

## CASE STUDY

# Best Practices for an Equitable Covid-19 Vaccination Program

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An array of factors hamper equitable Covid-19 vaccine deployment in the United States along racial, ethnic, age, and geographic lines. The Puget Sound Veterans Affairs facility developed a multidisciplinary vaccine delivery strategy to forestall systematic inequities in receipt of vaccination among veterans using methods that can be used by other health care organizations. The VA Puget Sound Health Care System deployed targeted outreach to individual patients on the basis of a simple score consisting of the sum of risk factors for severe Covid-19 disease and high-risk race or ethnicity. The health system then conducted sequential outreach using multiple communication modalities; worked with trusted community stakeholders to publicize and deploy mobile clinics to underserved areas; and monitored vaccination coverage rates by age, race, sex, and rural status at prespecified intervals and adjusted operations to ensure equity. Vaccination rates were highest in Black, multiracial, and Hispanic veterans compared with white veterans during the vaccine drive, a finding that persisted after the drive.

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## KEY TAKEAWAYS

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- » Develop an intentional vaccine delivery strategy in conjunction with experts in population-level barriers to vaccination; explicitly include demographic and social determinants of health data to prioritize vulnerable populations in accessing vaccination.
  - » Utilize multiple communication channels to reach patients who prefer to receive vaccine-related information in different formats.
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- » Reach out across departmental lines to expand vaccine delivery outside of the hospital or clinic (e.g., in-home vaccination, pop-up mobile clinics).
- » Employ learning health system methods, including using data to identify vaccine candidates, monitoring equity at prespecified intervals, and adjusting operations accordingly.
- » Collaborate with trusted community stakeholders from outside the medical establishment to enhance vaccine outreach and acceptance.

## The Challenge

The Covid-19 pandemic represents the greatest challenge to the U.S. health care system in a generation. Many groups with the highest Covid-19 incidence and rates of hospitalization and death are simultaneously experiencing the lowest rates of vaccination.<sup>1-4</sup> Black and Hispanic Americans suffer disproportionate age-adjusted Covid-19 deaths, but as a group, vaccination coverage rates initially hovered 10 to 20 percentage points below those of white Americans, although the gap had narrowed somewhat as of late July 2021.<sup>5,6</sup>

An array of factors around vaccine allocation, outreach, delivery, and monitoring hampered the initial equitable Covid-19 vaccine deployment in the United States.<sup>7</sup> Physical or geographic barriers may affect individuals with impaired mobility, housing instability, or rural residence. Complex vaccine registration processes hinder vaccination among those with language barriers, limited Internet connectivity, or time constraints. Lack of paid sick leave propagates vaccine hesitancy because of concern for missing work for vaccination or potential side effects. Finally, the fragmented initial U.S. vaccine rollout and a history of understandable mistrust in the medical system have been a few of the factors undermining vaccine willingness among Black and Hispanic Americans.<sup>8</sup> These barriers collectively contribute to Covid-19 vaccine inequities and necessitate a varied approach to ensure vaccine delivery to all willing individuals.

Our facility is part of the U.S. Veterans Health Administration (VHA). Military veterans are a heterogeneous group with a range of attitudes influencing health care decisions, including seven of 10 military families reporting concerns about vaccine safety, side effects, and efficacy according to one December 2020 survey. A follow-up survey in early April 2021 showed that among unvaccinated respondents without a scheduled appointment, 40% of veterans and 24% of active-duty service members reported that they definitely would not get vaccinated, whereas 26% of veterans and 17% of active service members said they definitely would get vaccinated.<sup>9,10</sup> Our vaccination program considered numerous factors that could affect vaccination access and acceptance in our catchment population.

## The Goal

We aimed to achieve an equitable, coordinated, and data-driven Covid-19 vaccination drive with respect to race, ethnicity, age, and geographic distance in a veteran population.

## The Execution

### *Setting*

The VHA is an integrated health care organization with 171 medical centers, 1,112 outpatient clinics, and more than 9 million enrolled veterans.<sup>11</sup> The VHA was allocated its own vaccine supply from the U.S. government, which was then distributed across VHA geographic regions and specific facilities. As a group, VHA patients are at risk of poor outcomes related to Covid-19 because of older age, a high burden of medical comorbidities, and disproportionate rates of social vulnerability. In December 2020, the VHA network rolled out a centralized vaccine prioritization schema developed in conjunction with the National Center for Ethics in Health Care.<sup>12</sup> Vaccination age strata diverged slightly from those of the Centers for Disease Control and Prevention (CDC), given the older population of the VHA compared with the United States overall (the median age of VHA enrollees is 65 years [interquartile range 50–73 years]).<sup>13</sup> The VHA also differed by recommending priority vaccination for specific groups at risk of severe Covid-19 disease or of viral exposure because of frequent contact with health care (e.g., hemodialysis, spinal cord injury, hospital-based chemotherapy, and solid-organ transplant) or communal dwelling status (e.g., nursing home resident or persons experiencing homelessness).

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Individual VHA facilities were given independent responsibility for developing their own outreach strategies and vaccine scheduling processes in conjunction with central VHA guidance. In instances in which the number of veterans within a priority group exceeded the local supply of vaccine, facilities were granted the authority to further substratify vaccination priority groupings.<sup>14</sup>

### *Best Practices Using the Equitable Vaccine Framework*

The VA Puget Sound Health Care System is a 291-bed academically affiliated tertiary care hospital with two main divisions (Seattle and Tacoma, WA) and seven outlying community clinics. Approximately 1 month in advance of our facility’s first administered Covid-19 vaccination in December 2020, we assembled a team to develop a facility-level framework for equitable vaccine delivery. Our strategy included four main domains: allocation, outreach, delivery, and monitoring (Table 1). Core team members came from several disciplines, including primary care, ethics, diversity/equity/inclusion, rehabilitation medicine, nursing, physical therapy, informatics, and health services research.

Table 1. Equitable Vaccine Framework Adapted to the VA Puget Sound

Vaccination Domain	Factors Creating Risk of Health Inequity*	Strategies to Reduce Inequity and Improve Vaccine Access
Dose allocation	<ul style="list-style-type: none"> <li>• Comorbidity (e.g., chronic disease, disability)</li> <li>• Racialization (including ethnoracial and ethnocultural diversity)</li> <li>• Age</li> </ul>	<ul style="list-style-type: none"> <li>• Utilized central VHA strategy to guide local implementation</li> <li>• Created facility-level equity work group to advise on best practices</li> <li>• Prioritized high-risk racial and ethnic groups within age strata</li> <li>• Substratified within age groups, when needed, on the basis of expected vaccine allocation</li> </ul>
Outreach	<ul style="list-style-type: none"> <li>• Racialization (including ethnoracial and ethnocultural diversity)</li> <li>• Gender identity/sex</li> <li>• Education/literacy level</li> <li>• Social capital (social support/networks, trust)</li> </ul>	<ul style="list-style-type: none"> <li>• Proactive outreach via sequential telephone, letter, email, and text message</li> <li>• Partnership with trusted community organizations to reach specific groups including nonprofit veteran advocacy groups, county department of health partnerships, and tribal representatives</li> <li>• Active use of social media channels</li> </ul>
Delivery	<ul style="list-style-type: none"> <li>• Place of residence (e.g., rural, homeless)</li> <li>• Occupation</li> <li>• Socioeconomic status (including income, coverage of health care and health care interventions)</li> <li>• Social capital (social support/networks, trust)</li> <li>• Age</li> </ul>	<ul style="list-style-type: none"> <li>• Large-scale longitudinal vaccine clinics at two sites (Seattle and Tacoma)</li> <li>• Longitudinal vaccine clinics at four smaller community-based sites</li> <li>• Mobile Medical Unit pop-up clinics at five additional rural sites</li> <li>• Availability of weekend and after-hours appointments</li> <li>• In-home vaccination via Homeless Health and Home-Based Primary Care teams for delivery of vaccination to homeless shelter residents and frail/elderly/homebound patients</li> <li>• Expansion of home vaccination to include other homebound veterans beyond elderly/frail (e.g., those with serious mental illness, post-traumatic stress disorder unable to come to large vaccine clinics)</li> <li>• Vaccination offered to inpatients on day of discharge, when medically appropriate</li> <li>• Free transportation support for qualifying veterans</li> </ul>
Monitoring	<ul style="list-style-type: none"> <li>• Place of residence (e.g., rural, homeless)</li> <li>• Racialization (including ethnoracial and ethnocultural diversity)</li> <li>• Age</li> </ul>	<ul style="list-style-type: none"> <li>• Regular monitoring of vaccination rates according to specific demographics: age, race, ethnicity, sex, ZIP Code/county, and defined clinical cohorts (homebound or experiencing homelessness)</li> <li>• Learning Health System approach using real-time data to guide operations (e.g., low vaccination rates in certain counties/ZIP Codes leading to mobile vaccination clinic in that area; low vaccination rates in Native American veterans leading to discussion with VHA tribal representatives)</li> </ul>

\*Note: Informed by the Equity Matrix in Ismail SJ, Tunis MC, Zhao L, Quach C. Navigating inequities: a roadmap out of the pandemic. *BMJ Glob Health* 2021;6:e004087. <https://gh.bmj.com/content/6/1/e004087>. Source: The authors.

## Allocation Strategy

Our team designed a vaccination allocation and priority strategy that identified individuals for early targeted outreach to forestall systematic inequities in receipt of vaccination. We assigned equal

weight to CDC-defined high-risk comorbidities and high-risk racial or ethnic groups and created a simple score consisting of the sum of risk factors. CDC-defined high-risk comorbidities used in our risk score included cancer, chronic kidney disease, chronic obstructive pulmonary disease, heart conditions (such as heart failure, coronary artery disease, or cardiomyopathies), weakened immune system (e.g., from solid-organ transplant), obesity (body mass index of 30 kg/m<sup>2</sup> or higher), sickle cell disease, smoking, and type 2 diabetes mellitus.<sup>15</sup> We summed up to five comorbidities in addition to high-risk race or ethnicity for a total risk score range of 0–6 for each patient.

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Given that age is the dominant risk factor for Covid-19 mortality, with other characteristics conferring additional risk with unknown relative impact, we contacted veterans for scheduling, by age group, in order of highest to lowest risk score. If patients tied by risk scores, they were contacted in order of oldest to youngest. To minimize travel burdens and to preserve patient-centeredness, once veterans became eligible on the basis of age group, no veterans were turned away if they requested vaccination or if they had another appointment that would bring them to the hospital, regardless of their risk score within their age group.

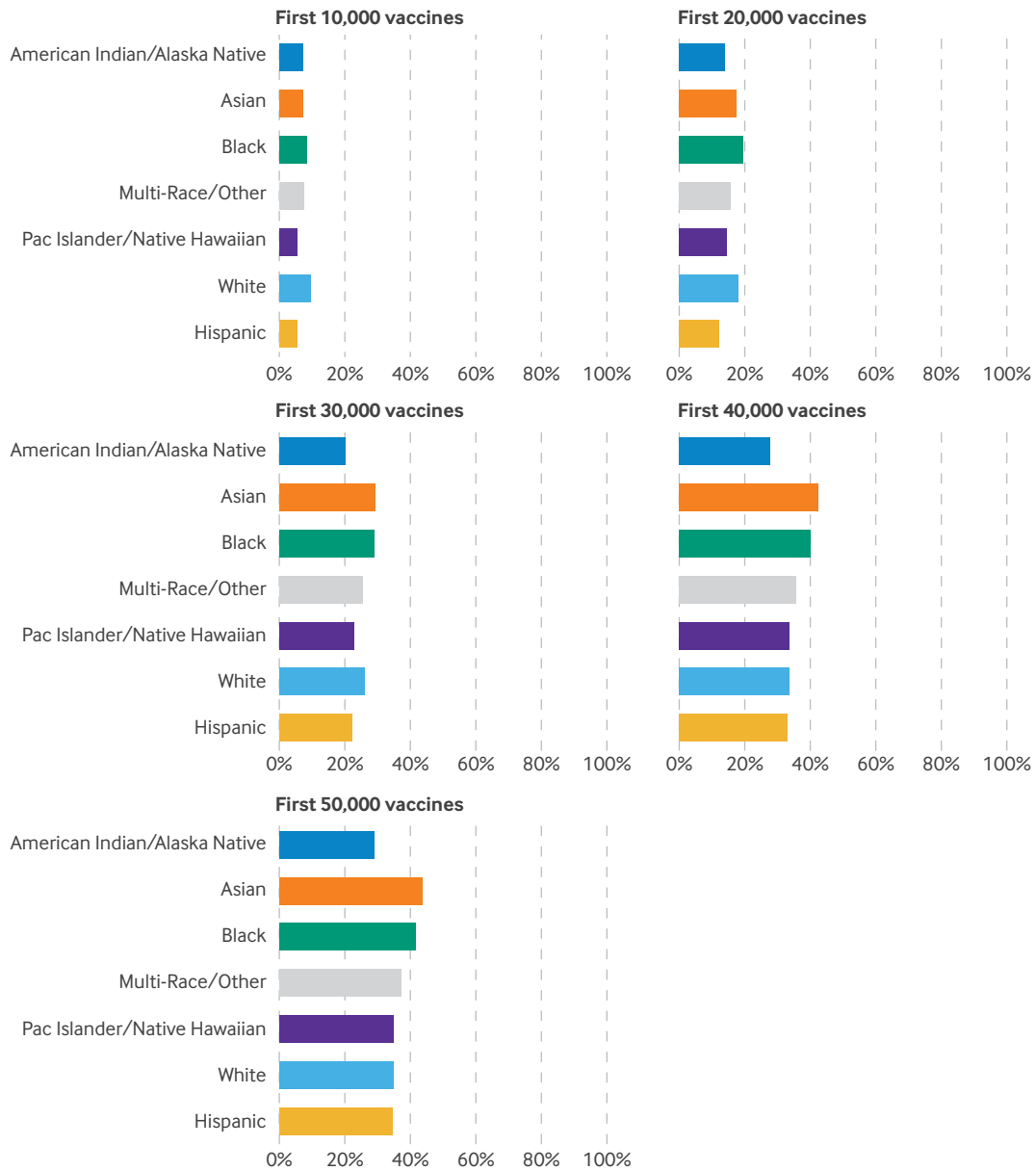
## *Outreach*

We conducted a systematic, multimodal outreach program for 100% of our veteran catchment population within 100 days to invite each patient for vaccine scheduling. We intentionally avoided relying on Web-based self-scheduling platforms as the primary conduit to vaccination appointments. Although it is more labor intensive than self-scheduling, we felt that initial personal outreach using individual telephone calls or emails was less likely to lead to disparities. During our vaccine drive, which launched December 21, 2020, and concluded May 30, 2021, our facility redeployed approximately 25% of our scheduling staff from routine hospital duties to support mass vaccine outreach. Outreach began with up to three automated, outbound telephone calls with direct connection to a live scheduler if the recipient answered the phone. For nonrespondents to phone outreach, we sequentially proceeded with a no-reply email with instructions to call our vaccine scheduling hotline, a mailed letter with the same information, and, lastly, a self-scheduling option using SMS text messaging. To facilitate uptake among those suspected to be at risk of barriers to vaccination, our facility worked with trusted frontline personnel, community stakeholders, our Social Work service, and local nonprofit veteran advocacy groups. We specifically disseminated tailored outreach to homeless veterans and rural and minority veterans. During the initial period, interest in vaccines was strong and exceeded available doses. In more recent months, the outreach team has encountered vaccine hesitancy. Outreach workers

FIGURE 1.

## Cumulative Receipt of Covid-19 Vaccination by Race and Ethnicity

By monitoring delivery at 10,000-vaccine intervals, the team was able to ensure equitable distribution by race and ethnicity. While uptake was greatest among white veterans at the first interval, over time, we saw increased vaccination rates among eligible Black, Asian, and multiple-race veterans. The period covered is from December 18, 2020, through July 28, 2021. Pac = Pacific.



Source: The authors

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were provided a script for such instances, and they were instructed to refer patients to their primary care provider for specific questions on side effects or other medical concerns.

## *Delivery*

We encountered a variety of barriers to equitable vaccine delivery, summarized using the validated Equity Matrix framework (Table 1).<sup>7</sup> Approximately 70% of vaccinations were given at large mass vaccination sites based at our two medical center campuses. We also offered vaccinations at four community-based rural clinics on a rotating basis. We compiled ZIP Code data using the most recent home address to identify locations with high concentrations of unvaccinated veterans and deployed targeted mobile outreach to five carefully chosen rural pop-up clinic locations. Additional mobile vaccination offerings included offsite teams sent to individually vaccinate homebound veterans or groups of veterans living in homeless shelters. We identified veterans for individualized vaccination via referrals from our home-based primary care program and the program's waiting list, our homeless primary care program, our rehabilitation medicine service, and our mental health department.

## *Monitoring*

Vaccine equity was monitored at intervals of every 10,000 vaccinations by comparing the cumulative proportion vaccinated by race and ethnicity, sex, and rural status within each age cohort (Figure 1).

These data were discussed by the vaccine equity team and translated into proactive, tailored interventions consistent with Learning Health System principles and vaccine equity best practices (Table 1).<sup>16,17</sup> For example, the team quickly noticed that vaccinations in rural counties lagged rates in King County, where Seattle is located. In response, we reviewed vaccine coverage rates by ZIP Code to select destinations for pop-up clinics based out of our hospital's Mobile Medical Unit. We promoted vaccination among rural veterans by collaborating with nonprofit veterans service organizations located in rural areas. These organizations often also assisted us with logistics, such as clinic setup and veteran transportation to the vaccination clinics.

## **Hurdles**

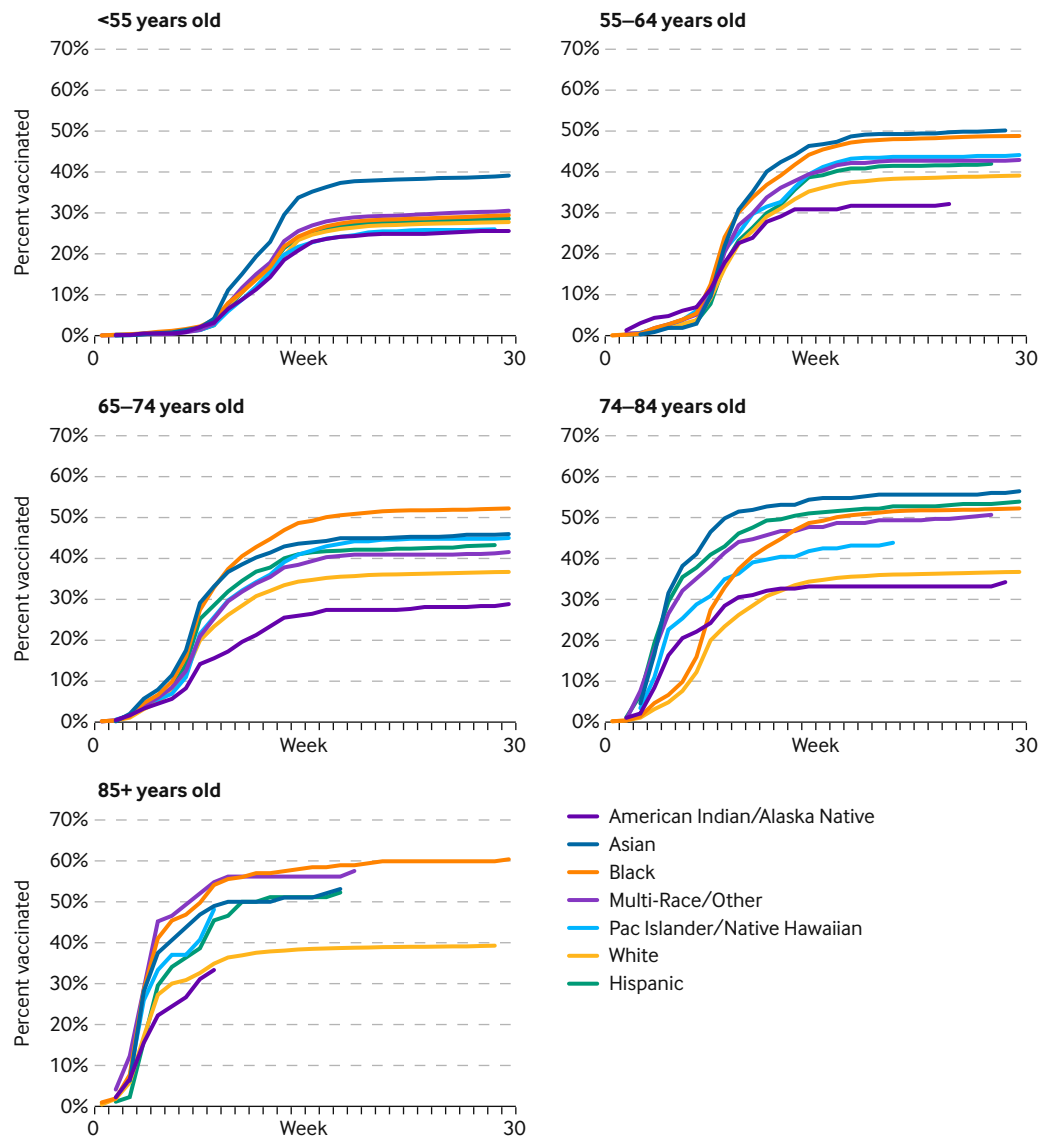
The initial vaccine supply was erratic and required a flexible outreach strategy that could be rapidly adjusted depending on the quantity of available vaccine. Fluctuating vaccine dose allocation required methodical and repeated communication to patients and community partners to apprise them of the availability of doses and locations for vaccination offerings. This communication was accomplished through public town hall-style meetings, direct patient email outreach, a recorded vaccine information hotline, and regular social media updates. With a limited initial vaccine supply initially, our personnel faced challenges communicating the rationale for phased eligibility to veterans who flooded our telephone lines seeking vaccination. We delivered frequent internal communications to staff members so that they were able to provide accurate information to veterans. We created scripting for telephone staff on the basis of prior research suggesting that veterans prefer a sickest-first allocation strategy for limited health care resources.<sup>18</sup>



FIGURE 2.

## Cumulative Receipt of Covid-19 Vaccination by Race, Ethnicity, and Age

Black, Hispanic, and multiracial veterans had higher rates of Covid-19 vaccination compared with white veterans in each age cohort. For all race and ethnicity groupings, the highest rates of vaccination occurred in older age groups.



Note: The first vaccines were administered on December 18, 2020. The vaccine equity program was launched on December 21, 2020, at Week 0. Week 22 represents the last week of the vaccine drive, which ended on May 30, 2021. Week 31 is the week ending July 31, 2021.

Note: The data represent the percentage of veterans who have been vaccinated from within that demographic group on the basis of age and race/ethnicity. Pac = Pacific.

Source: The authors

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**Table 2. Covid-19 Vaccination Rates, by Demographic Group and Age Cohort**

	<55 years	55–64 years	65–74 years	75–84 years	≥85 years
Per eligible enrollees, n (%)	11,481/40,063 (28.7)	7,244/17,539 (41.3)	10,443/27,295 (38.3)	6,176/14,118 (43.8)	1,817/4,445 (40.9)
Sex, n (%)					
Male	9,342/32,620 (29)	6,197/15,040 (41)	9,730/25,617 (38)	6,008/13,748 (44)	1,771/4,325 (41)
Female	2,139/7,443 (29)	1,047/2,499 (42)	713/1,678 (42)	168/370 (45)	46/120 (38)
Race, n (%)					
American Indian/Alaska Native	145/567 (26)	74/230 (32)	122/423 (29)	65/190 (34)	15/45 (33)
Asian	847/2,165 (39)	344/686 (50)	273/594 (46)	136/241 (56)	51/96 (53)
Black	1,579/5,364 (29)	1,429/2,928 (49)	1,124/2,152 (52)	479/761 (63)	125/207 (60)
Multirace/other	527/1,726 (31)	234/545 (43)	266/640 (42)	153/302 (51)	42/73 (58)
Pacific Islander/ Native Hawaiian	310/1,193 (26)	196/444 (44)	221/491 (45)	64/146 (44)	13/27 (48)
White	8,008/28,849 (28)	4,905/12,540 (39)	8,379/22,827 (37)	5,267/12,442 (42)	1,564/3,982 (39)
Ethnicity, n (%)					
Hispanic	1,040/3,638 (29)	331/788 (42)	347/802 (43)	187/347 (54)	46/88 (52)
Other	60/161 (37)	31/47 (66)	8/19 (42)	0/1 (0)	0/0 (0)
Rurality, n (%)					
Highly rural	78/448 (17)	75/347 (22)	219/958 (23)	156/554 (28)	28/108 (26)
Rural	1,462/7,661 (19)	1,354/3,992 (34)	2,528/8,486 (30)	1,498/4,314 (35)	372/1,160 (32)
Urban	8,896/28,462 (31)	5,512/12,390 (44)	7,547/17,391 (43)	4,442/8,974 (49)	1,386/3,087 (45)

Note: The denominators within each cell show the number of eligible patients. Rurality is based on definitions by the Office of Rural Health of the U.S. Department of Veterans Affairs, <https://www.ruralhealth.va.gov/aboutus/ruralvets.asp>. Source: The authors.

An important hurdle was the large staffing resources needed to support personalized telephone outreach. This was made possible by repurposing staff whose typical duties were on hiatus because of the pandemic, as well as by authorization from hospital leadership to allow overtime.

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Limitations of our approach include lack of data on vaccination that occurred outside the VHA, because VHA and state immunization information systems are unable to exchange data in Washington state. Some patients received multiple outreach communications before they were vaccinated, but our study was not designed to assess the effectiveness of the individual methods or combinations thereof. Finally, it is unclear whether results from a veteran population can be generalized to the United States as a whole (particularly its younger and non-English-speaking

populations), although we believe strongly that our efforts define best practices that would support equitable vaccine allocation in any setting.

Replication of the VHA's strategies to support vaccine equity in other settings would depend partially on states' departments of public health working with payers and health systems to achieve the level of data resources available within the VHA. Nevertheless, vaccine equity is achievable with relatively simple interventions, regular monitoring of vaccine administration rates, and collaboration with community stakeholders. Our results demonstrate that vaccine equity is feasible and within reach.

## The Interdisciplinary Vaccine Team

The team included three primary care-based general internists who served as the medical directors of the Covid-19 vaccine program. Representatives from other disciplines included an ethicist; geriatrician; physiatrist; diversity, equity, and inclusion expert; vaccine operations specialist; informaticist; health services researcher; and health psychologist. We reported up to the facility Emergency Operations Command, who reported up to the facility executive leadership.

## Metrics

After conducting vaccine outreach, we identified all unique patients who received at least one dose of Covid-19 vaccine at VA Puget Sound (Figure 2) using data from the VHA Corporate Data Warehouse, a comprehensive repository of information from VHA electronic health records.<sup>19</sup> Because data were obtained and analyzed as part of an operational quality improvement project, this project did not require Institutional Review Board review or exemption. Drafting and submission of this manuscript complied with applicable VHA policies.

As of July 28, 2021, our facility had administered a total of 79,643 vaccinations to 41,386 individual veterans, representing 41.6% of our total population of 99,362 veterans, including 41.5% of Black enrollees, 28.9% of American Indian/Native Alaskan enrollees, and 34.9% of white enrollees (Table 2). Most vaccinations were administered during our vaccination drive conducted from December 21, 2020, to May 30, 2021. Our facility vaccination totals include only vaccinations delivered within the VHA system, which prohibits a direct comparison with U.S. rates. As a whole, however, 57.4% of the U.S. population had received at least one dose of vaccine by July 30, 2021.<sup>20</sup>

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Our facility achieved equitable rates of vaccination using a targeted, multimodal, risk-based outreach strategy that included age, race and ethnicity, and rural status. Several factors contributed to our success. First, the VHA rolled out a clear, national vaccine prioritization plan that underpinned local facility efforts but also provided flexibility to tailor outreach within age cohorts. Second, the VHA is an established Learning Health System with access to real-time data resources, including clinical and demographic information for our catchment population.<sup>16</sup> This allowed us to identify veterans at greatest clinical risk and to reach out systematically to them, including those from racial or ethnic groups at risk of vaccine disparities. Third, we worked closely with trusted community-based stakeholders, nonprofit veteran advocacy groups, and other local experts to help us promote vaccination offerings to rural areas and minority groups. For example, when conducting mobile outreach to rural areas, we worked closely with local Veterans Service Organizations to help announce vaccine offerings, provide space, and recruit volunteers on the day of the vaccine clinic. Our interventions are consistent with peer-reviewed best practices for navigating vaccine inequities.

## **Where to Start**

The roots of disparities in vaccination rates are complex and require thoughtful, multimodal solutions. Health care systems would benefit from strategically designing their vaccine operations in ways that reduce sources of inequities within their unique target populations, especially by making scheduling accessible and using personalized outreach. We also relied extensively on trusted messengers — especially veterans service organizations — to help engage rural and underserved veterans. The use of multiple outreach strategies was critical, as was the use of scheduling personnel repurposed from other hospital operations during the Covid-19 pandemic. We thank the hundreds of staff and volunteers across VA Puget Sound Health Care System for their tireless work to support veteran vaccination.

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