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COVID-19 Booster Vaccination in the U.S. Military, August 2021–January 2022



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Introduction: A booster dose of messenger RNA vaccine protects against severe COVID-19 outcomes. This study examined the incidence of COVID-19 booster vaccination among active-duty U.S. military servicemembers between August 2021 and January 2022, factors associated with vaccination uptake, and trends over time.

Methods: This was a retrospective cohort study of active-duty military personnel using data from the Defense Medical Surveillance System. Participants were included if they served in the active component from August 2021 through January 2022 and were eligible to receive a COVID-19 booster dose by January 2022. Adjusted hazard ratio estimates of time to booster vaccination were calculated using Cox proportional hazards regression.

Results: Lower booster vaccine uptake was seen in the U.S. military (25%) than among the general U.S. population at the same time (45%). Booster vaccination increased with older age, with greater education, with higher income, among women, and among those stationed overseas; it decreased with previous COVID-19 infection and use of the Janssen vaccine. There were no significant racial or ethnic disparities in booster vaccination.

Conclusions: In the absence of a compulsory vaccination policy, lower booster vaccine uptake was seen among servicemembers than among the general U.S. population, particularly among members who were younger, were male, Marines, and had a previous history of infection. Low vaccination rates not only increase the risk of acute and long-term health effects from COVID-19 among servicemembers, but they also degrade the overall readiness of the U.S. military.

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INTRODUCTION

People who complete a primary series of messenger RNA (mRNA) coronavirus disease 2019 (COVID-19) vaccine, followed by a booster dose, have better protection against severe adverse outcomes than do people who only receive the primary series.^{1,2} U.S. military personnel are required to receive the primary COVID-19 vaccination series, and an assessment of the effectiveness of the Department of Defense's distribution plan has been published.³ Booster doses of COVID-19 vaccine are recommended but not required for U.S. military personnel, so they are available to them on a strictly voluntary basis.⁴ This study examined the incidence of COVID-19 booster vaccination

among U.S. military servicemembers between August 2021 and January 2022, factors associated with vaccination, and trends over time.

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METHODS

This was a retrospective cohort study of the Active Component military personnel using data from the Defense Medical Surveillance System⁵; Reserve and National Guard members were excluded. Participants were included if they served from August 2021 through January 2022 and were eligible to receive a COVID-19 booster dose by January 2022. *Servicemembers* were defined as being eligible to receive the booster dose on the date that was 150 days after completing a 2-dose initial mRNA series or 60 days after receiving 1 dose of the Janssen vaccine. The percentages of those who received a booster dose were described and stratified by demographic and clinical characteristics, including having a recent medical encounter for a comorbid condition,⁶ and previous infection with COVID-19. *Comorbid conditions* were defined as in a previous study, but the authors further inspected some individual conditions of interest, such as mental health conditions and pregnancy.⁷

Time-to-event analyses were used to both assess delays in vaccination and to ensure valid comparisons of time at-risk. For these analyses, the *start date* was defined as the date the service member became eligible to be boosted or the start of the surveillance period on August 1, 2021, whichever came last. Adjusted hazard ratio (AHR) estimates were calculated using Cox proportional hazards regression. All analyses were performed using SAS software, version 9.4 (SAS Institute, Cary, NC). The study was approved by the Uniformed Services University IRB.t

RESULTS

Among 1,340,712 members in service during August 2021, 980,963 (73.2%) were eligible for voluntary booster vaccination by January 31, 2022. Of these, 248,125 (25.3%) received a booster dose. Most personnel received an mRNA vaccine for both the primary series

($n=856,652$, 87.3%) and the booster ($n=226,844$, 91.4%). The incidence of booster vaccination uptake increased dramatically after the Centers for Disease Control and Prevention recommended universal adult booster vaccination (Figure 1). Uptake then decreased in late December and then increased again in early January 2022, concurrent with the emergence of the Omicron variant.

As seen in Table 1, the crude incidence of booster uptake among women was greater than among men and was highest in the oldest age group (≥ 45 years). Uptake was substantially reduced among servicemembers with a history of previous COVID-19 infection (14.1%) compared with uptake among those without previous infection (27.9%). Booster uptake was similar among different racial groups but varied by military service, with the lowest uptake in the Marine Corps and highest in the Air Force. In the adjusted analysis, servicemembers with previous COVID-19 infection had a substantially reduced adjusted incidence of booster vaccination (AHR=0.54; 95% CI=0.54, 0.55), whereas the association with comorbid diagnoses was minimal (AHR=0.97; 95% CI=0.96, 0.98). Interestingly, previous immunization with Janssen compared with immunization with an mRNA vaccine was also strongly associated with decreased booster uptake (AHR=0.43; 95% CI=0.42, 0.43). An increased rate of booster vaccination was seen among servicemembers who were female, were aged ≥ 30 years, were non-Hispanic Blacks and Hispanics, were officers, had higher education levels, were married, were employed in select occupations, and were stationed at overseas locations (AHR=2.11; 95% CI=2.09, 2.14).

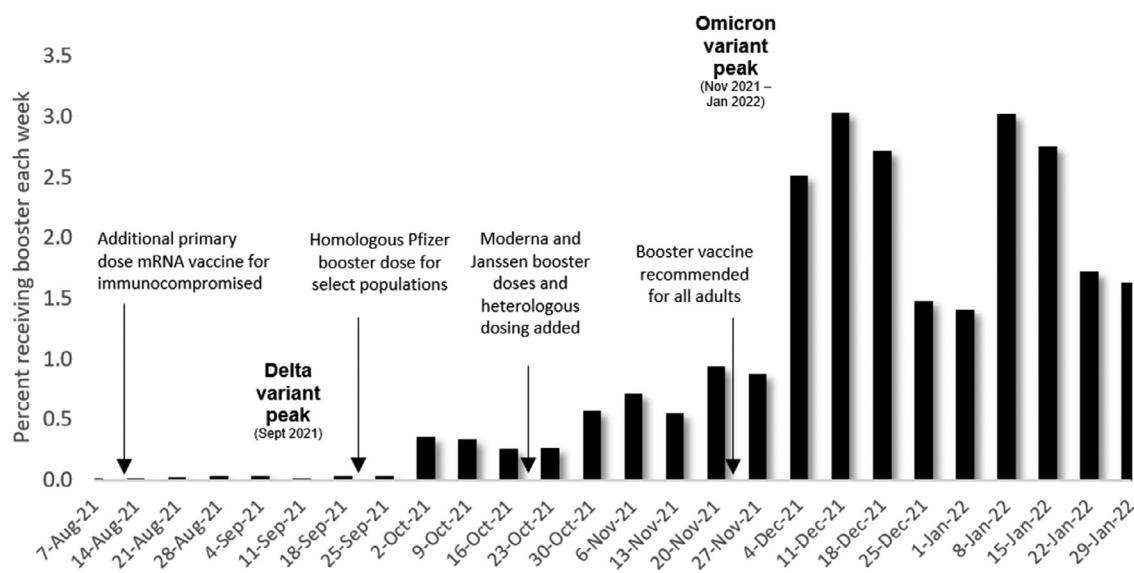


Figure 1. COVID-19 booster vaccine uptake among eligible active-duty military service members, by week. Aug, August; Dec, December; Jan, January; Nov, November; Oct, October; Sept, September.

Table 1. COVID-19 Booster Uptake Among Eligible Active-Duty Service members, August 1, 2021–January 31, 2022

Variables	Booster eligible	Number boosted	Percent boosted	Adjusted ^a hazard rate ratio (95% CI)
Full immunization type				
mRNA vaccine	856,652	226,844	26.5	ref
Janssen vaccine	124,311	21,281	17.1	0.43 (0.42, 0.43)
Sex				
Male	814,148	199,171	24.5	ref
Female	166,815	48,954	29.3	1.18 (1.17, 1.19)
Age, years				
<20	62,618	6,124	9.8	ref
20–24	287,599	42,627	14.8	0.80 (0.78, 0.82)
25–29	223,136	48,910	21.9	0.91 (0.89, 0.94)
30–34	164,151	48,547	29.6	1.11 (1.08, 1.14)
35–39	131,193	47,941	36.5	1.29 (1.25, 1.33)
40–44	69,589	30,814	44.3	1.44 (1.39, 1.48)
≥45	42,677	23,162	54.3	1.63 (1.57, 1.68)
Race and ethnicity				
Non-Hispanic White	543,194	138,625	25.5	ref
Non-Hispanic Black	142,189	33,573	23.6	1.07 (1.06, 1.09)
Hispanic	173,067	38,539	22.3	1.08 (1.06, 1.09)
Other/unknown	122,513	37,388	30.5	1.13 (1.11, 1.14)
Service				
Army	360,335	84,365	23.4	ref
Navy	283,573	82,769	29.2	1.03 (1.02, 1.04)
Air Force	221,011	66,073	29.9	1.03 (1.01, 1.04)
Marines	116,044	14,918	12.9	0.54 (0.53, 0.55)
Rank				
Enlisted	771,209	155,286	20.1	ref
Officer	209,754	92,839	44.3	1.34 (1.33, 1.36)
Education level				
High school or less	573,530	94,416	16.5	ref
Some college	120,555	33,901	28.1	1.16 (1.14, 1.18)
Bachelor's or advanced degree	265,400	111,702	42.1	1.41 (1.39, 1.43)
Other/unknown	21,478	8,106	37.7	1.29 (1.26, 1.32)
Marital status				
Single, never married	426,087	81,302	19.1	ref
Married	505,292	153,069	30.3	1.02 (1.01, 1.03)
Other/unknown	49,584	13,754	27.7	0.94 (0.92, 0.96)
Geographic region				
Northeast	30,272	9,031	29.8	1.23 (1.20, 1.26)
Midwest	57,879	11,438	19.8	0.84 (0.82, 0.96)
South	427,955	96,149	22.5	ref
West	248,559	47,741	19.2	0.79 (0.78, 0.79)
Overseas	126,105	57,379	45.5	2.11 (2.09, 2.14)
Other/unknown	90,193	26,387	29.3	1.21 (1.19, 1.23)
Occupation				
Combat related	140,440	26,029	18.5	ref
Motor transport	27,722	4,545	16.4	1.08 (1.04, 1.11)
Pilot/aircrew	40,494	15,297	37.8	1.08 (1.06, 1.10)
Repair/engineering	286,356	62,770	21.9	1.11 (1.10, 1.13)
Communications/intelligence	212,475	56,545	26.6	1.28 (1.26, 1.30)

(continued on next page)

Table 1. COVID-19 Booster Uptake Among Eligible Active-Duty Service members, August 1, 2021–January 31, 2022 (continued)

Variables	Booster eligible	Number boosted	Percent boosted	Adjusted ^a hazard rate ratio (95% CI)
Health care	91,364	36,339	39.8	1.23 (1.21, 1.25)
Other/unknown	182,112	46,600	25.6	1.15 (1.13, 1.17)
Comorbidity diagnosis before booster				
Any comorbidity	299,129	84,183	28.1	0.97 (0.96, 0.98)
No comorbidity	681,834	163,942	24.0	ref
Previous infection				
COVID-19 infection before booster	186,016	26,183	14.1	0.54 (0.54, 0.55)
No COVID-19 infection before booster	794,947	221,942	27.9	ref

^aModel adjusted for all variables in the table (i.e., age, sex, race and ethnicity, rank, service, education level, geographic region, occupation, marital status, previous comorbidities, previous SARS-CoV-2 infection, and full immunization type). mRNA, messenger RNA; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

DISCUSSION

This report characterizes the initial months of COVID-19 booster vaccine uptake among a population of active-duty U.S. military servicemembers who had received a mandatory primary vaccination series. No other military forces have published comparable vaccine uptake data. Voluntary uptake of the booster vaccine was low (25%) compared with uptake among the general U.S. population (45%) at the same time.⁸ This difference may be partially attributable to the younger ages and better health status of the military population. As seen in a previous military study of COVID-19 vaccine initiation, increasing age, greater education levels, and higher rank (a proxy for income) were associated with increased rates of COVID-19 booster vaccination after adjusting for other factors⁷ and mirror early trends seen in the general U.S. population. Also consistent with primary vaccination in the U.S. military, previous comorbidity diagnoses were not strongly associated with booster vaccination rates after adjustment for other covariates.

In contrast, racial and ethnic disparities in booster vaccination seen in the older U.S. population were not seen in the military,⁹ despite such disparities having been shown with the primary vaccination series.⁷ In addition, female servicemembers had higher booster vaccine rates than males, in contrast to the 10% lower likelihood of primary vaccination previously seen among females.⁷ Previous infection with COVID-19 had a stronger association with not receiving a booster vaccine (AHR=0.54) than it did with the primary vaccine series (adjusted risk ratio=0.80). This may be owing to perceptions of being less at-risk owing to perceived partial or full immunity from previous infection, decreased vaccine confidence, or other factors. Conversely, the higher rate of booster vaccination among those serving

overseas may be owing to a heightened perception of infection risk, earlier distribution and availability at these locations because of military requirements, or other factors. Overseas officials have also suggested that beneficiaries relied more on Department of Defense facilities overseas owing to vaccine unavailability through the host nations.³

Limitations

This study was limited by the fact that not all servicemembers were recommended for booster vaccination until November 22, 2021, several months after the start of the surveillance period. Therefore, servicemembers who were eligible for booster vaccination earlier in the study period may have differed from those who became eligible later. Vaccine uptake in the communities surrounding military installations was unavailable, but it may have influenced behavior among military beneficiaries. In addition, there were many complex individual, interpersonal, military, and societal factors influencing access to and willingness to receive this voluntary vaccination that were not measured in this study.

CONCLUSIONS

The findings from this study show that in the absence of a compulsory vaccination policy, lower COVID-19 booster vaccine uptake was seen among servicemembers than among the general U.S. population, particularly among members who were younger, were male, were Marines, and had a previous history of infection. Low vaccination rates not only increase the risk of acute and long-term health effects from COVID-19 among servicemembers, but they also degrade the overall readiness of the U.S. military. The low booster uptake found in this

study suggests that public health messaging and outreach are needed across all populations to maximize the protection of military forces from COVID-19, and it also highlights that high levels of booster uptake are unlikely to be seen in military populations in the absence of a vaccination mandate. The findings of this study further suggest that those with previous COVID-19 infection may be key groups to receive targeted messaging campaigns. Further research efforts should be directed to effectively communicating with these groups.

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