Act No. 11332 (2020), titled the "Mandatory Reporting of Notifiable Diseases and Health Events of Public Health Concern Act,"[5] mandates various public and private institutions to actively participate in disease surveillance and report cases of notifiable diseases. However, no disease surveillance system is currently established in Philippine jails, despite their dense and overcrowded populations heightening the risk of outbreaks, and limited disease reporting impeding early response.[6,7]

Disease surveillance enables continuous data collection and analysis to monitor disease burden, identify at-risk groups, track health outcomes and monitor targeted interventions.[8,9] Disease surveillance utilizes two key methods – indicator-based surveillance, which monitors predetermined health markers for routine analysis, and event-based surveillance, which captures unstructured data to detect emergent health events rapidly. Indicator-based surveillance follows a structured approach, whereas event-based surveillance offers flexibility in identifying unforeseen health risks.[8,10] An organized and rapid system for capturing epidemiological data is essential to detect and respond to public health threats promptly, ultimately reducing morbidity and mortality.[11]

[a] Department of Health, Manila, Philippines.
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In order to address the lack of disease surveillance in jails in the Philippines, a jail-based early warning surveillance system (JBEWS) was piloted in selected Calabarzon jails from July to September 2021. Calabarzon is an administrative region in central Luzon, Philippines, comprising five provinces and one highly urbanized city, representing around 15% of the Philippine population as of 2020. We describe the process of developing and establishing the disease surveillance system, which includes the assessment of the current reporting systems in the jails and the monitoring and evaluation of the implemented system.

METHODS

The development and implementation of the JBEWS in Calabarzon was conducted based on *A guide to establishing event-based surveillance* published by the World Health Organization (WHO).[10] The pilot study was conducted in three phases: the pre-implementation phase to design the surveillance system, the implementation of the system in the pilot sites, and the post-implementation review phase.

Pilot sites

The study is conducted in jail units in the Philippines, which house unsentenced persons deprived of liberty or those undergoing trial; hence, the word "jail" is used throughout this article. The pilot study included 21 of the 62 jails in Calabarzon, representing 30% of facilities by detainee numbers. They were purposely sampled using criteria based on high congestion rates, proximity to external health facilities and the presence of nurses assigned to the jail. The jails were divided into three groups based on population size: Category A had 14 jails with over 500 detainees, Category B had 33 jails with 100–500 detainees, and Category C had 10 jails with fewer than 100 detainees. To ensure representation across facility types, 30% of the jails from each category were randomly selected. If a jail's management opted not to participate in the study, another jail from the same category was randomly selected.

Pre-implementation phase

The study team reviewed detainees' health records from January 2020 to May 2021 and conducted key informant interviews and focus group discussions to inform the design of the surveillance system. A pilot facility assessment checklist was used to assess a facility's readiness to establish a disease surveillance system, including the availability of a workforce, computers and reliable internet connectivity.

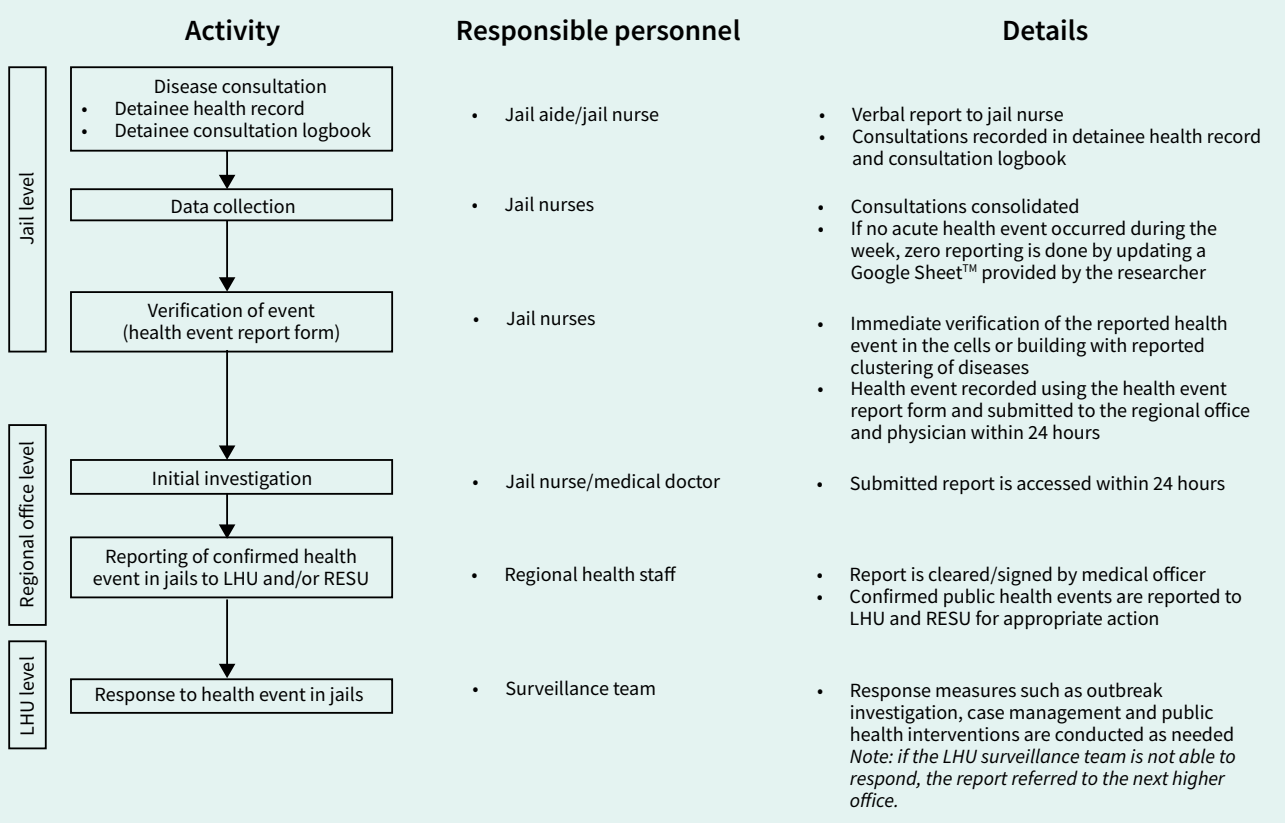
The focus group discussion was facilitated by selected medical staff, including the jail nurses responsible for disease reporting and officials of the Bureau of Jail Management and Penology (BJMP) from the pilot sites. They discussed the project in terms of their experiences, beliefs, perceptions and attitudes in relation to the conduct of jail disease surveillance. A semi-structured questionnaire was applied to gather information on the perceived preparedness and needs for the establishment of the disease surveillance system. Interviews conducted by external partners in the disease surveillance network included questions on organizational structure, reporting methods, data management and response activities. The JBEWS was then designed based on the information collected (**Fig. 1**).

Prior to implementation of the JBEWS, a comprehensive 1-day training course was held for jail nursing staff, medical officers and disease surveillance officers from Calabarzon local health units. This training familiarized the participants with the operation of the JBEWS, including the data collection tools and reporting flow.

Implementation phase

The implementation phase was conducted from 1 July to 15 September 2021, to give sufficient time for jail health events to be captured and to monitor consultations and hospitalizations among detainees and personnel. Data were then collected from the JBEWS on the events reported and responses. A submitted report was deemed timely if it was received within 24 hours of detecting the event. The completeness of reporting was assessed by the number of weekly consultation and hospitalization entries in the system. Data were analysed weekly using descriptive analyses and presented through tables and graphs in Microsoft Excel®. Electronic formats were stored securely, with the JBEWS team responsible for record keeping and archiving.

Fig. 1. **Design process flowchart for the jail-based early warning system, Calabarzon, the Philippines, from 1 July to 15 September 2021**



LHU: local health unit; RESU: Regional Epidemiology and Surveillance Unit.

Post-implementation phase

A focus group discussion with jail nurses was conducted to identify gaps and issues encountered during the implementation of the project. A final report on the outputs of the project was submitted to the BJMP and the Epidemiology Bureau of Calabarzon.

RESULTS

Pre-implementation phase

The key informant interviews and focus group discussions provided a summary of how the existing jail health programme in Calabarzon operated. The BJMP in Calabarzon operates 62 jails accommodating 22 880 detainees with 1853 staff. The Health Service Division is responsible for implementing health programmes and generates a monthly health report obtained from the detainee health consultation logbook, which monitors consultations provided to detainees for 130 ailments. However, reporting compliance is low, except for tuberculosis (TB) and HIV. A high compliance rate with daily reporting of COVID-19 cases was also required.

The records review showed that from January 2020 to May 2021, 88 069 detainees underwent medical examinations, with the most common ailments being boils, upper respiratory tract infections and rashes (**Table 1**). There were no available records of medical consultations for jail personnel during the review.

The pre-implementation assessment phase highlighted that few health events were reported through the existing system due to a shortage of health personnel, communication issues with the local health authorities, and a lack of communication protocols for detecting health events. In addition, jail staff reported that they lacked comprehensive disease surveillance training, and that the reporting system focused mainly on TB and HIV. They were also unfamiliar with Republic Act 11332 because it had not been disseminated to them. The Health Service Division acknowledged the

Table 1. Top 10 reported conditions in the record review of jail detainees in Calabarzon, the Philippines, from January 2020 to May 2021

Condition	Number of consultations	Attack rate per 100 population
Boils	10 959	48
Upper respiratory tract infection	10 891	47
Rash	5990	26
Hypertension	4865	21
Influenza	4168	18
Acute gastroenteritis	3896	17
Caries	3815	17
Migraine	3243	14
Infected wound	2596	11
Arthritis	2536	11

Source: Bureau of Jail Management and Penology. Monthly health report on COVID-19, March 2021. Unpublished.

importance of disease surveillance to prevent epidemics but reported that challenges arose due to the inadequate distribution of medical personnel, leading to multitasking among health-care professionals. Jail nurses recognized their role in reporting communicable diseases, but they were unaware of an existing early warning system and suggested capacity building and improved resources to enhance functionality. Limitations in reporting health events included a lack of coordination with local health units and unreliable internet connectivity.

Description of the system

The JBEWS was designed based on the information gathered during the pre-implementation phase, the existing monthly reporting system and WHO's *A guide to establishing event-based surveillance*[10] (**Fig. 1**).

When a jail nurse identified a disease cluster or an unusual surge in detainee consultations, they completed a health event form within 24 hours of detection. This form includes details such as time, location, number of cases detected, instances of mortality or hospitalization and responses. These reports were submitted to the decision-makers at the regional offices and the respective local health unit who implemented necessary measures such as outbreak investigation, case management and other public health interventions. The reports were also sent to the pilot study team. If there were no detected health events, the nurses were asked to submit a zero-health event report to the pilot study team at the end of each week in a Google Sheet™.

The JBEWS is primarily an event-based surveillance system. However, zero case reporting was included, which is typically associated with indicator-based surveillance. The reason was to verify the absence of any unreported health events and ensure weekly reporting in the system.

Implementation phase

The JBEWS captured 10 health events between 1 July and 15 September 2021. Two of the 21 jails each reported three events, while one reported two events and two reported one event – four influenza-like and three foodborne illnesses, an adverse event following immunization and conjunctivitis (**Table 2**). One case of pulmonary tuberculosis (PTB) was confirmed through laboratory testing and reported through the JBEWS (**Table 2**). The local health units promptly referred these health events to the regional doctor. Immediate responses included clinical management, the distribution of medications, active case finding and food-handling inspections to prevent further cases. The adverse event following immunization was also properly managed, and communicable diseases, such as influenza, conjunctivitis and PTB, were handled with active case finding and isolation to prevent further transmission (**Table 2**). All detected health events were between 2 and 10 cases, with no severe cases requiring hospitalization.

All reported health events were confirmed as genuine public heath events. Nine were reported to the JBEWS within 24 hours. All pilot sites reported zero cases in a timely manner. Twelve of the 21 pilot sites submitted weekly consultation and hospitalization entries at least eight times during the 10 weeks of the implementation phase.

Post-implementation phase

The evaluation of the JBEWS identified challenges such as workforce shortages, slow internet connectivity and the need for multitasking, with the lack of personnel posing the most significant obstacle. The COVID-19 pandemic further disrupted health-service delivery. Suggestions on improving the system included increasing internet accessibility, augmenting the workforce, implementing a uniform daily consultation logbook and

Table 2. Health event reported through the pilot jail-based early warning system in Calabarzon, the Philippines, from 1 July to 15 September 2021

Date of occurence	Pilot facility	Health event	No. of cases detected	Actions	Response
5 July 2021	Jail A	Influenza	7	Verified and recorded	-LHU monitoring -Clinical management -Isolation of cases -Active case finding
9 July 2021	Jail B	Influenza	10	Verified and recorded	-LHU monitoring -Clinical management -Isolation of cases -Active case finding
13 July 2021	Jail A	Foodborne illness	4	Verified and recorded	-Clinical management -Active case finding -Inspection of food handling
21 July 2021	Jail B	Foodborne illness	2	Verified and recorded	-LHU monitoring -Clinical management -Active case finding -Inspection of food handling
21 July 2021	Jail C	Foodborne illness	2	Verified and recorded	-LHU monitoring -Clinical management -Active case finding -Inspection of food handling
29 July 2021	Jail C	Influenza	2	Verified and recorded	-LHU monitoring -Clinical management -Isolation of cases -Active case finding
6 August 2021	Jail D	Adverse effect following immunization	2	Verified and recorded	-LHU monitoring -Clinical management
3 September 2021	Jail B	Influenza	3	Verified and recorded	-LHU monitoring -Clinical management -Isolation of cases -Active case finding
5 September 2021	Jail A	Conjunctivitis	2	Verified and recorded	-Clinical management -Isolation of cases -Active case finding
5 September 2021	Jail E	Pulmonary tuberculosis	2	Verified and recorded	-LHU monitoring -Clinical management -Isolation of cases -Active case finding

LHU: local health unit.

designating a focal person for each jail. Despite the challenges, the system proved effective in capturing, reporting and referring health events, leading to close monitoring and rapid case finding. It also strengthened collaboration between the jails and local health units. Jail nurses recommended implementing the system in other jails and regions to enhance disease control and outbreak prevention.

DISCUSSION

The JBEWS was successfully piloted in 21 jails in Calabarzon, the Philippines. The system detected health events with potential public health risks facilitating the timely assessment and response to control outbreaks. During the pilot study, the JBEWS was effective in capturing, verifying and reporting

health events to higher authorities and local health units within 24 hours. The BJMP accepted the introduction of proactive measures through the implementation of a disease surveillance system to detect and respond to potential disease outbreaks within their facilities.

The integration of the existing reporting system into the JBEWS was a prudent approach for enhancing sustainability and efficiency, as it avoided the duplication of efforts.[12] The existing consultation logbook, which contained essential information to effectively capture health events, was a valuable resource for the new reporting system. In addition, positive perceptions and commitment from jail health personnel were crucial to its success,[13] and were highlighted as all pilot sites conducted zero case reporting during the 10 reporting weeks of the pre-implementation phase. The fact that only 11 of the 21 jails submitted timely consultation and hospitalization logbook entries indicates a need to strengthen personnel commitment to high-quality data reporting.[14]

The establishment of the JBEWS in more locations will require additional workforce, capacity building through training and improved internet connections. The use of other methods for 24/7 reporting that are crucial for event-based surveillance could also be explored, such as telephone calls, short message services (SMS), emails and faxes.[15] Raising awareness of the Philippines' Republic Act 11332 for the mandatory reporting of infectious diseases among jail staff and enhancing coordination with local health units will facilitate data sharing and response. Addressing issues such as workforce shortages and slow internet connections when planning the improvement and sustainability of the JBEWS will enhance its effectiveness, provide a valuable tool to prevent and manage disease outbreaks in jails, and promote public health and safety.[9]

The pilot of the JBEWS encountered several limitations. As it was conducted during the peak of the COVID-19 pandemic, while jails were under lockdown, the usual service delivery mechanisms were restricted. The lockdown imposed stringent restrictions on movement, access and interactions within the jail setting, affecting the regular functioning of health-care services and surveillance procedures. This situation made it particularly challenging for external personnel, such as health-care professionals or surveillance officers, to enter the facility and conduct routine monitoring or investigations. Consequently, the surveillance methodology had to adapt to these limitations by using internal resources, such as jail nurses to facilitate active case finding and reporting within the confined environment. Despite these limitations, the primary goal of establishing an early warning system to detect outbreaks was achieved.

It is recommended that the BJMP should establish the JBEWS nationwide to enhance disease surveillance in the penal system. It is also recommended that the Philippines' Republic Act 11332 for mandatory reporting be circulated to all offices and units within the BJMP. For the JBEWS to operate effectively, the nursing workforce would need to be increased and the internet connectivity improved. It is also suggested that the BJMP should create an interagency policy with the Department of Health to adopt the JBEWS, so that the Department of Health can support the implementation of the system and provide technical assistance for the public health response and laboratory services. By implementing these measures, the disease surveillance system in the jails can be strengthened, enabling timely reporting and response to potential health risks.

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Conflicts of interest

The authors have no conflicts of interest to declare.

Ethics approval

Approval for the pilot study was obtained from both the national and regional levels of the Bureau of Jail Management and Penology, with the study protocol reviewed by the Directorate for Program Development.

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References

1. Michaud CM. Global burden of infectious diseases. In: Schaechter M, editor. Encyclopedia of Microbiology. 3rd ed. Academic Press; 2009. pp. 444–54. doi:10.1016/B978-012373944-5.00185-1
2. Preventing infectious diseases in prisons: a public health and human rights imperative. London: Penal Reform International; 2015. Available from: https://www.penalreform.org/blog/preventing-infectious-diseases-in-prisons-a-public-health/, accessed 29 June 2020.
3. Ndeffo-Mbah ML, Vigliotti VS, Skrip LA, Dolan K, Galvani AP. Dynamic models of infectious disease transmission in prisons and the general population. Epidemiol Rev. 2018;40(1):40–57. doi:10.1093/epirev/mxx014 pmid:29566137
4. Nijhawan AE. Infectious diseases and the criminal justice system: a public health perspective. Am J Med Sci. 2016;352(4):399–407. doi:10.1016/j.amjms.2016.05.020 pmid:27776722
5. Mandatory Reporting of Notifiable Diseases and Health Events of Public Health Concern Act. 2020. Republic Act No. 11332. Available from: https://ntp.doh.gov.ph/download/mandatory-reporting-of-notifiable-diseases-and-health-events-of-public-health-concern-act/, accessed 3 April 2024.
6. Yarcia LE. Kalusugan sa kulungan: examining the policy for people living with HIV/AIDS and hepatitis C in Philippine prisons. London: International Drug Policy Consortium; 2018. Available from: https://idpc.net/publications/2018/05/kalusugan-sa-kulungan-examining-the-policy-for-people-living-with-hiv-aids-and-hepatitis-c-in-philippine-prisons, accessed 20 January 2021.
7. Morales NJ. Jails, justice system at breaking point as Philippine drugs war intensifies. Reuters. 1 September 2017. Available from: https://www.reuters.com/article/us-philippines-justice/jails-justice-system-at-breaking-point-as-philippine-drugs-war-intensifies-idUSKCN1BB39F, accessed 20 January 2021.
8. Event-based surveillance. Atlanta (GA): United States Centers for Disease Control and Prevention; 2023. Available from: https://www.cdc.gov/globalhealth/healthprotection/gddopscenter/event-based-surveillance.html, accessed 15 September 2023.
9. Kuehne A, Keating P, Polonsky J, Haskew C, Schenkel K, Le Polain de Waroux O, et al. Event-based surveillance at health facility and community level in low-income and middle-income countries: a systematic review. BMJ Glob Health. 2019;4(6):e001878. doi:10.1136/bmjgh-2019-001878 pmid:31908863
10. A guide to establishing event-based surveillance. Manila: WHO Regional Office for the Western Pacific; 2008. Available from: https://iris.who.int/handle/10665/207737, accessed 14 December 2021.
11. Flanigan TP, Zaller N, Taylor L, Beckwith C, Kuester L, Rich J, et al. HIV and infectious disease care in jails and prisons: breaking down the walls with the help of academic medicine. Trans Am Clin Climatol Assoc. 2009;120:73–83. pmid:19768164
12. Bawa SB, Olumide EA, Umar US. The knowledge, attitude and practices of the reporting of notifiable diseases among health workers in Yobe State, Nigeria. Afr J Med Med Sci. 2003;32(1):49–53. pmid:15030066
13. Bautista MB. 31 integrated jail management system for the Bureau of Corrections. 2014. Available from: https://api.semanticscholar.org/CorpusID:173983655, accessed 13 February 2021.
14. Centers for Disease Control (CDC). Guidelines for evaluating surveillance systems. MMWR Suppl. 1988;37(5):1–18. pmid:3131659
15. Usman R, Bakare L, Akpan UO, Dalhat M, Dada AO, Okudo I, et al. Establishing event-based surveillance system in Nigeria: a complementary information generating platform for improved public health performance, 2016. Pan Afr Med J. 2022;42:63. doi:10.11604/pamj.2022.42.63.29621 pmid:35949466

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