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Vaccinating Veterans for COVID-19 at the U.S.
Department of Veterans Affairs



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Introduction: With the COVID-19 (most recent) Omicron variant surge across the U.S., more research is needed to better understand how vaccination and booster uptake can be increased. COVID-19 vaccinations have proven to help decrease the likelihood of becoming seriously ill, getting hospitalized, or dying. Studies examining patient characteristics of individuals who received COVID-19 vaccinations are limited. This study examines the patient characteristics of veterans who were vaccinated during the first 8 months (December 2020–July 2021) of the vaccination rollout at the U.S. Department of Veterans Affairs.

Methods: Using the U.S. Department of Veterans Affairs administrative and clinical data, bivariate and multivariate analyses were conducted to determine sociodemographic and health factors associated with the likelihood of receiving COVID-19 vaccination at the U.S. Department of Veterans Affairs.

Results: The analytic sample included 5,914,741 U.S. Department of Veterans Affairs users (49.7% vaccinated). Among the U.S. Department of Veterans Affairs medical facilities nationwide, COVID-19 vaccination rates (≥ 1 dose) varied from 33.9% to 73.7%. Veterans who were non-Hispanic American Indian/Alaskan natives, younger, living in rural areas, male, and unmarried; had U.S. Department of Veterans Affairs health insurance only; had fewer chronic conditions; did not receive the seasonal influenza vaccine; and were not living in community living centers or nursing homes were less likely to get vaccinated.

Conclusions: Understanding which groups of veterans are less likely to be vaccinated allows the U.S. Department of Veterans Affairs to develop targeted interventions to improve uptake in these groups. These results can also guide non-U.S. Department of Veterans Affairs organizations to create evidence-based educational outreach programs that reduce vaccine hesitancy among veterans who do not use U.S. Department of Veterans Affairs.

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INTRODUCTION

As of January 24, 2022, a total 87.4% of the U.S. adult population (aged ≥ 18 years) has received at least ≥ 1 dose of a coronavirus disease 2019 (COVID-19) vaccine, and 73.8% are fully vaccinated according to the U.S. Centers for Disease Control and Prevention.¹ Numerous studies have examined COVID-19 vaccine hesitancy or determinants of COVID-19 vaccine uptake in the U.S.^{2–9} In a recent study of 1,971 respondents consisting of a nonprobability convenience sample of U.S. adults,³ healthcare attitudes, practices,

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political affiliation, and certain demographic characteristics, including age, sex, and race/ethnicity, were associated with willingness to be vaccinated for COVID-19. Another study by Painter et al.⁴ examined the demographic characteristics of those who were vaccinated in the U.S. during the first month of the COVID-19 vaccination program (December 14, 2020, through January 14, 2021). This study found that almost 13 million individuals received ≥ 1 dose of a COVID-19 vaccine in the U.S. during this period. Among the 12,928,749 vaccinated, 63% were women, 55% were aged ≥ 50 years, 16.8% were aged 40–49 years, and 28.2% were aged 18–39 years. However, it is important to point out that the referenced study focused on the first month of vaccination when targeted vaccination limited access for younger people unless they had immunocompromising conditions or had certain occupations. Data on race/ethnicity were reported for about half (51.9%) of the vaccine recipients (6,706,697), and among those, 60.4% were White and 39.6% were members of racial or ethnic minority groups. Even though there are some states or counties that do track some characteristics of those who get vaccinated, oftentimes these data are incomplete and only bivariate associations are reported. No follow-up studies have examined the demographic characteristics of individuals vaccinated during >8 months since the COVID-19 vaccination program in the U.S. started. In another study by the Kaiser Family Foundation,⁵ 14% of the vaccine-eligible Americans consistently refused to get vaccinated since the vaccination rollout in December 2020. The same study also illustrated that some of the correlates of not getting vaccinated were having lower education, Republican Party affiliation, being White, having lower income ($< \$40,000$), and being insured. For most of the unvaccinated, many believe that vaccination poses a bigger risk than a COVID-19 infection.⁵

The U.S. Department of Veterans Affairs (VA) began its COVID-19 vaccination program for all veterans who use VA for their health care (VA-users) in mid-December 2020.¹⁰ The first vaccination rollout included Pfizer-BioNTech and Moderna, with the Janssen COVID-19 vaccine by Johnson and Johnson following in early March 2021.¹¹ The program was extended to the veterans' caregivers and their spouses in late March 2021.¹² In this paper, we examine the patient characteristics, including demographic and health factors, of all the veterans nationwide who receive health care from the VA and their vaccination status for COVID-19 (≥ 1 dose of Moderna, Pfizer-BioNTech, or Janssen COVID-19 vaccine) between December 1, 2020, and July 31, 2021. VA-users tend to be more racially diverse, socioeconomically disadvantaged, and medically more complex¹³ than the general adult population. As such, understanding patient characteristics of VA-users

that are associated with vaccination status is useful not just for VA to identify unvaccinated patients, but may also help public health officials and others identify other unvaccinated patient subpopulations for targeted interventions to reduce vaccine hesitancy.

METHODS

Study Sample

Using national VA administrative and clinical data, the distribution of vaccination rates at 129 VA medical centers nationwide was examined. The initial study population included all veterans who had accessed the VA healthcare system nationwide during the approved study timeframe (March 1, 2018, to July 31, 2021). This included anyone in the outpatient, inpatient, or fee-based community care databases during the approved study timeframe. All veterans who accessed care at the VA facilities for vaccination were captured in the outpatient encounter database, including those who may have used the VA for vaccination purposes only.

A total of 6,786,413 VA-users were included in this study: 3,092,033 (45.6%) were vaccinated for COVID-19 during the study period (December 1, 2020, through July 31, 2021), leaving 3,694,380 (54.4%) who were not vaccinated. The analytic sample for this study included a total of 5,914,741 VA-users (2,938,717 [49.7%] vaccinated and 2,976,024 [50.3%] not vaccinated) after excluding patients with missing data on study variables.

Measures

The dependent variable was a binary COVID-19 vaccination indicator (0=not vaccinated, 1=vaccinated). Vaccinated included ≥ 1 dose if the patient was receiving a 2-shot series. Predictor variables included race/ethnicity (Hispanic, non-Hispanic White, non-Hispanic African American, non-Hispanic Asian, non-Hispanic American Indian/Alaska Native, non-Hispanic Native Hawaiian/Other Pacific Islander, non-Hispanic multiple races, and unknown); non-VA health insurance status (yes/no); VA priority-based enrollment system, categorized into 4 groups on the basis of service-connected disability rating, income, recent military service, and other factors¹⁴ (no disability, low/moderate disability, high disability, low income); influenza vaccine receipt during the prior influenza season (2019–2020, yes/no; as the prior influenza season is more representative of a typical influenza vaccination uptake than during the COVID-19 pandemic because of lockdowns and corresponding unusually low rates of influenza in 2020–2021); urban/rural residence (urban, rural, highly rural); Charlson Comorbidity Index (a validated and readily applicable risk adjusted summary measure of comorbid diseases),¹⁵ which was categorized into 3 groups: 0=no chronic condition, 1=1 chronic condition, and 2= ≥ 2 chronic conditions; Community Living Center /Nursing Home status (yes/no); 4 age categories (18–44, 45–64, 65–74, ≥ 75 years); sex (male, female); and marital status (married, not married).

Statistical Analysis

Simple bivariate tests of the differences were conducted between vaccination groups on the listed predictor variables and multivariate analyses testing the associations of sociodemographic and health factors with the likelihood of receiving ≥ 1 dose of 1 of the

3 COVID-19 vaccines. For the bivariate analyses, chi-square tests for categorical variables and *t*-tests for continuous variables were conducted. Multivariate associations of key demographic and clinical variables with vaccination were tested with logistic regression. The model specification included all the aforementioned predictor variables and a sex X marital status interaction term, which was hypothesized. The associations of each variable with vaccination are expressed as differences in the adjusted percentages of patients vaccinated between each category and a reference category. The analysis accounted for clustering at the facility level. Statistical significance was set at $p < 0.05$. All analyses were conducted in Stata, version 15. The study was approved by the local VA IRB.

RESULTS

Figure 1 shows that all VA medical centers ($n=129$) had $\geq 33.9\%$ COVID-19 vaccination rates (≥ 1 dose). The median vaccination rate was 52.8%, with a maximum percentage of 73.7%, lower quartile of 45.8%, and upper quartile of 59.5%. Figure 2 displays the average COVID-19 vaccination rates by the 5 major districts.

In Table 1, Column 1 (% population) displays the percentage of the population for each patient characteristic. In terms of overall patient characteristics for the analytic sample, 1,104,619 (18.7%) were aged 18–44 years, 1,708,323 (28.9%) were aged 45–64 years, 1,745,873 (29.5%) were aged 65–74 years, and 1,355,926 (22.9%) were aged ≥ 75 years; 5,365,800 (90.7%) were male; 3,968,885 (67.1%) were non-Hispanic White, 1,025,485 (17.3%) were non-Hispanic African American, 406,920 (6.9%) were Hispanic, 363,361 (6.1%) were unknown race/ethnicity, and the remainder were non-Hispanic Asian, American Indian, Alaskan Native, Hawaiian, or Other; 3,344,031 (56.5%) were married; 4,136,572

(69.9%) had a non-VA health insurance coverage; 4,005,834 (67.7%) lived in urban areas, 1,667,919 (28.2%) lived in rural areas, and 240,988 (4.1%) lived in highly rural communities; 1,857,977 (31.4%) were vaccinated for the seasonal influenza (2019–2020 influenza season); 2,411,078 (40.8%) had high service-connected disability, 1,463,789 (24.8%) had low/moderate service-connected disability, 1,017,853 (17.2%) had no disability, and 1,022,021 (17.3%) had low income; 1,451,614 (24.5%) had ≥ 2 chronic conditions, 1,103,650 (18.7%) had 1 chronic condition, and 3,359,477 (56.8%) had no chronic conditions; and 15,853 (0.3%) lived in community living centers or nursing homes (Table 1).

In Table 1, Column 2 displays the percentage of the population that was vaccinated for COVID-19 for each patient characteristic. According to these unadjusted findings, younger veterans were less likely to get vaccinated than older veterans: 296,215 (26.8%) for ages 18–44 years, 813,877 (47.6%) for ages 45–64 years, 1,040,204 (59.6%) for ages 65–74 years, and 788,421 (58.2%) for ages ≥ 75 years. Male veterans (2,696,819, 50.3%) and married Veterans (1,704,782, 51.0%) were more likely to get vaccinated than female veterans (241,898, 44.1%) and not married veterans (1,233,935, 48.0%), respectively. Non-Hispanic Whites (1,954,050, 49.2%) were less likely to get vaccinated than non-Hispanic African Americans (543,699, 53.0%), Asians (36,949, 54.0%), and Native Hawaiian or Other Pacific Islanders (21,042, 50.4%), as well as Hispanics (203,643, 50.0%). However, non-Hispanic Whites (1,954,050, 49.2%) were more likely to get vaccinated than American Indians/Alaskan Natives (17,099, 42.8%). Veterans with other (non-VA) health insurance coverage

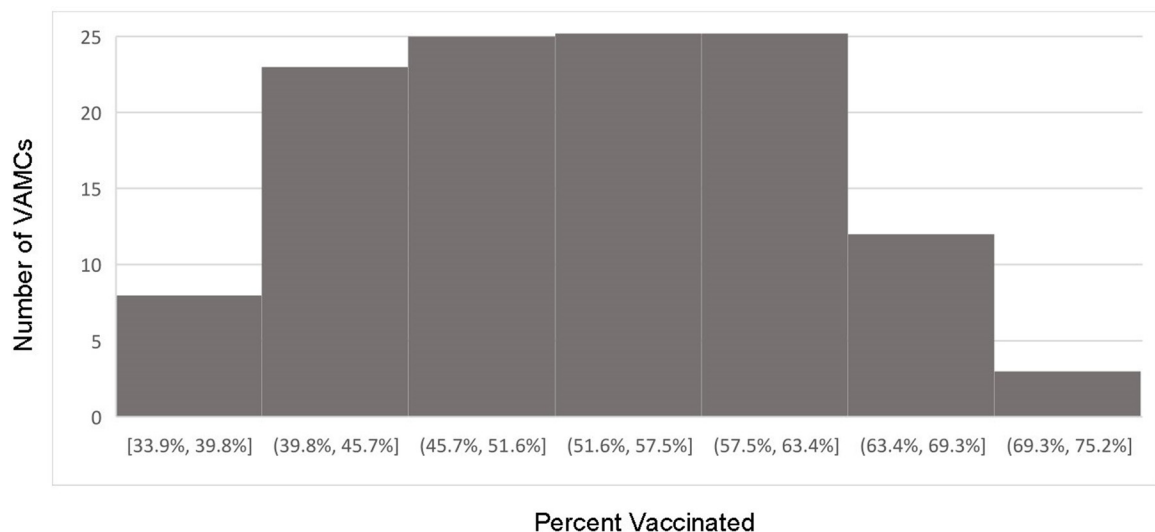
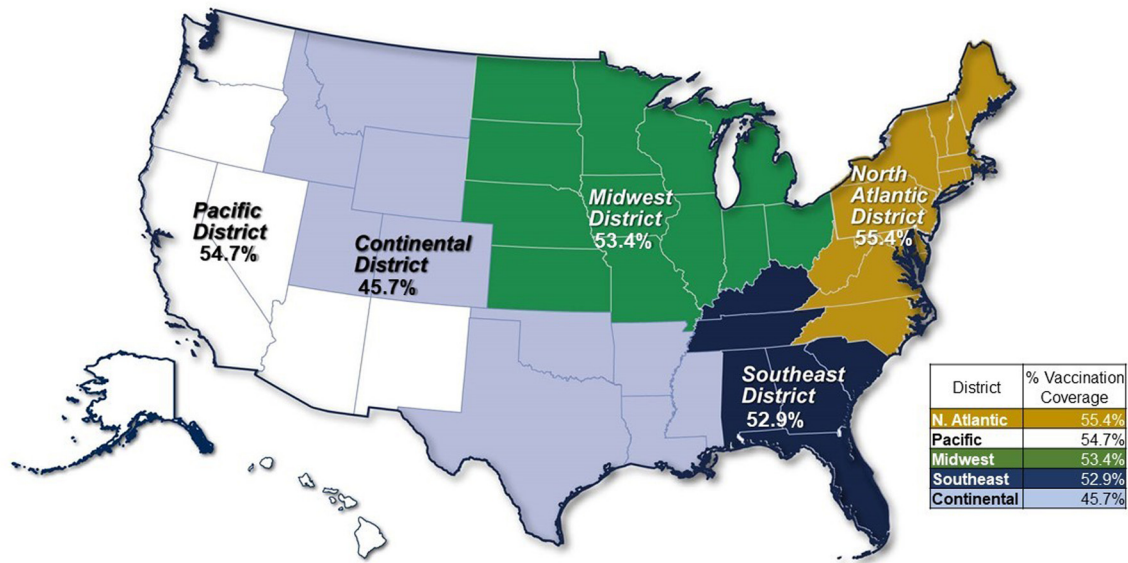


Figure 1. COVID-19 vaccination coverage across 129 VAMCs, December 1, 2020 through July 31, 2021. VAMC, VA Medical Center.



Source: VA. Map Resources (map). | GAO-16-803

Figure 2. COVID-19 vaccination coverage across 5 major districts (December 1, 2020 through July 31, 2021). N, 5,914,741 VA users.

Table 1. Overall Patient Characteristics and COVID-19 Vaccination Status by Patient Characteristics, N=5,914,741

Characteristics	Population n (%)	COVID-19 vaccinated ^a n (%)
Age, years		
18–44	1,104,619 (18.7)	296,215 (26.8)
45–64	1,708,323 (28.9)	813,877 (47.6)
65–74	1,745,873 (29.5)	1,040,204 (59.6)
≥75	1,355,926 (22.9)	788,421 (58.2)
Sex		
Male	5,365,800 (90.7)	2,696,819 (50.3)
Female	548,941 (9.3)	241,898 (44.1)
Race/ethnicity		
Hispanic or Latino	406,920 (6.9)	203,643 (50.0)
Non-Hispanic American Indian or Alaskan Native	39,970 (0.7)	17,099 (42.8)
Non-Hispanic Asian	68,379 (1.2)	36,949 (54.0)
Non-Hispanic African American	1,025,485 (17.3)	543,699 (53.0)
Non-Hispanic Native Hawaiian or Other Pacific Islander	41,741 (0.7)	21,042 (50.4)
Non-Hispanic White	3,968,885 (67.1)	1,954,050 (49.2)
Unknown	363,361 (6.1)	162,235 (44.7)
Marital status		
Married	3,344,031 (56.5)	1,704,782 (51.0)
Not married	2,570,710 (43.5)	1,233,935 (48.0)
Health insurance		
Yes	4,136,572 (69.9)	2,264,958 (54.8)
No	1,778,169 (30.1)	673,759 (37.9)
Influenza vaccination 2019–2020		
Yes	1,857,977 (31.4)	1,236,142 (66.5)
No	4,056,764 (68.6)	1,702,575 (42.0)
Rural/urban		
Urban	4,005,834 (67.7)	2,072,072 (51.7)

(continued on next page)

Table 1. Overall Patient Characteristics and COVID-19 Vaccination Status by Patient Characteristics, N=5,914,741 (continued)

Characteristics	Population n (%)	COVID-19 vaccinated ^a n (%)
Rural	1,667,919 (28.2)	759,238 (45.5)
Highly rural	240,988 (4.1)	107,407 (44.6)
Enrollment priority		
High disability	2,411,078 (40.8)	1,208,807 (50.1)
Low/moderate disability	1,463,789 (24.8)	715,272 (48.9)
Low income	1,022,021 (17.3)	506,276 (49.5)
No disability	1,017,853 (17.2)	508,362 (49.9)
Charlson		
≥2 chronic conditions	1,451,614 (24.5)	938,949 (64.7)
1 chronic condition	1,103,650 (18.7)	633,181 (57.4)
No chronic condition	3,359,477 (56.8)	1,366,587 (40.7)
Community living center /nursing home		
Yes	15,853 (0.3)	12,226 (77.1)
No	5,898,888 (99.7)	2,926,491 (49.6)

Note: For categorical variables, chi-square test was conducted. All comparisons were statistically significant $p < 0.001$.

VA, U.S. Department of Veterans Affairs.

^aCOVID-19 vaccination at the VA (nationally) December 1, 2020 through July 31, 2021.

(2,264,958, 54.8%) were more likely to get vaccinated than VA-only insured veterans (673,759, 37.9%). Veterans living in urban areas (2,072,072, 51.3%) were more likely to get vaccinated than those living in rural (759,238, 45.5%) and highly rural communities (107,407, 44.6%). Veterans who received their influenza vaccine for the 2019–2020 influenza season were more likely to get vaccinated than those who did not get a seasonal influenza vaccination (1,236,142, 66.5% vs 1,702,575, 42.0%). For the VA priority-based enrollment categories, the vaccination rates varied from 48.9% to 50.1% (Table 1). In terms of Charlson scores, the vaccination rates varied from 40.7% to 64.7%, where veterans with higher Charlson scores were more likely to get vaccinated. Veterans living in community living centers or nursing homes were more likely to get vaccinated than those not living in community living centers or nursing homes (12,226, 77.1% vs 2,926,491 49.61%). All bivariate comparisons were statistically significant at $p < 0.001$.

The results of the logistic regression analysis are summarized in Table 2. There was evidence of adjusted associations for each demographic and health variable with vaccination. Most non-White racial/ethnic groups had a higher percentage of individuals who were vaccinated for COVID-19 than non-Hispanic Whites, except for American Indian/Alaskan Natives, whose vaccination percentage was 3.1 points lower than non-Hispanic Whites (Table 2). Vaccination among veterans who had non-VA health insurance was significantly higher than among those with only VA insurance. Similarly, vaccination among veterans receiving influenza vaccines was dramatically higher than among those not receiving

them. Regarding age, vaccination percentages among veterans aged ≥ 75 years were higher than those among younger veterans. In addition, veterans living in rural or highly rural areas were less likely to be vaccinated than those living in urban areas, and veterans with single or multiple chronic conditions were more likely to be vaccinated than those with no chronic conditions. For the VA priority-based enrollment items, vaccination rates among those in the high disability group or in the low/moderate disability group were higher than in the no disability group. However, the vaccination rate in the low-income group was lower than in the no disability group. Furthermore, results of the test of the sex X marital status interaction indicated that female married veterans were more likely to be vaccinated than male married veterans, but a much smaller sex difference was observed among unmarried veterans. Finally, the vaccination rate among veterans living in community living centers/nursing homes was higher than among those not living in these facilities (Table 2).

DISCUSSION

To date, numerous studies have examined the demographic characteristics associated with COVID-19 vaccine uptake in the U.S. Moreover, this study identified the demographic characteristics of vaccinated veterans during the past 8 months, a notably longer period than extant studies such as the one by Painter and colleagues.⁴ This extended timeframe provides a better understanding of the factors that are more likely to be associated with vaccination uptake over

Table 2. Factors Associated With COVID-19 Vaccination

Variable	Adjusted % COVID-19 vaccinated	Nonreference vs reference (ref) difference in % COVID-19 vaccinated (95% CI)
Age categories, years		
18–44	31.6	–25.2% (–30.4%, –20.0%)
45–64	48.7	–8.1% (–11.4%, –4.8%)
65–74	56.4	–0.4% (–1.9%, 1.1%)
≥75	56.8	ref
Race/ethnicity		
Non-Hispanic American Indian or Alaska Native	45.4	–3.2% (–5.8%, –0.7%)
Non-Hispanic Asian	58.6	10.0% (7.2%, 12.8%)
Non-Hispanic African American	53.1	4.5% (3.1%, 6.0%)
Hispanic or Latino	53.4	4.8% (1.8%, 7.8%)
Non-Hispanic Native Hawaiian or other Pacific Islander	50.8	2.2% (0.8%, 3.6%)
Unknown	46.3	–2.4% (–4.8%, 0.1%)
Non-Hispanic White	48.6	ref
Sex and marital status interaction		
Unmarried female	49.4	1.6% (0.9%, 2.3%)
Unmarried male	47.8	ref
Married female	53.9	3.1% (2.3%, 4.0%)
Married male	50.8%	ref
Non-VA health insurance		
Yes	51.0	4.4% (2.9%, 6.0%)
No	46.5	ref
Influenza vaccination 2019–2020		
Yes	62.6	18.9% (15.8%, 21.9%)
No	43.8	ref
Rural/urban		
Highly rural	42.1	–10.3% (–13.0%, –7.7%)
Rural	44.4	–8.0% (–9.6%, –6.5%)
Urban	52.4	ref
Enrollment priority		
High disability	51.5	3.0% (2.2%, 3.7%)
Low/moderate disability	49.8	1.3% (0.5%, 2.1%)
Low income	46.6	–2.0% (–2.7%, –1.3%)
No disability	48.5	ref
Charlson		
≥2 chronic conditions	56.7	11.5% (6.9%, 16.0%)
1 chronic condition	53.9	8.7% (4.4%, 12.9%)
No chronic condition	45.2	ref
Community living center /nursing home		
Yes	63.1	13.5% (11.3%, 15.6%)
No	49.7	ref

Note: COVID-19 vaccination at the VA (nationally) December 1, 2020 through July 31, 2021. VA, U.S. Department of Veterans Affairs.

time. Moreover, compared with the general adult population, VA-users are more likely to be members of racial or ethnic minority groups, be less educated, have lower incomes, and have poor health status.¹⁶ Thus, this study provides an examination of groups

that are at heightened risk for increased morbidity and mortality from COVID-19.

Using the VA administrative and clinical data, this study examined patient factors associated with COVID-19 vaccination uptake during the first 8 months of the

vaccination program through July 31, 2021. After adjusting for other predictors, compared with non-Hispanic Whites, the likelihood of being vaccinated was higher among non-Hispanic African Americans, Hispanics, Asians, Native Hawaiians or Other Pacific Islanders but not among American Indian/Alaskan Natives. These findings might reflect the VA's increased outreach efforts to racial/ethnic minorities or differences in political affiliation across differing racial and ethnic groups. These study findings support the Kaiser Family Foundation study results, which also indicated that Whites were more likely to be unvaccinated. The study results also illustrated that the low-income veterans were less likely to get vaccinated, which also support the Kaiser Family Foundation study results, where low income was associated with being unvaccinated. The oldest age group (≥ 75 years), which is most at risk for morbidity and mortality from COVID-19 and was prioritized for the initial rollout of the vaccine, had the highest vaccination rate. Veterans living in rural or highly rural areas were less likely to get vaccinated than those in urban areas, perhaps because of limited access to the main VA medical facilities in urban areas, which were the primary locations for vaccine distribution. Female, especially married female veterans; veterans with non-VA insurance; and veterans with single or multiple chronic conditions were more likely to get vaccinated for COVID-19 than male veterans, especially married male veterans; veterans with VA-only insurance; and veterans with no chronic conditions, respectively.

Limitations

This study has limitations. First, the data are based on electronic healthcare records, which have limited socio-demographic information and lack data on behavioral and attitudinal factors that might be associated with vaccination uptake. Moreover, some VA-users might have been vaccinated outside of the VA and may show up in the data as unvaccinated; it is unclear whether this misclassification might be random or systematic and how it might impact the study results. It should be noted that VA clinicians should inquire about vaccine status during appointments and thus at least some individuals who were vaccinated outside VA were included. However, given the recency of the pandemic and the availability of COVID-19 vaccines, probability-based, national survey studies of COVID-19 vaccine hesitancy that include many of the measures that were examined in this study are nonexistent. Conducting secondary data analyses using administrative and clinical data from the VA, which is the largest integrated healthcare system in the U.S., provides information about factors that might be associated with vaccination uptake. Second, as the

COVID-19 vaccination program is ongoing, future studies beyond the initial 8-month rollout could lead to somewhat different findings. Third, the generalizability and applicability of the study findings to nonveterans or to the 10 million veterans who do not receive care from VA may be limited. However, non-VA healthcare organizations can still learn lessons from these findings. The VA has made significant efforts to reach out to its patients, including efforts to encourage VA healthcare providers to discuss vaccination during patient visits. Finally, it is important to note that limiting the analytic sample to those with complete data on all study variables may have reduced the generalizability of the findings as well.

CONCLUSIONS

Even though it has been 22 months since the onset of the COVID-19 pandemic, much is still unknown. Similarly, COVID-19 vaccine hesitancy and acceptance are new areas of research, and more studies are needed to better understand what factors are associated with vaccination uptake. Given this knowledge gap and the recency of the COVID-19 vaccines, this study helps bridge the gap by conducting secondary analysis of VA administrative and clinical data to identify the most salient sociodemographic and health risk factors associated with COVID-19 vaccination uptake. A better understanding of the socioeconomic and health risk determinants of vaccination among veterans can help guide the VA in efforts to increase COVID-19 vaccination rates among younger veterans, male veterans, White veterans, the uninsured veterans (non-VA), and veterans living in rural/highly rural areas. These findings could also assist non-VA healthcare organizations, safety net community clinics, public health departments, and others to create evidence-based educational outreach programs and other interventions to help the socioeconomically disadvantaged, racially diverse, and medically vulnerable patient populations increase vaccine uptake. In the coming months, additional research will be needed to understand the characteristics of those who are and are not getting vaccinated and reasons for their hesitancy or acceptance. Moreover, as boosters are rolled out and should future annual immunization for COVID-19 be required, additional studies will be required to examine which groups are likely to uptake the vaccine on an ongoing basis.

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