



Demographic Characteristics of Adults Receiving COVID-19 Booster Vaccinations

KEY POINTS

- As of March 9, 2022, 47.5 percent of the fully vaccinated adult population has received a booster.
- Booster doses of the available COVID-19 vaccines are recommended for everyone aged 12 and older to protect against infection and severe disease caused by SARS-CoV-2, especially in light of emerging and circulating variants of concern.
- People aged 40 and above, those with a college degree or higher, people who identified as gay, lesbian, or bisexual, people with insurance coverage, and those with a household income of \$75,000 and above were more likely than their respective reference groups to have received a booster.
- People aged 18 to 24 years, people who reported their race and/or ethnicity as non-Hispanic Black or Hispanic, people with children in the household, and those with a household income of \$50,000 or less were less likely than their respective reference groups to have received a booster.
- These results may help to target outreach efforts and policy decisions to increase booster uptake and ensure that more of the population is protected from severe disease, hospitalization, or death due to COVID-19.

Introduction

As of March 9, 2022, 75.1 percent of the United States population 18 and over is fully vaccinated, and 47.5 percent of the fully vaccinated population 18 and over has received a booster (Figure 1).¹ COVID-19 vaccines continue to be safe and effective at reducing the risk of COVID-19, including the risk of severe illness and death among those who are fully vaccinated, and reducing the spread of disease.² However, emerging data suggests that there may be waning vaccine effectiveness and efficacy (VE) against SARS-CoV-2 infection and symptomatic COVID-19 during the six months after completing the initial

¹ Centers for Disease Control and Prevention. COVID-19 Vaccinations in the United States, Updated January 15, 2022. Available at <https://data.cdc.gov/Vaccinations/COVID-19-Vaccinations-in-the-United-States-Jurisd/unskb7fc>; last accessed March 9, 2022.

² Centers for Disease Control and Prevention. COVID-19 Vaccines Work, Updated December 23, 2021. Available at <https://www.cdc.gov/coronavirus/2019-ncov/vaccines/effectiveness/work.html>, last accessed January 18, 2022.

vaccination series.³ Booster doses of COVID-19 vaccines have been highly effective at preventing COVID-19 associated medical encounters during both the Delta- and Omicron-predominant periods.⁴ A recent study conducted in Israel during high Delta variant transmission indicated that receiving a booster dose of the Pfizer-BioNTech vaccine was associated with a 90 percent reduced risk of mortality compared to those who had not received a booster.⁵ A study that included 25 U.S. jurisdictions found that booster dose recipients, especially those aged greater than 50 years, had higher protection against infection and death during the Delta-predominant period and during the emergence of Omicron.⁶ In another study of individuals aged 16 years and older, a booster dose of the Pfizer-BioNTech vaccine was substantially effective at preventing infection and severe illness, which was observed across all age groups in the study.⁷ With emerging variants, including the highly infectious Omicron variant, current vaccines are expected to protect against severe illness or death among fully vaccinated individuals; however, breakthrough infections are likely to occur,⁸ highlighting the importance of receiving booster doses when recommended.

Table 1 summarizes the criteria for booster eligibility by vaccine and age. The Centers for Disease Control and Prevention (CDC) currently recommends that all eligible people receive a booster dose of a COVID-19 vaccine when they meet the recommended timeline for receiving a booster after completing the initial vaccination series. Currently, the only COVID-19 vaccine approved or authorized⁹ for teens aged 12 to 17 years is the Pfizer-BioNTech vaccine, and they can receive this vaccine as their booster dose five months after completing their initial vaccination series.¹⁰ For adults aged 18 and older, any of the three currently available COVID-19 vaccines may be used as a booster, regardless of the initial brand

³ Feikin, Daniel and Higdon, Melissa M. and Abu-Raddad, Laith J. and Andrews, Nick and Araos, Rafael and Goldberg, Yair and Groome, Michelle and Huppert, Amit and O'Brien, Katherine and Smith, Peter G. and Wilder-Smith, Annelies and Zeger, Scott L and Knoll, Maria D. and Patel, Minal, Duration of Effectiveness of Vaccines Against SARS-CoV-2 Infection and COVID-19 Disease: Results of a Systematic Review and Meta-Regression. Available at SSRN: <https://ssrn.com/abstract=3961378> or <http://dx.doi.org/10.2139/ssrn.3961378>

⁴ Thompson MG, Natarajan K, Irving SA, et al. Effectiveness of a Third Dose of mRNA Vaccines Against COVID-19–Associated Emergency Department and Urgent Care Encounters and Hospitalizations Among Adults During Periods of Delta and Omicron Variant Predominance — VISION Network, 10 States, August 2021–January 2022. *MMWR Morb Mortal Wkly Rep.* ePub: 21 January 2022. DOI: <http://dx.doi.org/10.15585/mmwr.mm7104e3>

⁵ Arbel R, Hammerman A, Sergienko R, Friger M, Peretz A, Netzer D, Yaron S. BNT162b2 Vaccine Booster and Mortality Due to Covid-19. *N Engl J Med.* 2021 Dec 23;385(26):2413-2420. doi: 10.1056/NEJMoa2115624. Epub 2021 Dec 8. PMID: 34879190; PMCID: PMC8728797.

⁶ Johnson AG, Amin AB, Ali AR, et al. COVID-19 Incidence and Death Rates Among Unvaccinated and Fully Vaccinated Adults with and Without Booster Doses During Periods of Delta and Omicron Variant Emergence — 25 U.S. Jurisdictions, April 4–December 25, 2021. *MMWR Morb Mortal Wkly Rep.* ePub: 21 January 2022. DOI: <http://dx.doi.org/10.15585/mmwr.mm7104e2>

⁷ Bar-On YM, Goldberg Y, Mandel M, Bodenheimer O, Freedman L, Alroy-Preis S, Ash N, Huppert A, Milo R. Protection against Covid-19 by BNT162b2 Booster across Age Groups. *N Engl J Med.* 2021 Dec 23;385(26):2421-2430. doi: 10.1056/NEJMoa2115926. Epub 2021 Dec 8. PMID: 34879188; PMCID: PMC8728796.

⁸ Centers for Disease Control and Prevention. Omicron Variant: What You Need to Know. Updated December 20, 2021. Available at <https://www.cdc.gov/coronavirus/2019-ncov/variants/omicron-variant.html>; last accessed January 18, 2022.

⁹ The Pfizer-BioNTech vaccine is fully approved for teens 16-17 years, and authorized for emergency use in children 12-15 years

¹⁰ Centers for Disease Control and Prevention. CDC Expands Booster Shot Eligibility and Strengthens Recommendations for 12-17 Year Olds. Media Statement, January 5, 2022. Available at <https://www.cdc.gov/media/releases/2022/s0105-Booster-Shot.html>; last accessed January 18, 2022.

of vaccine received; however, an mRNA vaccine is clinically preferred.¹¹ Adults who initially completed a series of either of the mRNA vaccines are eligible for a booster dose of any vaccine five months after completing their initial vaccination series, and adults who initially received the Johnson & Johnson/Janssen vaccine are eligible for a booster dose of any vaccine two months after their initial vaccination.

Table 1. Booster Eligibility by Vaccine and Age

	Based on a person’s initial vaccine brand and time since initial vaccination, they should receive the following booster doses: ¹²		
	Pfizer-BioNTech†	Moderna†	Johnson & Johnson/Janssen
Teens 12-17 Years Old	Can only receive Pfizer-BioNTech vaccine, at least five months after receiving primary COVID-19 vaccination	Not authorized or approved for this age group	Not authorized or approved for this age group
Adults 18 Years and older	Any brand† of COVID-19 vaccine, at least five months after receiving primary COVID-19 vaccination	Any brand† of COVID-19 vaccine, at least five months after receiving primary COVID-19 vaccination	Any brand† of COVID-19 vaccine, at least two months after receiving primary COVID-19 vaccination

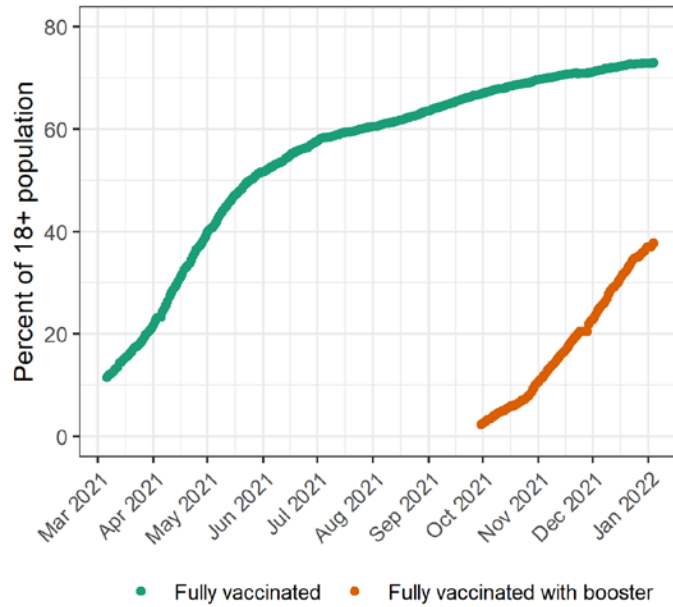
Notes: † The Pfizer-BioNTech or Moderna mRNA vaccine is clinically preferred in most situations based on current Advisory Committee on Immunization Practices (ACIP) recommendations

To support outreach efforts and policy decisions to increase booster uptake among all eligible adults, this analysis explores the demographic characteristics of adults associated with increased likelihood of having received a COVID-19 booster dose, using federal survey data collected in December 2021.

¹¹ Centers for Disease Control and Prevention. CDC Endorses ACIP’s Updated COVID-19 Vaccine Recommendations. Media Statement, December 16, 2021. Available at <https://www.cdc.gov/media/releases/2021/s1216-covid-19-vaccines.html>

¹² Centers for Disease Control and Prevention. COVID-19 Vaccine Booster Shots. Updated January 7, 2022. Available at https://www.cdc.gov/coronavirus/2019-ncov/vaccines/booster-shot.html?s_cid=11706:cdc%20covid%20booster:sem.ga:p:RG:GM:gen:PTN:FY22; last accessed January 18, 2022.

Figure 1. Percent of Adults in the United States who are Fully Vaccinated and Fully Vaccinated with Booster, by Date of Vaccination Status



Source: CDC COVID Data Tracker, January 10, 2022

Methods

Data

ASPE examined demographic characteristics of adults receiving booster doses of COVID-19 vaccines using survey data from the U.S. Census Bureau’s Household Pulse Survey (HPS). The HPS is designed to produce statistics at the national and state levels and for the 15 largest Metropolitan Statistical Areas. The HPS includes information on vaccination status for COVID-19, intentions to receive the COVID-19 vaccine, and other sociodemographic factors of U.S. residents. The HPS first began collecting information on the number of doses received and brand of the first vaccine received in the survey administered December 1-13, 2021 (Week 40).¹³ Of the 1.04 million housing units sampled, the overall weighted response rate was approximately 5.8 percent (60,826 respondents).¹⁴

¹³ Specifically, the survey asks: “How many dose(s) of a COVID-19 vaccine have you received?” to which the respondent can select: 1 vaccination; 2 vaccinations; 3 vaccinations; 4 or more vaccinations; or Don’t know. The other question asks, “Which brand of COVID-19 vaccine did you receive first?” and the respondent may choose, “Pfizer-Biontech”, “Moderna”; “Johnson and Johnson (Janssen)”; “One of the brands that requires two initial shots, but not sure which brand”; “None of these brands”; or “Don’t know”.

¹⁴ US Census Bureau (2021). Source of the Data and Accuracy of the Estimates for the Household Pulse Survey Phase 3.3. Available at https://www2.census.gov/programs-surveys/demo/technical-documentation/hhp/Phase3-3_Source_and_Accuracy_Week40.pdf, last accessed December 30, 2021.

CDC provides data on overall uptake of boosters in the U.S. population, which is updated daily. CDC also provides booster uptake by a select set of sociodemographic and geographic factors such as race and ethnicity, age, gender, state, and county. CDC produces this information from data gathered when a person gets a vaccine, which is then reported to CDC by participating jurisdictions. While the HPS provides lower frequency data than the CDC data, there are still two main advantages to using the HPS. First, the HPS provides sociodemographic information not available in the CDC data, such as educational attainment, marital status, sexual orientation, gender identity, presence of children in the household, household income, and insurance coverage. Second, the HPS data are available at the individual level which facilitates analysis of the data using different levels of analysis than those provided by CDC. Together, these features allow for identification of factors associated with booster uptake.

Determining Booster Status

Among those fully vaccinated, we utilized the number of doses reported in conjunction with the brand of the first dose reported to determine whether or not a respondent received a booster dose. For example, if a respondent reported that they had received three doses of a COVID-19 vaccine and reported the Pfizer-BioNTech vaccine for their first dose, this respondent would be considered to have received a booster dose.

We determined that respondents received a booster for the following combinations of the number of doses and first brand vaccine received:

- 1) three or more doses and Pfizer
- 2) three or more doses and Moderna
- 3) two or more doses and Johnson & Johnson/Janssen
- 4) three or more doses and “One of the brands that requires two initial shots, but not sure which brand”

By contrast, we define fully vaccinated but not receiving a booster for the following combinations:

- 1) two doses and Pfizer
- 2) two doses and Moderna
- 3) two doses and “One of the brands that requires two initial shots, but not sure which brand”
- 4) one dose and Johnson & Johnson/Janssen

Those reporting “None of these brands” or “Don’t know” were excluded from the analysis.

Analysis of Demographic Factors by Booster Status

First, we conducted a descriptive analysis to present demographic characteristics of the respondents in our sample and of those that have received a booster. Second, we used a logistic regression to calculate adjusted odds ratios of receiving a booster using the following sociodemographic and geographic information: age, sex, race/ethnicity, college degree completion, marital status, sexual orientation, gender identity, presence of children in the household, health insurance status, household income, and US Census region of residence among the sample of respondents selected for the analysis (see Appendix 1 for additional details). In our analysis, we also identified respondents with missing information for any of the sociodemographic characteristics. Based on this assessment, we determined that household income and insurance coverage information was missing for at least 14 percent of the sample.

Consequently, in our logistic regression we include categorical variables for respondents missing household income or insurance coverage information. This serves two purposes. First, it maintains our sample size by preserving observations that would be dropped from our analysis if they contained missing values. Second, it mitigates potential selection bias arising from excluding from our sample respondents with missing household income or insurance coverage information whose decision to receive a booster may be correlated with other demographic characteristics.

Results

Table 2 presents the demographic composition of all fully vaccinated respondents (first column) compared with those who received a booster (second column) and those who did not receive a booster (third column). There are key demographic differences between those who received a booster and those who did not. For instance, the older population made up a larger percentage of those who received a booster than of those who did not receive a booster. Respondents aged 65 and over represented 40 percent of those who received a booster, while respondents aged 65 and over represented only 14 percent of those who did not receive a booster. In terms of household income, those with higher household incomes made up a larger proportion of those who received a booster compared to respondents who did not receive a booster. Of those who received a booster, 43 percent of respondents reported a household income of \$75,000 and above, compared to only 28 percent of respondents who did not receive a booster. Moreover, there were also stark differences with respect to educational attainment. Those with a college degree or higher made up a larger percentage of those who received a booster than those who did not receive a booster. Forty-five percent of respondents who received a booster reported having a college degree or higher, compared to 28 percent of their counterparts who reported not receiving a booster. Finally, compared to respondents who did not receive a booster, those who received a booster were less likely to report being Hispanic (12 percent versus 21 percent) or non-Hispanic Black (8 percent versus 12 percent), and more likely to report being non-Hispanic White (71 percent versus 57 percent).

Table 2. Demographic Composition of Survey Respondents

Variable	All Fully Vaccinated Respondents	Respondents Who Received a Booster	Respondents Who Did Not Receive a Booster
Sex			
Male	48%	48%	48%
Female	52%	52%	52%
Age			
18 – 24	7%	2%	10%
25 – 39	25%	17%	31%
40 – 54	25%	21%	28%
55 – 64	18%	21%	17%
65+	24%	40%	14%
Race/Ethnicity			
White, Non-Hispanic	63%	71%	57%
Black, Non-Hispanic	11%	8%	12%
Asian, Non-Hispanic	6%	6%	6%
Other/Multiple Race	3%	3%	4%
Hispanic	17%	12%	21%
Education			
No College Degree	65%	55%	72%
College Degree or Higher	35%	45%	28%
Marital Status			
Married	57%	64%	52%
Widowed	5%	7%	4%
Divorced/Separated	14%	14%	14%
Never Married	24%	15%	30%
Sexual Orientation			
Gay or Lesbian	3%	4%	3%
Straight	89%	91%	88%
Bisexual	4%	3%	5%
Something Else/Don't Know	3%	3%	4%
Gender Identity			
Cisgender	98%	99%	98%
Transgender	2%	1%	2%
Children in Household			
Yes	34%	25%	40%
No	66%	75%	60%
Insurance Coverage			
Yes	81%	87%	76%
No	5%	2%	7%

Table 2. Demographic Composition of Survey Respondents

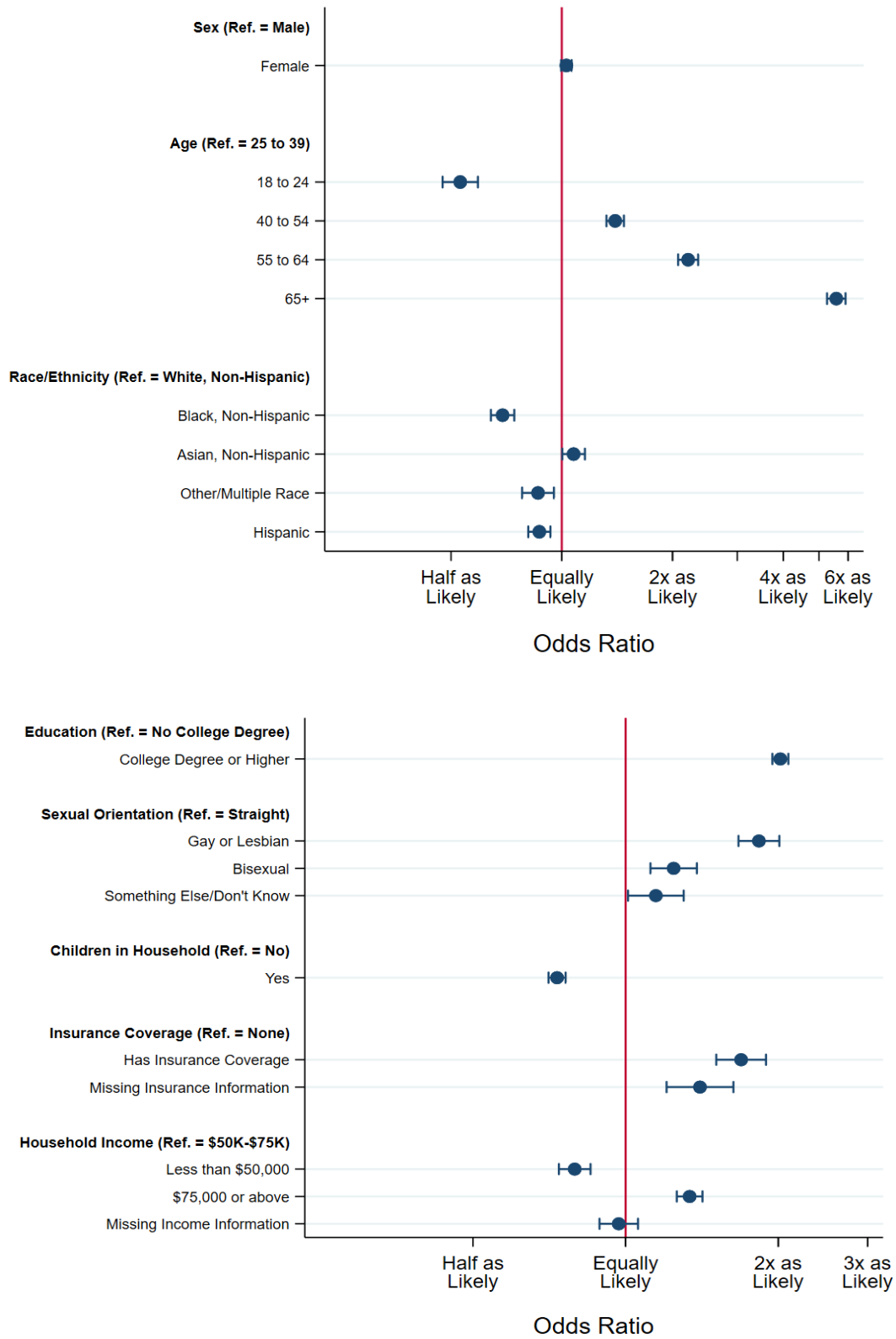
Variable	All Fully Vaccinated Respondents	Respondents Who Received a Booster	Respondents Who Did Not Receive a Booster
Missing Information	14%	11%	17%
Household Income			
Less than \$50,000	29%	24%	34%
\$50,000 to \$74,999	14%	14%	14%
\$75,000 and above	35%	43%	28%
Missing Information	22%	18%	25%
Region			
Northeast	18%	19%	17%
South	37%	35%	38%
Midwest	20%	21%	19%
West	25%	25%	25%

Source: ASPE analysis of Household Pulse Survey December 1-13, 2021.

Figure 2 provides a visual representation of key odds ratios and 95% confidence intervals from a logistic regression that estimates the odds of being more or less likely to have received a booster by certain demographic characteristics (Appendix Table 2 presents the full results of our logistic regression). Each of the odds ratios is an estimate of the association between our explanatory variables and booster uptake after controlling for a range of demographic and other variables. The likelihood of booster uptake for respondents in a given demographic category is interpreted as being “equally likely” relative to the reference group if the odds ratio is equal to one (1). If the odds ratio is two (2), the likelihood of booster uptake for respondents in a given demographic category is considered to be two-times more likely than those in the reference group. Results are statistically significant at the 95% confidence level if the confidence interval does not cross the “equally likely” red line.

Among fully vaccinated adults, older respondents were statistically significantly more likely to have received a booster—respondents aged 65+ were over five times as likely to have received a booster compared to people aged 25 to 39 years. Non-Hispanic Black, Other/Multiple Race, and Hispanic respondents were significantly less likely to have received a booster compared to non-Hispanic White respondents, while non-Hispanic Asian respondents were significantly more likely to have received a booster, though the magnitude was low. Those with a college degree or higher were significantly twice as likely as those without a college degree to have received a booster. Respondents who reported being gay, lesbian, bisexual, or something else were significantly more likely to have received a booster compared to straight respondents. Those with children in the household were significantly less likely to have received a booster compared to those without children. Lastly, having insurance coverage and higher household incomes were both associated with being significantly more likely to have received a booster.

Figure 2. Adjusted Odds Ratios and Confidence Intervals of Key Demographic Characteristics Associated with Booster Uptake



Notes: The above values represent the adjusted odds ratios for each demographic category relative to their respective reference groups, as defined by “Ref =” on the left side of the plot. An estimated odds ratio equal to one for a given demographic category implies booster uptake for this given demographic category was equally likely as booster uptake for the reference group, after accounting for control variables. An estimated odds ratio equal to two for a given demographic category implies booster uptake for this given demographic category was twice as likely as booster uptake for the reference group, after accounting for control variables. If the 95 percent confidence interval does not cross the “equally likely” red line for a given demographic category, then the odds ratio is interpreted as being statistically significant at the 95 percent level. A full list of the odds ratios for all demographic characteristics included in the model, as well as statistical significance, is available in Appendix Table 2.

Source: ASPE analysis of Household Pulse Survey December 1-13, 2021.

Discussion

As of March 9, 2022, 47.5 percent of fully vaccinated adults 18 years and over have received a booster dose of a COVID-19 vaccine.¹⁵ CDC’s COVID-19 Data Tracker displays some available data for people aged 12+ who have received a booster, showing differences by race, ethnicity, age, and sex.¹⁶ Although the population for the CDC data includes those aged 12 and older and our analysis includes only adults aged 18 and over, similar trends in the proportions of age, sex, and race and ethnicity categories of booster recipients were observed. CDC also reports percentages of booster eligible people aged 12+ who have and have not received a booster, by race and ethnicity. Among these individuals, non-Hispanic Asian and non-Hispanic White booster-eligible adults had the highest percentage of uptake (59.6% and 54.4%, respectively), and Hispanic and non-Hispanic Black booster-eligible adults had the lowest percentage of booster uptake (40.0% and 43.7% respectively).¹⁷ The results of our odds ratio analysis are similar to these statistics reported by CDC, which showed that non-Hispanic Asian respondents had the highest odds of booster uptake, while non-Hispanic Black and Hispanic respondents had lower odds of booster uptake compared to non-Hispanic White respondents.

Other demographic characteristics that are collected through the HPS may also be important for informing booster uptake and likelihood of receiving a booster. Utilizing the available HPS data to estimate the odds of different self-reported demographic groups having received a booster can help decision-makers understand where more targeted resources may be needed. According to this analysis, booster uptake has not been equal across all demographic groups, with some groups being more or less likely to have received a booster dose. Policy decision makers can consider adjusting or tailoring messaging or interventions for booster uptake to groups who were found to be less likely to receive a booster in this analysis, such as young adults, people with children in the household, and people with an income of less than \$50,000 per year. Although recent surveys show that the majority of adults are aware of CDC’s booster recommendations, almost a quarter of adults surveyed were unaware of

¹⁵ Centers for Disease Control and Prevention. COVID-19 Vaccinations in the United States. Available at [CDC COVID Data Tracker](#) Last accessed March 9, 2022

¹⁶ Centers for Disease Control and Prevention. COVID-19 Vaccinations in the United States. Available at [CDC COVID Data Tracker](#) Last accessed March 9, 2022

¹⁷ Centers for Disease Control and Prevention. COVID-19 Vaccination Equity. Available at [CDC COVID Data Tracker](#) Last accessed March 9, 2022

booster recommendations.¹⁸ While this analysis indicates that different groups may be more or less likely to act on these recommendations, it also may be indicative that some groups are more aware of booster recommendations than others, and future analyses may be able to look further into booster recommendation awareness compared to likelihood of booster uptake among those who are aware.

Data related to the Omicron variant continues to be collected and analyzed as the variant spreads rapidly worldwide. Early data shows that while breakthrough infections among the fully vaccinated are occurring, receiving a booster dose of an mRNA vaccine enhances the neutralizing antibody response against the Omicron variant, highlighting the importance of booster doses.¹⁹ Currently, less than half of vaccinated adults have received a booster dose, but emerging information on the spread of the Omicron variant may influence booster decision making. A recent survey showed that about half of vaccinated adults who have not yet received a booster dose report that the Omicron variant will make them more likely to get a booster.²⁰ Other recent surveys indicate that 42% of adults are very or somewhat worried they will be infected with the Omicron variant, but only 25% are worried about the potential personal impact of the Omicron variant compared to the potential impact on the economy and local hospitals (56% and 54%).²¹ Future work on the topic of booster uptake could address different questions that were not able to be included in this analysis, such as booster uptake among eligible adolescents, the impact of COVID-19 variants including Omicron, and analyzing reasons for hesitancy to get a booster dose. Understanding which demographic groups are more or less likely to receive a booster is essential for informing policy decisions and targeted outreach to increase booster update among fully vaccinated adults in the United States.

Limitations

Vaccine accessibility and other individual factors that may influence whether or not someone receives a booster could not be assessed in this analysis. Additionally, the analysis could not account for which individuals in the sample were eligible to receive a booster based on the initial timing of their original vaccination, and as such, some differences in booster uptake may be influenced by individuals who received their initial vaccination course later and were not yet eligible for a booster. Thus, our estimates should be used with caution when attempting to generalize beyond the factors examined herein. In addition, our estimates should be used in conjunction with other relevant information. Local contextual information, including trends and data related to vaccine access, community morbidity and mortality, social vulnerability, and vaccine administration can provide additional insights and applicability. Our estimates use individual level responses intended to capture sentiment in the U.S. at the time of the

¹⁸ <https://www.kff.org/coronavirus-covid-19/poll-finding/kff-covid-19-vaccine-monitor-early-omicron-update/>

¹⁹ Garcia-Beltran WF, St Denis KJ, Hoelzemer A, Lam EC, Nitido AD, Sheehan ML, Berrios C, Ofoman O, Chang CC, Hauser BM, Feldman J, Roederer AL, Gregory DJ, Poznansky MC, Schmidt AG, Iafrate AJ, Naranbhai V, Balazs AB. mRNA-based COVID-19 vaccine boosters induce neutralizing immunity against SARS-CoV-2 Omicron variant. *Cell*. 2022 Jan 6:S0092-8674(21)01496-3. doi: 10.1016/j.cell.2021.12.033. Epub ahead of print. PMID: 34995482; PMCID: PMC8733787.

²⁰ <https://www.kff.org/coronavirus-covid-19/press-release/omicron-variant-increases-worries-and-gives-momentum-to-covid-19-booster-shots-may-motivate-a-small-share-of-unvaccinated-adults-to-get-an-initial-shot/>

²¹ <https://www.kff.org/coronavirus-covid-19/poll-finding/kff-covid-19-vaccine-monitor-january-2022/>

survey; careful consideration is advised when examining questions outside of the time period assessed in this analysis. The survey questions available in the HPS also do not currently include reasons why an individual may or may not be willing to get a booster specifically, although they do include questions around reasons for vaccine hesitancy for the initial COVID-19 vaccination series.

Due to nonresponse bias, the HPS may not be fully representative of all U.S. adults and survey-based estimates for vaccination rates and booster uptake may not match data from other sources. A full discussion of limitations associated with the HPS can be found in the survey's technical documentation.²² Additionally, in some portions of the analysis, smaller sample sizes may have been insufficient to show a statistically significant difference in booster uptake for some demographic groups.

Conclusions

With COVID-19 variants of concern emerging and spreading globally, vaccinations remain critical for reducing the spread of SARS-CoV-2 and preventing severe illness, hospitalizations, and deaths. Recent data around vaccine effectiveness, waning immunity, and efficacy of booster doses highlights the importance of adopting evidence-based booster dose recommendations and encouraging individuals to receive booster doses as soon as they are eligible. In the United States, booster coverage among fully vaccinated adults remains low, but understanding the demographics of groups who are more or less likely to have received a booster thus far can help inform policy and communications decisions to improve booster uptake.

²² US Census Bureau (2021). Source of the Data and Accuracy of the Estimates for the Household Pulse Survey Phase 3.3. Available at https://www2.census.gov/programs-surveys/demo/technical-documentation/hhp/Phase3-3_Source_and_Accuracy_Week40.pdf, last accessed December 30, 2021.

Appendix 1: Analytic Methods

ASPE estimated associations between booster uptake and survey respondents’ characteristics using the most recently available federal survey data.

We estimate the odds ratios of receiving a booster using the Census Bureau’s Household Pulse Survey (HPS). The HPS is designed to produce statistics at the national and state levels and for the 15 largest Metropolitan Statistical Areas. The HPS includes information on U.S residents’ vaccination for COVID-19, the number of doses received and the brand of the first COVID-19 vaccine as well as other sociodemographic information. The questions about the number of doses received and the brand of the first COVID-19 vaccine received were first introduced in the survey in December 1-13, 2021 (“Week 40”) for all adults who reported being vaccinated for COVID-19.

We determined whether respondents received a booster using information on the number of doses and first brand of vaccine received as reported by the respondents (see table below).

Table S- 1. Criteria to Determine Booster Status		
Questions Used	Received Booster	Did not Receive Booster
Number of Doses Received and Brand of First Dose Received	3 or 4 doses and Pfizer 3 or 4 doses and Moderna 3 or 4 doses and “two initial shots, but not sure of brand” 2, 3 or 4 doses and Johnson & Johnson	2 doses and Pfizer 2 doses and Moderna 1 dose and Johnson & Johnson 2 doses and “two initial shots, but not sure of brand”

We use a binary logistic regression model characterized by equation (1) to obtain the odds ratios:

$$(1) \text{logit}(y_i) = a + d * X + \partial_r + e_i$$

In equation (1), y_i is equal to one if respondent i has received a booster and zero otherwise. We examine this model for all adults who have been fully vaccinated. X is a set of sociodemographic characteristics for respondent i : age (18-24, 25-39, 40-54, 55-64, 65+), gender, race/ethnicity (Hispanic, non-Hispanic White, non-Hispanic Black, non-Hispanic Asian, and non-Hispanic Other/Multiple Race), education (No College, College or Higher), marital status (Married, Widowed, Divorced/Separated, Never Married), sexual orientation (Gay or Lesbian, Straight, Bisexual, Something Else/Don’t Know), gender identity (Cisgender, Transgender), presence of children in the household (Yes, No), health insurance status (insured, not insured, missing health insurance information), and household income (less than \$50,000, \$50,000 to \$74,999, \$75,000 and above, and Missing Information). The model also includes four Census region indicators, ∂_r , to control for region-specific characteristics, as well as to compare booster uptake between regions after accounting for covariates.

Appendix 2: Results of Logistic Regression

Table A-1. Factors Associated with Booster Uptake Among Fully Vaccinated Adults	
Demographic Characteristic	Odds Ratio
Sex	
Male	Ref.
Female	1.029*
Age	
18 – 24	0.530***
25 – 39	Ref.
40 – 54	1.397***
55 – 64	2.206***
65+	5.575***
Race/Ethnicity	
White, Non-Hispanic	Ref.
Black, Non-Hispanic	0.690***
Asian, Non-Hispanic	1.077**
Other/Multiple Race	0.862***
Hispanic	0.869***
Education	
No College Degree	Ref.
College Degree or Higher	2.019***
Marital Status	
Married	1.230***
Widowed	1.144**
Divorced/Separated	1.036
Never Married	Ref.
Sexual Orientation	
Gay or Lesbian	1.832***
Straight	Ref.
Bisexual	1.244***
Something Else/Don't Know	1.147**
Gender Identity	
Cisgender	Ref.
Transgender	0.924
Children in Household	
Yes	0.733***
No	Ref.
Insurance Coverage	
Yes	1.690***
No	Ref.
Missing Information	1.402***
Household Income	

Table A-1. Factors Associated with Booster Uptake Among Fully Vaccinated Adults	
Demographic Characteristic	Odds Ratio
Less than \$50,000	0.794***
\$50,000 to \$74,999	Ref.
\$75,000 and above	1.337***
Missing Information	0.969
Region	
Northeast	Ref.
South	0.939**
Midwest	1.003
West	0.972

Note: * p-value <0.10; ** p-value <0.05; *** p-value <0.01.

Source: ASPE analysis of Household Pulse Survey December 1-13, 2021.

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