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American Journal of Infection Control

journal homepage: www.ajicjournal.org

Brief Report

Trends in COVID-19 vaccination receipt and intention to vaccinate, United States, April to August, 2021



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Key Words:

COVID-19 vaccine
Vaccine hesitancy
Vaccine confidence
Disparities
Trends

To assess trends in and factors associated with COVID-19 vaccination coverage, data from the Household Pulse Survey were analyzed. From April to August 2021, vaccination coverage with at least 1 dose increased from 70%-82%, while vaccination intent increased from 82%-86%, with the highest increase among the most vulnerable groups. More efforts are needed to boost confidence in vaccines and to encourage all eligible people to be fully vaccinated.

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In December 2020, the COVID-19 vaccine became available in the United States under an Emergency Use Authorization for groups prioritized for early vaccination and to all adults ≥ 18 years starting in April 2021¹; however, COVID-19 vaccination with at least 1 dose and with all recommended doses was 78% and 68%, respectively, as of October 9, 2021.² The importance of achieving high and equitable vaccination uptake was demonstrated throughout the summer of 2021 when increasing transmission of COVID-19 variants, lagging vaccination rates, and a reduction in social distancing and other preventive measures led to rising number of cases, hospitalizations, and deaths throughout the U.S. after months of decline.³ Furthermore, the re-opening of schools and businesses, and increased social gatherings

and travel,⁴ amplify the need for increased vaccination coverage. Unfortunately, even as vaccination coverage and intent increased from January to March 2021, disparities existed by age, race and/or ethnicity, and other sociodemographic factors.⁵ To follow-up on these early vaccination disparities, the present study assessed trends and differences in vaccination coverage and intent from April to August 2021, and examined changes in reasons for not getting vaccinated using a large, nationally representative survey.

METHODS

Data from five waves (April 14–26, May 12–24, June 9–21, July 21–August 2, August 18–30, 2021) of the Household Pulse Survey were analyzed ($n=343,553$). The survey design of the HPS has been described previously.⁶ The response rates for five waves of data collection ranged from 6.1%–7.4%.⁷ This study was reviewed by the Tufts University Health Sciences Institutional Review Board and was not considered human subjects research.

COVID-19 vaccination receipt (≥ 1 dose) was assessed by the following questions: “Have you received a COVID-19 vaccine?” [yes/no] Among unvaccinated adults, intent to be vaccinated was assessed with the question: “Once a vaccine to prevent COVID-19 is available to you, would you...definitely, probably, be unsure about, probably not, or definitely not get a vaccine.” Because measuring intent over time would show bias as more people get vaccinated, vaccination intent was defined as being vaccinated or being definitely or probably likely to get vaccinated. Among all non-vaccinated respondents who did

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Article Summary Line: From April to August, 2021, vaccination coverage and intent increased by 12 and 4 percentage points, respectively; however, more unvaccinated people reported concerns about side effects and mistrust of vaccines, suggesting a need to increase efforts to boost confidence in the safety and efficacy of vaccines and to encourage all eligible people to be fully vaccinated.

Conflict of Interest Disclosures (includes financial disclosures): The authors have no conflicts of interest relevant to this article to disclose. None of the authors have financial relationships relevant to this article to disclose.

Funding/Support: No funding was secured for this study. Laura Corlin was supported by Eunice Kennedy Shriver National Institute of Child Health & Human Development (NICHD) grant number K12HD092535 and by the Tufts University/Tufts Medical Center Rapid Response Seed Funding Program. Jennifer Allen was supported by the Tufts University Office of the Vice Provost for Research (OVPR) Research and Scholarship Strategic Plan.

not report that they definitely planned to get vaccinated in April and August (n=18,888), respondents were asked reasons for not getting vaccinated (Appendix).

Trends in vaccination status were assessed for each survey wave overall and by socioeconomic characteristics through multivariable regression (Appendix). Factors associated with and differences in vaccination coverage and intent were examined using multivariable regression models and t-tests. Proportions and differences in reasons for not getting vaccinated were assessed. Analyses accounted for the survey design and weights to ensure a representative sample in SAS (version 9.4; SAS Institute, Inc.) and Stata (version 16.1).

RESULTS

Receipt of ≥1 dose of a COVID-19 vaccine and intent to be vaccinated increased from April 14 to August 30, 2021 nationally and across most sociodemographic characteristics (Table 1 and Supplemental table; Supplemental figure). Vaccination coverage with at least one dose increased from 70%-82% while vaccination intent increased from 82%-86% (Table 1 and Supplemental table).

Vaccination coverage increased within each sociodemographic group, but the largest increases in coverage occurred among younger adults (18-24 years: 20 percentage points [pp]), Hispanic or Latino populations (17 pp), adults with lower levels of education (less than high school education: 18 pp) and lower income (less than \$35,000: 19 pp), as well as those not covered by insurance (24 pp) (Table 1).

In multivariable analyses, factors associated with vaccination coverage and intent were older age, identification with certain racial and/or ethnic minority groups, having a higher education or income, having insurance, and not having a prior COVID-19 diagnosis (Table 1 and Supplemental table). Reasons for not getting vaccinated changed from April to August, with a higher proportion of adults in August having concerns about possible side effects (from 51%-57%), lack of trust in vaccines (from 30%-44%), lack of trust in the government (from 23%-40%), and belief that the vaccine is not needed (from 20%-30%) (Fig 1).

CONCLUSION AND DISCUSSION

Receipt of and intention to get a COVID-19 vaccine increased from April to August 2021, particularly among groups which had the lowest vaccination coverage, suggesting that disparities in vaccination coverage and intent among vulnerable populations found early in 2021 were narrowing. Nevertheless approximately 7% of the population continue to report that they definitely will not get vaccinated, a statistic that has remained relatively unchanged since April 2021.

The findings in this study are subject to several limitations. First, although sampling methods and data weighting were designed to produce nationally representative results, respondents might not be fully representative of the general U.S. adult population. Second, vaccination status was self-reported and is subject to social desirability bias. Third, the HPS has a low response rate (<10%); although non-response bias assessment conducted by the Census Bureau found that the survey weights mitigated most of this bias.⁸

Of note is that reasons for not being vaccinated have changed. For example, there is now a higher proportion of adults (among those who have not been vaccinated) who reported that they were concerned about possible side effects, did not trust COVID-19 vaccines or the government, or did not believe they needed a vaccine. In August, over a quarter of respondents also reported that they did not know if a COVID-19 vaccine would protect them against the SARS-CoV-2 virus. These changes in reasons for not getting vaccinated may stem from factors such as vaccine misinformation, the pause in the Janssen vaccine, reports of side effects, or the belief that the vaccine is not needed due to perceived immunity from COVID-19 or the “free-

Table 1 Trends in and factors associated with receipt of ≥1 dose of COVID-19 vaccine among adults ≥18 years, by sociodemographic characteristics and survey week, United States, Household Pulse Survey, April 14, 2021 to August 30, 2021

| | 4/14-4/26 N = 68,913 | | 5/12-5/24 N = 72,897 | | 6/9-6/21 N = 68,067 | | 7/21-8/2 N = 64,562 | | 8/18-8/30 N = 69,114 | | 8/18-8/30 | |
|-------------------------------|-------------------------|--------------|-------------------------|--------------|------------------------|--------------|------------------------|---------------|-------------------------|---------------|-----------|--------------|
| | % | (95% CI) | % | (95% CI) | % | (95% CI) | % | (95% CI) | % | (95% CI) | % | (95% CI) |
| All | 69.7 | (69.0, 70.3) | 77.3 | (76.7, 78.0) | 79.1 | (78.5, 79.8) | 82.0 | (81.4, 82.6) | 82.3 | (81.7, 82.9)* | 12.6 | (11.7, 13.5) |
| Age Group | | | | | | | | | | | | |
| 18-24 | 52.6 | (49.8, 55.4) | 66.3 | (62.6, 70.0) | 71.8 | (68.2, 75.4) | 74.5 | (71.7, 77.3) | 72.2 | (69.3, 75.2)* | 19.6 | (15.5, 23.7) |
| 25-39 | 57.4 | (56.1, 58.6) | 67.5 | (66.0, 69.0) | 69.9 | (68.4, 71.3) | 73.1 | (71.3, 74.9) | 73.6 | (72.3, 74.9)* | 16.2 | (14.4, 18.0) |
| 40-54 | 66.1 | (64.6, 67.5) | 75.6 | (74.3, 76.8) | 76.9 | (75.6, 78.3) | 80.2 | (79.1, 81.3) | 80.4 | (79.2, 81.6)* | 14.3 | (12.4, 16.2) |
| 55-64 | 78.4 | (76.7, 80.0) | 83.8 | (82.7, 85.0) | 85.1 | (83.8, 86.5) | 88.4 | (87.2, 89.5)* | 88.4 | (87.3, 89.5)* | 10.0 | (8.0, 12.0) |
| 65+ | 88.4 | (87.1, 89.6) | 90.4 | (89.2, 91.6) | 91.1 | (90.1, 92.2) | 92.8 | (92.1, 93.6) | 94.2 | (93.5, 94.9)* | 5.8 | (4.4, 7.2) |
| Sex | | | | | | | | | | | | |
| Male | 69.2 | (68.1, 70.3) | 77.6 | (76.5, 78.7) | 79.5 | (78.3, 80.6) | 81.6 | (80.4, 82.7) | 81.3 | (80.2, 82.3)* | 12.1 | (10.6, 13.6) |
| Female | 70.1 | (69.3, 70.9) | 77.1 | (76.2, 77.9) | 78.8 | (78.1, 79.5) | 82.4 | (81.6, 83.2) | 83.3 | (82.7, 83.9)* | 13.2 | (12.2, 14.2) |
| Race/ethnicity | | | | | | | | | | | | |
| NH White | 72.2 | (71.6, 72.9) | 78.1 | (77.3, 78.8) | 79.5 | (78.7, 80.3) | 82.7 | (82.0, 83.5) | 82.9 | (82.3, 83.5)* | 10.7 | (9.8, 11.6) |
| NH Black | 62.6 | (60.5, 64.8) | 70.8 | (68.8, 72.8) | 71.9 | (70.0, 73.9) | 75.7 | (73.4, 78.0) | 77.4 | (75.2, 79.5)* | 14.8 | (11.8, 17.8) |
| NH Asian | 80.2 | (77.2, 83.1) | 91.0 | (89.7, 92.4) | 94.6 | (93.2, 95.9) | 94.4 | (92.6, 96.2) | 95.7 | (94.3, 97.0)* | 15.5 | (12.3, 18.7) |
| NH multi/other | 58.9 | (55.4, 62.4) | 65.7 | (62.3, 69.1) | 68.5 | (65.0, 72.0) | 79.5 | (76.1, 82.9) | 74.4 | (71.6, 77.3)* | 15.5 | (11.0, 20.0) |
| Hispanic or Latino | 64.0 | (62.0, 66.1) | 76.6 | (74.5, 78.7) | 79.6 | (77.4, 81.7) | 80.0 | (77.8, 82.3) | 81.0 | (78.7, 83.2)* | 17.0 | (14.0, 20.0) |
| Educational Status | | | | | | | | | | | | |
| Less than high school | 54.4 | (50.5, 58.3) | 67.1 | (63.0, 71.1) | 68.6 | (65.2, 71.9) | 70.0 | (66.6, 73.5) | 72.5 | (68.8, 76.2)* | 18.1 | (12.7, 23.5) |
| High school diploma or GED | 61.3 | (59.8, 62.9) | 70.1 | (68.8, 71.4) | 71.8 | (70.2, 73.4) | 75.9 | (74.4, 77.4) | 76.0 | (74.6, 77.4)* | 14.7 | (12.6, 16.8) |
| Some college/associate degree | 68.4 | (67.3, 69.5) | 75.3 | (74.2, 76.4) | 77.5 | (76.5, 78.4) | 81.1 | (80.1, 82.1) | 81.2 | (80.3, 82.2)* | 12.8 | (11.3, 14.3) |
| Bachelor's degree or higher | 83.3 | (82.4, 84.2) | 89.1 | (88.6, 89.7) | 90.8 | (90.2, 91.3) | 92.0 | (91.6, 92.5) | 92.3 | (91.8, 92.7)* | 9.0 | (8.0, 10.0) |

(continued on next page)

Table 1 (Continued)

| | 4/14-4/26 N = 68,913 | | 5/12-5/24 N = 72,897 | | 6/9-6/21 N = 68,067 | | 7/21-8/2 N = 64,562 | | 8/18-8/30 N = 69,114 | | Difference | | 8/18-8/30 | |
|---|-------------------------|--------------|-------------------------|--------------|------------------------|--------------|------------------------|--------------|-------------------------|---------------|------------|--------------|------------------|--------------|
| | % | (95% CI) | % | (95% CI) | % | (95% CI) | % | (95% CI) | % | (95% CI) | % | (95%CI) | aPR [†] | (95%CI) |
| Annual Household Income | | | | | | | | | | | | | | |
| Less than \$35,000 | 58.8 | (56.5, 61.0) | 70.9 | (69.0, 72.8) | 72.3 | (70.4, 74.2) | 74.6 | (72.8, 76.5) | 78.0 | (76.3, 79.6)* | 19.2 | (16.4, 22.0) | 1.00 | |
| \$35,000 - \$49,999 | 70.1 | (67.4, 72.8) | 73.2 | (70.8, 75.5) | 77.2 | (75.1, 79.3) | 84.1 | (82.0, 86.2) | 83.1 | (81.4, 84.9)* | 13.0 | (9.8, 16.2) | 1.04 | (1.02, 1.07) |
| \$50,000 - \$74,999 | 73.1 | (70.8, 75.4) | 78.7 | (77.5, 80.0) | 81.0 | (79.3, 82.7) | 83.9 | (82.1, 85.7) | 85.7 | (84.4, 86.9)* | 12.6 | (10.0, 15.2) | 1.05 | (1.02, 1.07) |
| \$75,000 and above | 80.1 | (79.1, 81.0) | 85.4 | (84.5, 86.3) | 87.1 | (86.2, 88.0) | 90.2 | (89.3, 91.1) | 89.0 | (88.2, 89.8)* | 8.9 | (7.7, 10.1) | 1.06 | (1.03, 1.08) |
| Did not report | 64.8 | (63.5, 66.1) | 73.8 | (72.5, 75.2) | 75.6 | (74.3, 76.9) | 76.2 | (74.7, 77.7) | 75.5 | (74.1, 76.9)* | 10.7 | (8.8, 12.6) | 0.99 | (0.96, 1.02) |
| Insurance Status | | | | | | | | | | | | | | |
| Covered by some type of health insurance | 74.6 | (73.8, 75.4) | 80.7 | (79.9, 81.5) | 82.4 | (81.6, 83.3) | 85.9 | (85.2, 86.6) | 85.8 | (85.2, 86.4)* | 11.2 | (10.2, 12.2) | 1.00 | |
| Not covered by any type of health insurance | 43.8 | (40.4, 47.3) | 59.2 | (55.9, 62.5) | 62.1 | (58.8, 65.3) | 64.5 | (60.8, 68.2) | 67.9 | (64.5, 71.3)* | 24.1 | (19.3, 28.9) | 0.88 | (0.84, 0.92) |
| COVID-19 Status | | | | | | | | | | | | | | |
| Previously diagnosed with COVID-19 | 57.4 | (55.4, 59.5) | 65.8 | (63.6, 67.9) | 68.9 | (67.1, 70.7) | 73.3 | (71.5, 75.2) | 72.6 | (71.0, 74.2)* | 15.2 | (12.6, 17.8) | 0.89 | (0.87, 0.91) |
| Not previously diagnosed with COVID-19 | 72.1 | (71.4, 72.7) | 79.5 | (78.8, 80.1) | 81.1 | (80.5, 81.8) | 84.6 | (83.9, 85.2) | 85.3 | (84.7, 85.9)* | 13.2 | (12.3, 14.1) | 1.00 | |
| HHS region [‡] | | | | | | | | | | | | | | |
| 1 | 76.7 | (75.1, 78.3) | 86.4 | (85.0, 87.7) | 88.6 | (86.9, 90.3) | 90.3 | (88.8, 91.8) | 89.8 | (88.6, 91.1)* | 13.1 | (11.1, 15.1) | 1.00 | |
| 2 | 72.2 | (69.1, 75.2) | 80.2 | (77.0, 83.3) | 81.6 | (79.1, 84.2) | 87.6 | (84.9, 90.2) | 87.2 | (85.1, 89.3)* | 15.0 | (11.3, 18.7) | 0.97 | (0.94, 0.99) |
| 3 | 72.2 | (70.5, 74.0) | 79.6 | (77.6, 81.5) | 80.3 | (78.8, 81.8) | 85.4 | (83.5, 87.2) | 85.0 | (82.8, 87.1)* | 12.8 | (10.0, 15.6) | 0.97 | (0.95, 0.99) |
| 4 | 63.7 | (62.2, 65.3) | 70.7 | (69.1, 72.3) | 73.1 | (71.3, 74.8) | 76.5 | (74.9, 78.0) | 76.8 | (75.4, 78.2)* | 13.1 | (11.0, 15.2) | 0.91 | (0.89, 0.93) |
| 5 | 69.8 | (68.3, 71.3) | 78.5 | (77.2, 79.8) | 80.6 | (79.3, 81.9) | 81.9 | (80.2, 83.7) | 81.9 | (80.5, 83.4)* | 12.1 | (10.0, 14.2) | 0.94 | (0.92, 0.97) |
| 6 | 69.0 | (66.3, 71.7) | 75.6 | (73.9, 77.4) | 76.2 | (73.8, 78.6) | 76.6 | (74.4, 78.8) | 79.5 | (77.8, 81.3)* | 10.5 | (7.3, 13.7) | 0.94 | (0.91, 0.96) |
| 7 | 71.7 | (69.7, 73.6) | 74.9 | (73.0, 76.7) | 75.3 | (73.2, 77.3) | 80.4 | (78.4, 82.4) | 80.2 | (78.4, 82.0)* | 8.5 | (5.8, 11.2) | 0.93 | (0.91, 0.96) |
| 8 | 70.1 | (68.1, 72.2) | 76.7 | (74.6, 78.7) | 77.7 | (75.7, 79.6) | 82.4 | (80.5, 84.3) | 83.1 | (81.0, 85.1)* | 13.0 | (10.1, 15.9) | 0.95 | (0.92, 0.99) |
| 9 | 72.3 | (70.4, 74.1) | 81.9 | (80.1, 83.7) | 83.9 | (82.2, 85.6) | 85.9 | (84.6, 87.2) | 85.7 | (84.1, 87.3)* | 13.4 | (11.0, 15.8) | 0.95 | (0.92, 0.98) |
| 10 | 69.4 | (67.5, 71.4) | 75.8 | (73.9, 77.7) | 82.0 | (80.3, 83.7) | 84.7 | (82.8, 86.5) | 84.2 | (82.3, 86.0)* | 14.8 | (12.1, 17.5) | 0.97 | (0.95, 0.99) |

Abbreviations: aPR, adjusted prevalence ratio; CI, confidence interval.

*p-value for trend from April to August significant at <0.001.

[†]Prevalence ratio adjusted for age, sex, race/ethnicity, educational status, annual household income, insurance status, previous COVID-19 diagnosis, and HHS region.

[‡]Health and human services regions are defined as the following: Region 1, Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont; Region 2, New Jersey, New York, Puerto Rico, and the Virgin Islands; Region 3, Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, and West Virginia; Region 4, Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee; Region 5, Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin; Region 6, Arkansas, Louisiana, New Mexico, Oklahoma, and Texas; Region 7, Iowa, Kansas, Missouri, and Nebraska; Region 8, Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming; Region 9, Arizona, California, Hawaii, Nevada, American Samoa, Commonwealth of the Northern Mariana Islands, Federated States of Micronesia, Guam, Marshall Islands, and Republic of Palau; Region 10; Alaska, Idaho, Oregon, and Washington.

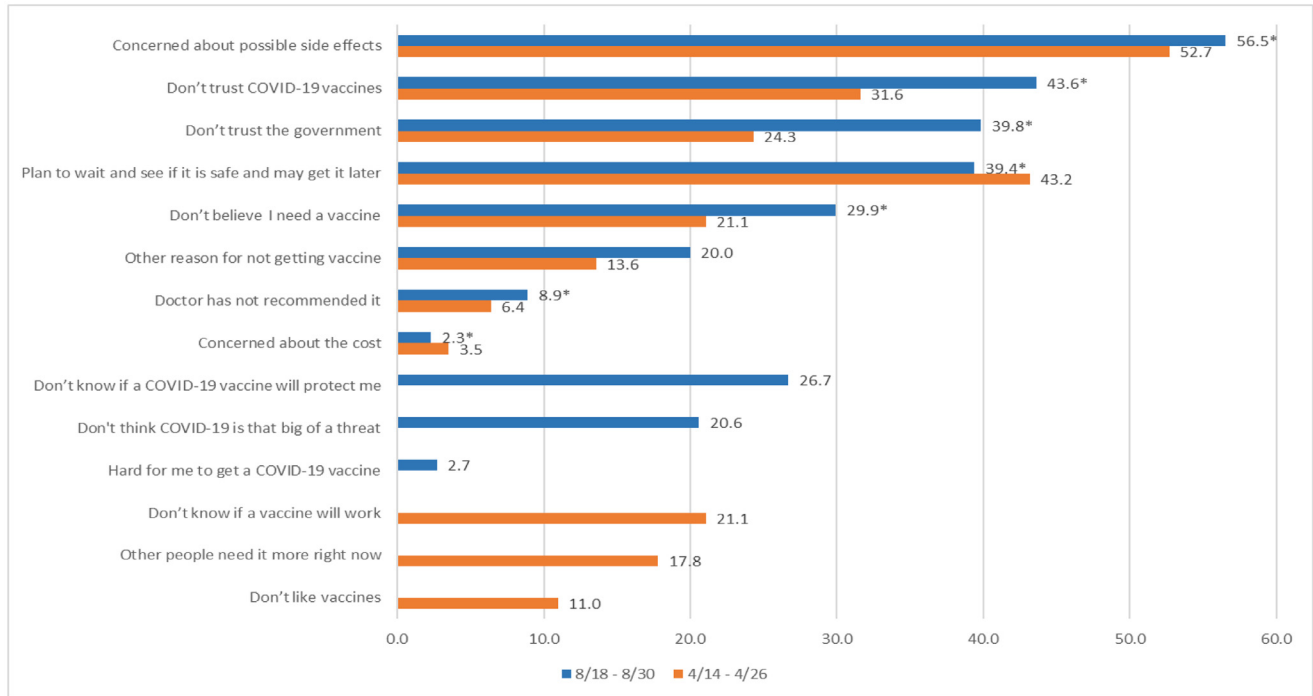


Fig 1. *Statistically significant ($P < .05$) using test of differences in proportions between April and August.

loader effect," which occurs when the rest of the population is vaccinated and the disease does not spread.^{9,10}

The recent rise of cases in the summer of 2021 suggests the need to increase efforts to encourage all eligible people to be fully vaccinated. Boosting confidence in the safety and efficacy of vaccines, increasing trust in the government, encouraging healthcare providers to recommend vaccines, and dispelling misinformation about the vaccine will play a critical role in protecting the public from COVID-19.

APPENDIX

Reasons for not getting vaccinated were assessed by the following question: "Which of the following, if any, are reasons that you [probably will/be unsure about/probably won't/definitely won't] [get a COVID-19 vaccine]". In April 2021, response options, in which respondents could select all that apply, were: (1) I am concerned about possible side effects of a COVID-19 vaccine, (2) I don't know if a COVID-19 vaccine will work, (3) I don't believe I need a COVID-19 vaccine, (4) I don't like vaccines, (5) My doctor has not recommended it, (6) I plan to wait and see if it is safe and may get it later, (7) I think other people need it more than I do right now, (8) I am concerned about the cost of a COVID-19 vaccine, (9) I don't trust COVID-19 vaccines, (10) I don't trust the government, and (11) Other (please specify). In July 2021, the following options were dropped (I don't know if a COVID-19 vaccine will work, I think other people need it more than I do right now, and I don't like vaccines) and replaced with the following options (I don't know if a COVID-19 vaccine will protect me, I don't think COVID-19 is that big of a threat, and it's hard for me to get a COVID-19 vaccine). Other response options stayed the same. Socio-demographic factors assessed were age group [18-24, 25-39, 40-54, 55-64, ≥ 65 years], sex, race and/or ethnicity [Hispanic, non-Hispanic Asian, non-Hispanic Black, non-Hispanic white, non-Hispanic other and/or multiracial], educational attainment [less than high school, high school equivalent, some college or associate's degree, Bachelor's degree or higher], annual household income [$< \$35,000$, $\$35,000$ - $49,999$, $\$50,000$ - $74,999$, $\geq \$75,000$, did not report], health insurance

status [covered, not], previous COVID-19 diagnosis [yes, no], and Health and Human services region. Health and human services regions are defined as the following: Region 1, Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont; Region 2 New Jersey, New York, Puerto Rico, and the Virgin Islands; Region 3 Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, and West Virginia; Region 4, Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee; Region 5, Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin; Region 6, Arkansas, Louisiana, New Mexico, Oklahoma, and Texas; Region 7, Iowa, Kansas, Missouri, and Nebraska; Region 8, Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming; Region 9, Arizona, California, Hawaii, Nevada, American Samoa, Commonwealth of the Northern Mariana Islands, Federated States of Micronesia, Guam, Marshall Islands, and Republic of Palau; Region 10; Alaska, Idaho, Oregon, and Washington.

SUPPLEMENTARY MATERIALS

Supplementary material associated with this article can be found in the online version at <https://doi.org/10.1016/j.ajic.2021.12.022>.

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