Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
Short Communication

Unique pattern of COVID-19 infection in the State of Hawai‘i

F. DeWolfe Miller a,⁎, Sumner La Croix b, Tim Brown e, L. Thomas Ramsey d, David Morens g

a John A. Burns School of Medicine, University of Hawaii, Honolulu, HI 96813, United States
b University of Hawaii Economic Research Organization, Honolulu, HI 96822, United States
c East-West Center, Honolulu, HI 96848, United States
d University of Hawaii, Honolulu, HI 96822, United States
e National Institute of Allergy and Infectious Diseases, National Institutes of Health, Building 31, Room 7A-03, 31 Center Drive, MSC 2520, Bethesda, MD 20892-2520, United States

A R T I C L E   I N F O

Article history:
Received 10 October 2020
Received in revised form 25 November 2020
Accepted 26 November 2020

A B S T R A C T

This is a brief report on an unusual observation regarding COVID-19 cases. The State of Hawaii is one of the most remote of the Pacific islands and the population is approximately 1.4 million. The racial and ethnic diversity is very high. For example, white Caucasians comprise ~25%, Asians including Japanese, Chinese, and other Asian groups account for ~30%, Hawaiians for 20%, and Pacific Islanders mostly from Micronesia and Samoa comprise ~4%. We discovered that the COVID-19 rate in the latter group was up to 10 times that in all of the other groups combined and they accounted for almost 30% of cases. Moreover, we are unaware of COVID-19 transmission from Pacific Islanders to islanders with other ethnicities. Thus, there is an epidemic within the epidemic in Hawaiʻi.

© 2020 The Author(s). Published by Elsevier Ltd on behalf of International Society for Infectious Diseases. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

The State of Hawaiʻi comprises the most remote of the Pacific islands and it is currently experiencing an unusual coronavirus disease 2019 (COVID-19) epidemic within an epidemic. Hawaiʻi is an archipelago with a population of 1.42 million in 2019. Most COVID-19 cases have been concentrated on the main island of Oʻahu, followed by much smaller rates on Maui, Kauaʻi, and the Island of Hawaiʻi. The first confirmed case of COVID-19 was reported in a Hawaiʻi resident who returned to Oʻahu on March 6, 2020. A sharp peak in COVID-19 cases occurred in March and April 2020, where 62% were attributed to returning residents and visiting tourists. On March 23, the State imposed mandatory 14-day isolation on all incoming visitors and residents returning from the United States and foreign countries. Daily air passenger arrivals dropped to 1–2% of those in 2019. By April 23, the number of reported cases of COVID-19 decreased to less than five per day. Many non-essential businesses reopened between May 15 and June 15, and the stay-at-home order was lifted on June 1. However, COVID-19 transmission in Hawaiʻi rebounded at the end of July and peaked at the end of August. The City and County of Honolulu banned social gatherings on August 18, as well as adding a stay-at-home order and closing non-essential businesses on August 27. In total, 15,003 cases were reported in the week ending October 30 (DOH, 2020).

Hawaiʻi’s population is multi-ethnic, including large subpopulations descended from Asians, native Hawaiians, other Pacific islanders, and Europeans, as well as many recent immigrants, predominantly from Asia and the Pacific islands. The COVID-19 case rate per 100,000 for Pacific Islanders was 448 on July 17 and 7.5 times higher than the combined rate for all other non-Pacific Islanders (59.7/100,000). The COVID-19 rate in native Hawaiians (not included in the Pacific Islanders classification) was 52.5/100,000 and slightly lower than the rate in Caucasians at 63.0/100,000 (see Figure).

Remarkably, the cumulative rate per 100,000 among Pacific Islander after July 17 increased during every 7-day interval to 2383/100,000 by September 4. On October 30, Pacific Islanders comprised 4% of the total population of Hawaiʻi but they accounted for 31% of the total reported COVID-19 cases (Figure 1).

Pacific Islanders in Hawaiʻi come primarily from American Samoa, followed by countries with a compact of free association (COFA) with the United States: Federated States of Micronesia or FSM (Pohnpei, Kosrae, Chuuk, and Yap), the Republic of the Marshall Islands, and the Republic of Palau. Smaller numbers come from Guam, Tonga, Tahiti, and other Pacific Islands. Many have chosen to live permanently in Hawaiʻi and roughly 80% of the

⁎ Corresponding author.

https://doi.org/10.1016/j.ijid.2020.11.201
1201-9712/© 2020 The Author(s). Published by Elsevier Ltd on behalf of International Society for Infectious Diseases. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).
Pacific Islander population are located in Honolulu (DBEDT, 2012). Anecdotal reports from local community health centers, which are the principal medical providers for Pacific Islanders, indicate that COVID-19 cases are concentrated among people from the COFA countries, who make up almost one-third of this group (Halliday and Akee, 2020).

The median ages of members of the various Pacific Islander groups were between 18.5 and 23.7 years in 2013–2017, which were much lower than the median age of 38.6 years in the entire state (DBEDT, 2018). The sex ratios for the larger groups are slightly above or below 1.0. Pacific islanders are less educated than the rest of the population and their per capita incomes were 30%–80% below the median for the remaining population of Hawai‘i in 2013–2017 (DBEDT, 2018). They are more likely to work in frontline service jobs than the rest of the population, particularly in the tourism sector (DBEDT, 2018; DBEDT, 2020).

The epidemic among Pacific Islanders in Hawai‘i has not been mirrored by significant COVID-19 epidemics in the corresponding Pacific islands, except for Guam, the Northern Mariana Islands, and French Polynesia. In particular, there is no evidence for COVID-19 transmission occurring between Pacific Islanders and non-Pacific Islanders in Hawai‘i, i.e., an epidemic within the larger island-wide epidemic.

Local explanations for the high COVID-19 rates in Pacific Islanders have been inferred from observations that Pacific Islander households in Hawai‘i tend to be multi-generational, thereby leading to crowded living quarters, which make physical distancing, isolating at home, and adhering to lockdown orders difficult, and these issues may increase COVID-19 transmission. Language barriers and cultural practices anchored in large group meetings, such as religious services but particularly funerals, may have also contributed to the observed high rates.

Specific measures are being implemented to reduce transmission in Pacific Islander communities in Hawai‘i (Derauf et al., 2020). Most Pacific Islanders (excluding native Hawaiians) in the United States do not live in Hawai‘i but instead they live in the continental United States, and thus they should be monitored by public health officials for COVID-19 infections and elevated mortality rates (DBEDT, 2020; Derauf et al., 2020).

Financial support

None.

Conflicts of interest statement

None.

Ethical approval

Not required.

References

Derauf D, Miller FD, Brown T. The Fierce Urgency of Now – Engaging Pacific Islander Communities in Hawaii to contain COVID–19. Honolulu, Hawaii: East – West Center; 2020 East-West Wire. 24 Aug 2020.
Halliday TJ, Akee RQ. The impact of Medicaid on medical utilization in a vulnerable population: Evidence from COFA migrants. Health Economics 2020;2020(29):1231–50. https://doi.org.eres.library.manoa.hawaii.edu/10.1002/hec.4132.