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Mobile COVID-19 Vaccination Clinics Reach Disadvantaged Populations and Increase Vaccination Rates

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Abstract

COVID-19 vaccines are a critical intervention for controlling the spread of COVID-19 and may be administered at fixed clinic locations or mobile clinics. This study compares the demographics of the populations vaccinated at fixed and mobile clinics to investigate whether mobile clinics vaccinate a different population from fixed clinics and to assess whether mobile clinics improve vaccination rate and success. A retrospective chart review was conducted for all COVID-19 vaccinations (N=325 988) administered by a major Hawai'i health care provider at its affiliated fixed and mobile clinics between January 2021 and May 2022. Data collected included location of vaccination, age, sex, primary race, health insurance provider, and billing zip code. Mobile clinics vaccinated younger patients on average (P<.001). Native Hawaiians and other Pacific Islanders (risk-adjusted odds ratio = 2.03, 95% CI=1.96, 2.11) as well as those with non-commercial health insurance (risk-adjusted odds ratio = 4.26, 95% CI = 4.02, 4.51) were most likely to be vaccinated at a mobile clinic rather than a fixed clinic, as compared to White patients. The differences between the patient populations vaccinated at fixed and mobile clinics suggest that mobile clinics may be a useful tool in expanding the reach of vaccination efforts to a more demographically diverse patient population.

Abbreviations and acronyms

AI/AN = American Indian/Alaska Native
aOR = adjusted odds ratio
COVID-19 = coronavirus disease 2019
HPH = Hawai'i Pacific Health
NHOPI = Native Hawaiian and other Pacific Islander
OR = odds ratio
rOR = risk-adjusted odds ratio

Introduction

Vaccination has been identified as a critical intervention in controlling the spread of coronavirus disease 2019 (COVID-19). Mobile clinics, which are specially equipped motor vehicles that deliver health care services directly to communities, are a well-established model of care both in Hawai'i and the continental US. There are an estimated 2000 mobile clinics serving approximately 7 million patients nationwide,[1,2] providing a variety of health care services including vaccinations, infectious disease screening, chronic condition screening, women's health services, and health education. In Hawai'i, various organizations have deployed mobile clinics, including the Hawai'i Houseless Outreach and Medical Education Project,[3] the Keēwemauliola vehicle operated by Kaiser Permanente,[4] and Project Vision Hawai'i,[5] to bring primary care services directly to communities. These services include vaccinations, health screenings, wound care, well child visits, vision screenings, and dental exams.

Mobile clinics across the country frequently care for medically underserved populations. Because they travel directly to communities, they help to mitigate logistical and psychological barriers to care including lack of transportation, challenges with making appointments, long wait times for care, concerns about contracting COVID-19 in a public location, and intimidation by health care settings. Minority patients and those with low socioeconomic status are more likely to experience these barriers to care due to disproportionately limited internet, computer, and transportation access,[6,7] as well as a distrust of health care institutions stemming from historic discrimination in medical settings. Therefore, mobile clinics are uniquely positioned to enhance health care access for these vulnerable populations. In the continental US, mobile COVID-19 vaccine clinics have been found to vaccinate high numbers of racial minorities[6,8,9] and higher proportions of minorities compared to fixed clinics.[9,10] Fixed clinics are defined as COVID-19 vaccination centers which do not move between sites, such as hospitals, doctors' offices, and mass vaccination centers.

Hawai'i, which is the only US state where non-Hispanic Whites do not make up a majority of the population,[11] has a unique demographic composition compared to other states, with much higher proportions of Asian, Native Hawaiian and other Pacific Islander (NHOPI), and multiracial individuals. In Hawai'i, patients received COVID-19 vaccines at either fixed clinics, including hospitals and mass vaccination centers, or at mobile clinics deployed by health care organizations. While the patient demographics served by mobile clinics, including mobile COVID-19 vaccine clinics, are well documented in the continental US, fewer data exist on mobile COVID-19 vaccinations in the uniquely diverse population of Hawai'i.

In light of the distinctive demographic makeup of the state and the well-established diversity of the mobile clinic patient population in other parts of the country, a comparison of fixed and mobile clinic vaccinations in Hawai'i may help to determine mobile clinic usefulness as a strategy for targeting particular patient demographics. Additionally, this comparison might inform the future use of mobile clin-

ics for providing other health care services to those groups. Therefore, this study compares the demographics of the populations vaccinated for COVID-19 at fixed clinics and mobile clinics in order to determine whether mobile vaccine clinics reached a demographically distinct population from traditional, fixed clinics.

Methods

Development of mobile clinics

Hawai'i Pacific Health (HPH), a large health care system in Hawai'i, vaccinated patients against COVID-19 through a combination of fixed and mobile vaccine clinics. While HPH performed the majority of its vaccinations at fixed clinics, including medical centers, affiliated medical offices, and at the Pier 2 Cruise Terminal in Honolulu, HPH also deployed mobile vaccine clinics in approximately 130 locations beginning in May 2021 in order to increase access to the COVID-19 vaccine. These mobile clinics were operated onboard the "Vax Squad Buses," a set of retrofitted tour buses, which transported vaccines and medical personnel to schools, shopping centers, churches, and other community-based settings across the islands of O'ahu and Kaua'i. Mobile clinic locations were selected based on community need and logistical feasibility, with a focus on areas distant from mass vaccination centers.

Data collection

A retrospective chart review was performed for all COVID-19 vaccinations administered by HPH between January 2021 and May 2022. Vaccinations of HPH employees (N=18 711) were excluded, yielding a total of 325 988 vaccinations. Data collected for each patient included the location of vaccination, age, sex, primary race, health insurance provider, and billing zip code. Health insurance provider was classified as commercial (insurance plans provided by private companies), Medicare/Medicaid, or military. Patients whose insurance coverage did not fall under these 3 categories, including patients without health insurance, were classified as "other." This study was determined to be exempt from Institutional Review Board review by the Hawai'i Pacific Health Research Institute.

Data stratification

Because COVID-19 vaccine eligibility was initially staggered based on factors such as patient occupation, age, and medical history, demographic comparisons between the populations vaccinated at fixed and mobile clinics were separated into 7 time periods. To devise the time periods, a vaccine eligibility timeline was created and partitioned based on the dates on which HPH began offering vaccinations to different groups. From January to March 2021, HPH extended eligibility to individuals aged 75 and older and first responders, followed by essential workers in February and early March 2021. Eligibility further expanded in early March 2021 to include individuals aged 70 and older and those with high-risk medical conditions. In mid-March 2021, the focus shifted to individuals aged 65 and older, with further expansion to those aged 60 and older by late March and early April. By April 2021, vaccination was available to those aged 16 and older across both O'ahu and Kaua'i, eventually expanding to include those aged 12 and up and 5 and up throughout 2021 and 2022. Time period 7, which lasted from April 2021 to May 2022, was the only period during which both fixed and mobile vaccine clinics were operational and available to community members. Additionally, it was the longest time period of the 7 and provided the greatest number of vaccinations. Therefore, comparisons between patient demographics at fixed vs. mobile clinics were only made for time period 7. **Table 1** displays the dates and patient eligibility information for each time period.

Statistical analysis

Descriptive statistics were calculated to characterize the study population. T-test was used to compare mean ages between fixed and mobile clinic groups. Chi-square was used to test differences for categorical variables (age, sex, race, and insurance type). Multivariable logistic regression was used to calculate the likelihood of vaccination at a mobile clinic adjusting for various demographic factors. Statistical analyses were done using Stata 15.1 (College Station, TX).

Results

Demographic composition by vaccination site type

Mobile clinics (N=42 245) vaccinated proportionally younger patients compared to fixed clinics (N=137 098), with a mean (SD) age of 32.3 (24.1) years at mobile clinics compared to 36.8 (22.7) years at fixed clinics (P<.001). Mobile clinics also vaccinated a slightly higher percentage of male patients than fixed clinics (48.4% vs. 47.1%, P<.001). **Table 2** shows the age and sex demographics of the populations vaccinated at fixed and mobile clinics during time period 7.

The population vaccinated at mobile clinics had a significantly different racial composition than the population vaccinated at fixed clinics, with mobile clinics vaccinating higher percentages of NHOPI (19.3% vs. 13.3%, P<.001) and Black patients (1.5% vs. 1.1%, P<.001) and a lower percentage of White (16.4% vs. 21.3%, P<.001) and Asian patients (55.7% vs. 58.3%, P<.0001). **Figure 1** illustrates the primary race distribution of patients vaccinated at fixed and mobile clinics.

Mobile clinics vaccinated a higher percentage of patients with Medicaid/Medicare (31.5% vs. 28.4%, P<.001) and military insurance (6.4% vs. 1.9%, P<.001) and a lower percentage of patients with commercial insurance (57.7% vs. 66.8%, P<.001). **Figure 2** illustrates the health insurance type distribution of patients vaccinated at fixed and mobile clinics.

Table 1. Time Periods Used for Demographic Comparisons of COVID-19 Vaccine Administration

Time Period	Dates	Patient Eligibility	N
1	1/15/21–3/31/21	Age 75+ and first responders	25806
2	2/1/21–3/7/21	Essential workers	49826
3	3/8/21–3/14/21	Age 70+ and high-risk medical conditions	13037
4	3/15/21–3/28/21 3/15/21–3/21/21	Age 65+ (Oʻahu) Age 65+ (Kauaʻi)	25211
5	3/29/21–4/11/21 3/22/21–4/4/21	Age 60+ (Oʻahu) Age 60+ (Kauaʻi)	28886
6	4/12/21–4/18/21	Age 50+ (Oʻahu)	11714
7	4/5/21–5/12/21 4/19/21–5/12/21 5/13/21–11/2/21 11/3/21–5/9/22	Age 16+ (Oʻahu) Age 16+ (Kauaʻi) Age 12+ Age 5+	179343

Table 2. Age and Sex Demographics by Vaccination Site During Time Period 7

Variable	**Fixed** (N=137098)	**Mobile** (N=42245)	***P*-value**
Mean ± SD			
Age	36.8 ± 22.7	32.3 ± 24.1	<.001
Percent (n)			
Male	47.1% (64528)	48.4% (20459)	<.001
Female	52.9% (72517)	51.5% (21768)	
X	0.0% (53)	0.0% (18)	

X = patients designated neither male nor female

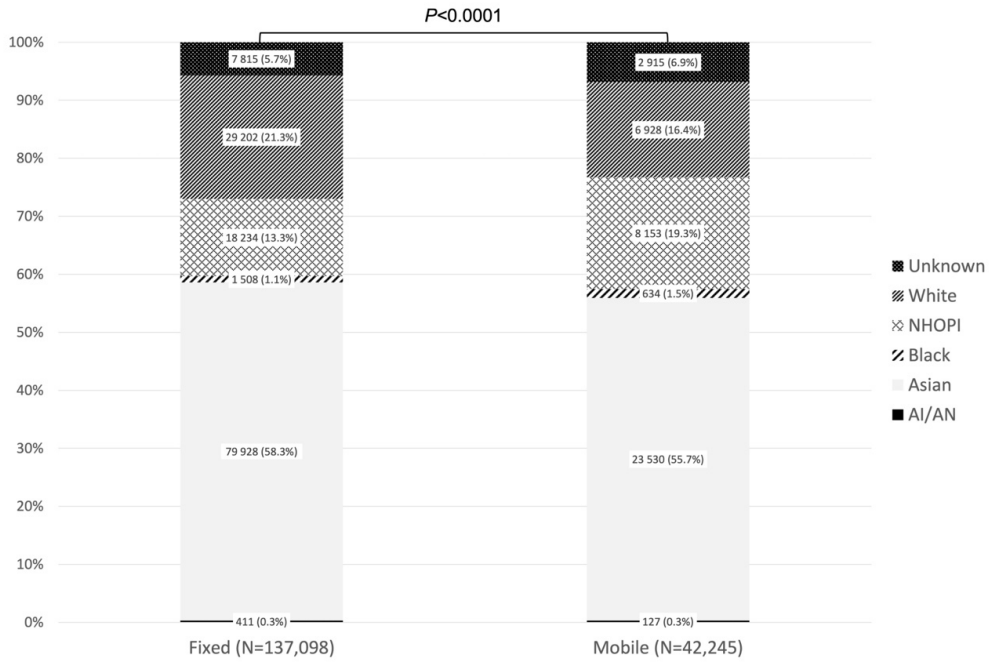

Figure 1. Primary Race Distributions of the Populations Vaccinated at Fixed and Mobile Clinics During Time Period 7

NHOPI = Native Hawaiian and other Pacific Islander, AI/AN = American Indian/Alaska Native

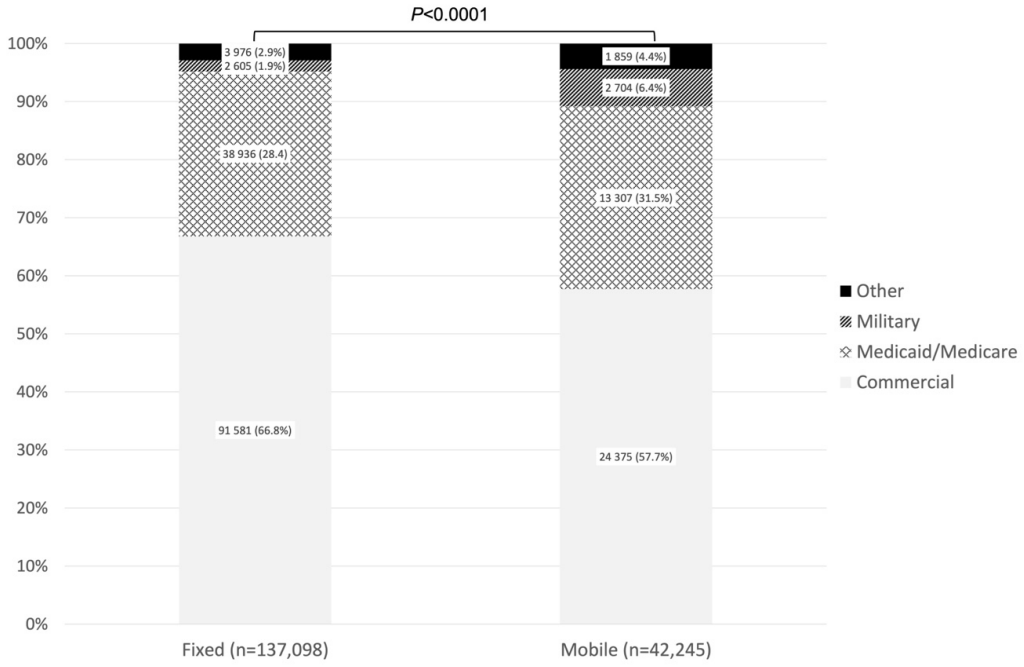

Figure 2. Health Insurance Type Distributions of the Populations Vaccinated at Fixed and Mobile Clinics During Time Period 7

NHOPI = Native Hawaiian and other Pacific Islander, AI/AN = American Indian/Alaska Native

Multivariable comparisons between vaccination site types

Table 3 shows the likelihood of individuals of a given race or health insurance type to visit a mobile clinic rather than a fixed clinic in comparison to a reference population (White and commercial insurance). After adjusting for race and insurance type, racial minorities, including American Indian/Alaska Native, Asian, Black, and NHOPI patients, were more likely to visit mobile clinics in comparison to White patients (P<.05). Among minority groups, NHOPI patients were the most likely group to visit mobile clinics, with a risk-adjusted odds ratio of 2.03 (95% CI=1.96, 2.11). Patients with non-commercial health insurance, including those with Medicaid/Medicare and military insurance, were more likely to visit mobile clinics in comparison to those with commercial insurance (P<.05). Patients with military insurance were the most likely to visit mobile clinics compared to the commercial insurance group, with a risk-adjusted odds ratio of 4.26 (4.02, 4.51).

Discussion

These findings regarding COVID-19 vaccination tendencies are consistent with studies done in the continental US which found that mobile health clinics, including mobile COVID-19 vaccine clinics, predominantly serve patients who are younger, belong to racial minorities, and are either uninsured or underinsured. However, it is the first to investigate the reach of mobile COVID-19 vaccine clinics within the distinctive demographic composition of Hawai‘i and found that NHOPI patients were the most likely to visit mobile clinics out of all the racial groups studied. This suggests that mobile clinics are especially effective in reaching the NHOPI population in Hawai‘i, a community of particular concern given that NHOPI patients experience higher COVID-19 case rates and suffer poorer outcomes from COVID-19 in comparison to other racial and ethnic groups.[12] Mobile vaccine clinics may have been deployed near communities with higher concentrations of NHOPI residents, thereby improving geographic access. Additionally, mobile clinics may reduce logistical and cultural barriers to care that disproportionately affect NHOPI communities, such as transportation challenges or distrust of institutional health care settings.

In addition, the higher proportion of patients with Medicare, Medicaid, and military insurance seen at mobile clinics compared to those with commercial insurance suggests that mobile clinics may be particularly useful in reaching individuals with public insurance coverage. While insurance categories are not a uniform indicator of socioeconomic status, patients with public insurance may be more likely to face financial or logistical barriers to care.[13, 14] As such, they may benefit significantly from the reduced barriers provided by mobile health care delivery, highlighting the potential of mobile clinics to improve access for these populations.

Overall, these results strongly suggest that mobile clinics in Hawai‘i may be an effective tool in targeting specific populations, including racial minorities and those with public health insurance, for the purposes of vaccinations. This is particularly important in communities where access to traditional health care facilities is limited due to geographic, financial, or cultural barriers. Therefore, mobile

Table 3. Likelihood of Vaccination at a Mobile Location During Time Period 7

Variable		OR	95% CI	rOR*	95% CI
Race	White	Reference		Reference	
	AI/AN	1.39	(1.23, 1.72)	1.41	(1.14, 1.75)
	Asian	1.24	(1.20, 1.28)	1.37	(1.33, 1.42)
	Black	1.75	(1.59, 1.93)	1.44	(1.30, 1.59)
	NHOPI	1.88	(1.81, 1.95)	2.03	(1.96, 2.11)
	Unknown	1.56	(1.48, 1.64)	1.54	(1.47, 1.62)
Insurance Type	Commercial	Reference		Reference	
	Medicaid/Medicare	1.28	(1.25, 1.31)	1.28	(1.25, 1.31)
	Military	3.92	(3.70, 4.14)	4.26	(4.02, 4.51)
	Other	1.71	(1.61, 1.81)	1.71	(1.61, 1.81)

OR = odds ratio, rOR = risk-adjusted odds ratio, AI/AN = American Indian/Alaska Native, NHOPI = Native Hawaiian and Other Pacific Islander
*Adjusted for race and insurance type.

clinics may also be useful for reaching these groups with other health care interventions, such as biometric screenings or specialty care including hearing, vision, and dental services.

Limitations

Although there are inherent limitations to conducting a retrospective study with data collection from the electronic medical records, consistent recording at mobile and fixed vaccination sites potentially limited erroneous and missing information. The study did not control the analysis for variation in mobile site locations, which may have influenced patient demographics. Many of the sites, which the "Vax Squad Bus" visited, were schools and locations near US military bases on Oʻahu, which may have influenced the age and insurance type of patients visiting the mobile clinics held at those sites. Additionally, the electronic medical record only documents patient-reported primary race and does not include more detailed ethnicity information, meaning that it was not possible to make direct comparisons of multiracial patients, which make up 24% of the population of Hawaiʻi,[15] vaccinated at fixed and mobile clinics. Another potential limitation is that this study counted the total number of vaccines administered, not the number of individual patients vaccinated. Therefore, some patients may have been counted more than once if they received both their initial and booster doses during time period 7. Lastly, this study was limited to the patient population served by a single Hawaiʻi health care provider, which is large, but not the only health care provider in the state of Hawaiʻi. Nonetheless, this study provides valuable data about the provision of COVID vaccinations in Hawaiʻi.

Conclusion

The mobile clinic model may be an effective tool for targeting specific populations, including racial minorities and patients with public insurance, in Hawaiʻi and the rest of the US with future important health care interventions including vaccinations, disease screenings, and other specialty services. This could potentially provide a resource to increase health equity for groups at increased risk for suboptimal medical care access and outcomes.

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Conflict of Interest and Disclosures

None of the authors identify any conflict of interest.

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