ASPE
ASSISTANT SECRETARY FOR PLANNING AND EVALUATION

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Unvaccinated for COVID-19 but Willing: Demographic Factors, Geographic Patterns, and Changes Over Time

Key Points

- Adults who have not yet been vaccinated against COVID-19 but might be willing to do so ("unvaccinated but willing") are a key population for outreach in pandemic response.
- As of August 2021, approximately 30% of U.S. adults are unvaccinated; among these, approximately 44% may be willing to get vaccinated against COVID-19.
- The proportion of adults who are unvaccinated but willing varies between demographic groups, with higher rates among young adults, Blacks, Hispanics, and uninsured individuals.
- Among the unvaccinated but willing, concerns about side effects and a desire to "wait and see" are the most cited reasons for not vaccinating.

Introduction

As of August 4, 2021, 70.1 percent of U.S. adults have received at least one dose of a COVID-19 vaccine.[1] However, vaccine coverage varies dramatically across the country, with less than 40 percent of adults fully vaccinated in a third of U.S. counties. Despite a sufficient supply of COVID-19 vaccines, daily vaccinations have dwindled in recent months. While vaccine hesitancy may contribute to low local vaccination rates,[2] a portion of U.S. adults continue to indicate that they are willing to be vaccinated but have not yet received the vaccine. This suggests that outreach and efforts to improve access to and information about COVID-19 vaccines may be beneficial in trying to increase vaccination rates.

To support state and local communication and outreach efforts, this analysis explores data on unvaccinated adults who express a willingness to be vaccinated against COVID-19 (whom we refer to in this report as "unvaccinated but willing") among different geographic areas and

[1] Centers for Disease Control and Prevention, COVID Data Tracker, https://covid.cdc.gov/covid-data-tracker/#datatracker-home, last accessed August 4, 2021.

[2] Beleche, T., Ruhter, J., Kolbe, A., Marus, J., Bush, L., and Sommers, B. COVID-19 Vaccine Hesitancy: Demographic Factors, Geographic Patterns, and Changes Over Time. Washington, DC: Office of the Assistant Secretary for Planning and Evaluation, U.S. Department of Health and Human Services. May 2021. Available at https://aspe.hhs.gov/pdf-report/vaccine-hesitancy, last accessed June 30, 2021.

sociodemographic groups. Additionally, this analysis models which factors are associated with being unvaccinated but willing and examines changing trends over time.

Methods and Data

Data

ASPE examined sociodemographic factors and vaccination using national survey data from the U.S. Census Bureau's Household Pulse Survey (HPS) from April 14-April 26 to June 23-July 5.[3] In addition, ASPE developed state, county, and sub-state level estimates of the proportion of adults who are unvaccinated but willing using the 2019 American Community Survey (ACS) 1-year Public Use Microdata Sample (PUMS).[4] We used a PUMA-to-county crosswalk from the Missouri Census Data Center[5] to create county-level estimates; PUMAs are Public-Use Microdata Areas, local areas of roughly 100,000 people, as defined in the ACS. PUMAs spanning multiple counties had their estimates apportioned across those counties based on overall 2010 Census populations.

The HPS is nationally representative and includes information on U.S. residents' intentions to receive the COVID-19 vaccine when available, as well as other sociodemographic and geographic (state, region and metropolitan statistical areas) information. The ACS is a nationally representative survey, and it provides key sociodemographic and geographic (state, region, PUMAs, county) information.

Defining "Unvaccinated but Willing"

Our sample includes individuals who responded "yes" or "no" to having received the COVID-19 vaccine and excludes respondents for whom there was no response. We also use the survey question, *"Once a vaccine to prevent COVID-19 is available to you, would you…get a vaccine?",* which provides the following options: 1) "definitely get a vaccine"; 2) "probably get a vaccine"; 3) "unsure"; 4) "probably not get a vaccine"; 5) "definitely not get a vaccine." We define "willingness" to include all responses indicating they are "unsure," "probably," or "definitely" going to get a COVID-19 vaccine. We view these as the population of unvaccinated adults who

[3] U.S. Census Bureau, Household Pulse Survey (COVID-19), available at https://www.census.gov/programs-surveys/household-pulse-survey.html.

[4] U.S. Census Bureau, American Community Survey Public Use Microdata Sample (PUMS), available at https://www.census.gov/programs-surveys/acs/microdata.html.

[5] Missouri Census Data Center, All About Public Use Microdata Areas (PUMAs), available at https://mcdc.missouri.edu/geography/PUMAs.html.

may be persuaded to be vaccinated if the reasons(e.g., information gaps or access barriers) for not vaccinating can be addressed by communication or outreach efforts.

Thus, our approach divides the population into three categories: already vaccinated, unvaccinated but willing, and unvaccinated and unwilling.

For those who answered "no" to having received the COVID-19 vaccine or who said they do not intend to receive all required doses, the surveys also asks, "Which of the following, if any, are reasons that you [only probably will /probably won't/definitely won't] [get a COVID-19 vaccine/won't receive all required doses of a COVID-19 vaccine]?." We also explore reasons for not vaccinating.

Modeling "Unvaccinated but Willing" Status

Our modeling focuses on estimating the unvaccinated but willing which is calculated out of all adults (vaccinated and unvaccinated), except where noted. Our statistical analysis occurred in two steps and mirrors our previous analysis on vaccine hesitancy. First, using the HPS, we used a logistic regression to analyze predictors of being unvaccinated but willing using the following sociodemographic and geographic information: age, gender, race/ethnicity, education, marital status, health insurance status, household income, state of residence, and interaction terms between race/ethnicity and having a college degree. Second, we applied the regression coefficients from the HPS analysis to the data from the ACS to predict "unvaccinated but willing" status for each ACS respondent ages 18 and older. We then averaged the predicted values by the appropriate unit of geography, using the ACS survey weights, to develop area-specific estimates. (For additional details on the methodology please see ASPE's Issue Brief on vaccine hesitancy.[6])

Comparison with County Vaccination Rates

The estimates developed in this model do not account for local variation in vaccination rates. Therefore, these predictions should be used in conjunction with actual vaccination data wherever possible. For this analysis, we obtained county-level vaccination data from the CDC[7] for all states except Texas and Hawaii, which do not report county-level vaccinations to the CDC. Therefore, CDC data were supplemented with county-level vaccination data from the

[6] Beleche, T., Ruhter, J., Kolbe, A., Marus, J., Bush, L., and Sommers, B. COVID-19 Vaccine Hesitancy: Demographic Factors, Geographic Patterns, and Changes Over Time. Washington, DC: Office of the Assistant Secretary for Planning and Evaluation, U.S. Department of Health and Human Services. May 2021. Available at https://aspe.hhs.gov/pdf-report/vaccine-hesitancy, last accessed June 30, 2021.

[7] CDC. COVID Data Tracker: COVID-19 Integrated County View. Available at https://covid.cdc.gov/covid-data-tracker/#county-view, last accessed July 15, 2021.

Texas[8] and Hawaii[9] Departments of Health. Data from the CDC and Texas were updated on July 8, 2021; data from Hawaii were updated on July 15, 2021. Vaccination coverage was estimated according to the percent of the population 12 years of age or older that is fully vaccinated.

Results

Unvaccinated but Willing - Changes Over Time

Figure 1 shows that out of all unvaccinated adults, the proportion of unvaccinated but willing[10] adults has decreased from 62 percent in April to 44 percent in late June/early July 2021. This is expected given the increase in availability of the COVID-19 vaccine over this period and the increase in vaccinated adults. A greater proportion of the unvaccinated now represent vaccine hesitant individuals who are unlikely to get the COVID-19 vaccine ("unvaccinated but unwilling"); however, these data show that a significant percentage of unvaccinated adults may still be willing to get vaccinated.

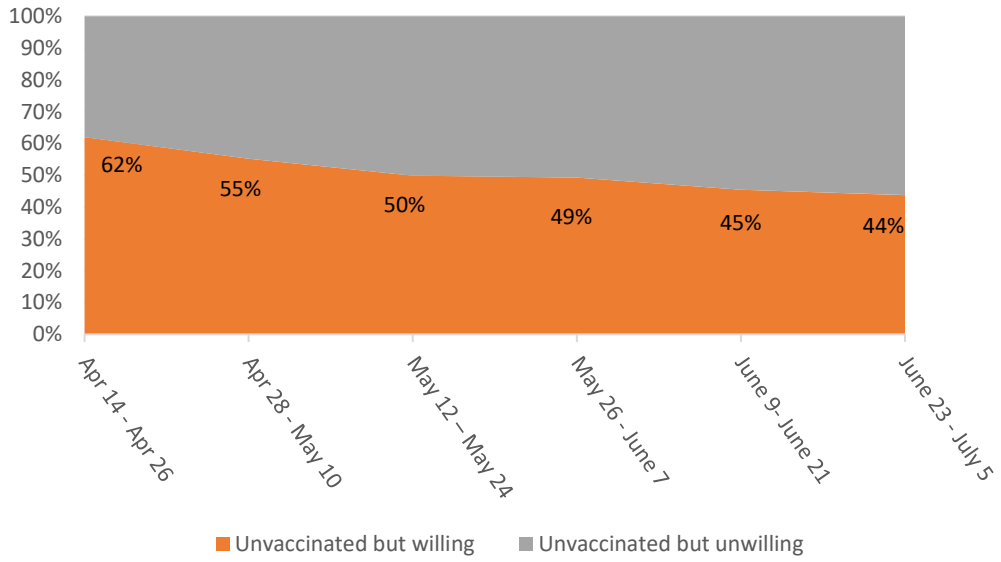
Appendix Table A 1 presents the percent of unvaccinated but willing based on select demographic characteristics of all vaccinated and unvaccinated adults and how the percentage has changed between the surveys administered between April 14-April 26, 2021 and June 23-July 5, 2021. Although the percent of unvaccinated but willing significantly declined over time across all demographic groups, the largest absolute differences were among those ages 18-39, Blacks, Asians, Hispanics, and those without a college degree.

[8] Texas Department of State and Human Services COVID-19 Accessible Vaccine Data for July 11, 2021. Available at https://www.dshs.texas.gov/coronavirus/immunize/vaccine.aspx, last accessed July 11, 2021.

[9] State of Hawaii Department of Health. Hawaii COVID-19 Data. Available at https://health.hawaii.gov/coronavirusdisease2019/current-situation-in-hawaii/#vaccine, last accessed July 15, 2021.

[10] Throughout this brief, we use the term "unvaccinated but willing" to refer to unvaccinated adults who said that they would definitely get, probably get, or were unsure about getting the COVID-19 vaccine. We view these as the population of unvaccinated adults who may be persuaded to be vaccinated if the reasons for not vaccinating can be addressed by information gaps or enhanced access. See Methods for more details.

Figure 1. Trends in Attitudes Among Unvaccinated Adults



Note: In this figure, the percent of unvaccinated but willing is calculated out of all unvaccinated adults.
Source: ASPE analysis of the Household Pulse Survey for April 14-April 26, 2021 through June 23-July 5, 2021

Demographic Factors by Vaccination and Willingness Status

Table 1 presents select demographic characteristics by vaccination and willingness to vaccinate status for the most recent survey, June 23-July 5, 2021. In this survey, the vaccinated represent 81 percent of our sample, with the unvaccinated but willing representing 8 percent of the entire sample or 44 percent of all unvaccinated adults. The percent of unvaccinated but willing is highest between the ages of 18 and 39, Blacks, Other/Multiple Race, and Hispanics. There is also a higher percentage of unvaccinated but willing among Blacks, Other/Multiple Race, and Hispanics who have not completed a college degree. We note that the Household Pulse Survey overestimates vaccination coverage relative to actual vaccination rates. Currently, approximately 70 percent of U.S. adults have received at least one dose of the COVID-19 vaccine. Therefore, the values in Table 1 are likely underestimates of the true size of the unvaccinated but willing population.

Table 1.- Select Demographic Characteristics of HPS Respondents by Vaccination and Willingness to Vaccinate Status				
Demographic Characteristic		Vaccinated	Unvaccinated but Willing	Unvaccinated but Unwilling
Gender	Male	81%	7%	11%
	Female	80%	9%	10%
Age	18-24	74%	15%	11%
	25-39	72%	12%	16%
	40-54	78%	10%	13%
	55-64	86%	5%	8%
	65+	93%	3%	5%
Race/Ethnicity	White, not Hispanic	82%	6%	12%
	Black, not Hispanic	73%	17%	11%
	Asian, not Hispanic	94%	4%	2%
	Other/Multiple race	73%	11%	16%
	Hispanic	80%	11%	8%
College * Race/Ethnicity	Non-College White (non-Hispanic)	76%	8%	15%
	College White (non-Hispanic)	92%	3%	5%
	Non-College Black (non-Hispanic)	68%	20%	12%
	College Black (non-Hispanic)	85%	8%	7%
	College Non-College Asian (non-Hispanic)	90%	6%	4%
	College Asian (non-Hispanic)	97%	2%	1%
	Non-College Other/Multiple Race	69%	12%	18%
	College Other/Two-Race	84%	7%	9%
	Non-College Hispanic	79%	12%	9%
	College Hispanic	89%	5%	6%
Overall		81%	8%	11%

Notes: Willing is defined to include those who responded, "unsure", or "will probably" or "will definitely" intend to receive a COVID-19 vaccine when available. Unwilling is defined to include those who responded, "will definitely not", or "will probably not" intend to receive a COVID-19 vaccine when available. The Household Pulse Survey overestimates vaccination coverage relative to actual vaccination rates. Currently, approximately 70% of U.S. adults have received at least one dose of the COVID-19 vaccine. Therefore, these values likely underestimate the actual size of the unvaccinated but willing population.
Source: ASPE analysis of the Household Pulse Survey for June 23- July 5, 2021

Predicting the Unvaccinated but Willing

Table A 2 shows the odds ratios from the model used to predict the unvaccinated but willing for the survey administered in the period June 23-July 5, 2021. The results indicate that several factors were significantly associated with higher odds of being unvaccinated but willing:

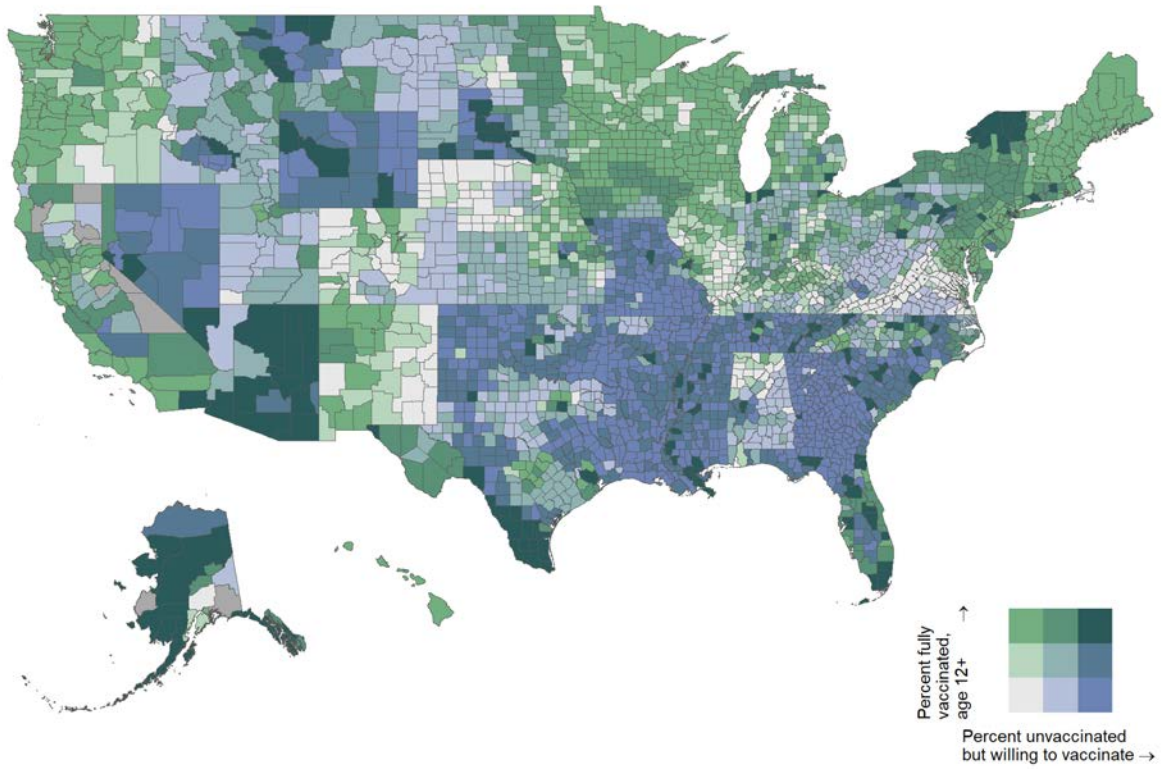
younger age, being Black, and being uninsured or having Medicaid. People without a college degree were also more likely to be unvaccinated but willing than those with a degree.

Geographic Patterns

Figure 2 presents the estimated percent of unvaccinated but willing adults by county, modulated by actual vaccination coverage of the population ages 12 and over. Because the model does not explicitly include vaccination coverage, this allows us to more robustly identify areas that may have a significant percentage of unvaccinated but willing individuals. For each metric, the counties were divided into the bottom, middle, and top third of all counties.[11] Counties in light green have achieved the highest vaccination coverage and have the lowest percentage of remaining unvaccinated but willing adults. These counties are most prevalent on the west coast, New England, and the upper Midwest. Counties in dark green have achieved the highest vaccine coverage but may also still have a significant proportion of their adult population who may be willing to vaccinate but have not yet done so – a pattern visible in several rural areas including upstate New York, Alaska, Southern Texas, and Arizona. Finally, counties in blue have the lowest vaccination coverage, but a high proportion of adults who may be willing to be vaccinated. This metric identifies counties with the highest potential for benefit from targeted outreach and efforts to improve access to vaccines. Many of these counties are in the South, as well as parts of the Midwest and West.

[11] For vaccination coverage, the bottom, middle, and top third of all counties corresponded to 0-34.8%, 34.8-45.8%, and 45.8-99.9%; for the percent unvaccinated but willing to vaccinate, the bottom, middle, and top third of all counties corresponded to 0-7%, 7-9.2%, and 9.2-24.7%.

Figure 2. Estimated Percent of Unvaccinated but Willing and Vaccine Coverage by County



Notes: Willing is defined as those who responded, "unsure", "probably" or "definitely" about their intent to receive a COVID-19 vaccine. Counties in dark gray are missing vaccination data. Vaccination coverage is defined as the percent of the population aged 12+ that is fully vaccinated. Systematic missing data in some states may result in underestimation of vaccine coverage. Colors correspond to tertiles for each variable (i.e., divided such that a third of counties appear in each group). Tertiles for the percent fully vaccinated correspond to 0-34.8%, 34.8-45.8%, and 45.8-99.9%. Tertiles for the percent unvaccinated but willing to vaccinate correspond to 0-7%, 7-9.2%, and 9.2-24.7%. The Household Pulse Survey overestimates vaccination coverage relative to actual vaccination rates. Currently, approximately 70% of U.S. adults have received at least one dose of the COVID-19 vaccine. Therefore, our estimates of the unvaccinated but willing population are likely underestimated.

Source: ASPE analysis of Household Pulse Survey for June 23-July 5, 2021.

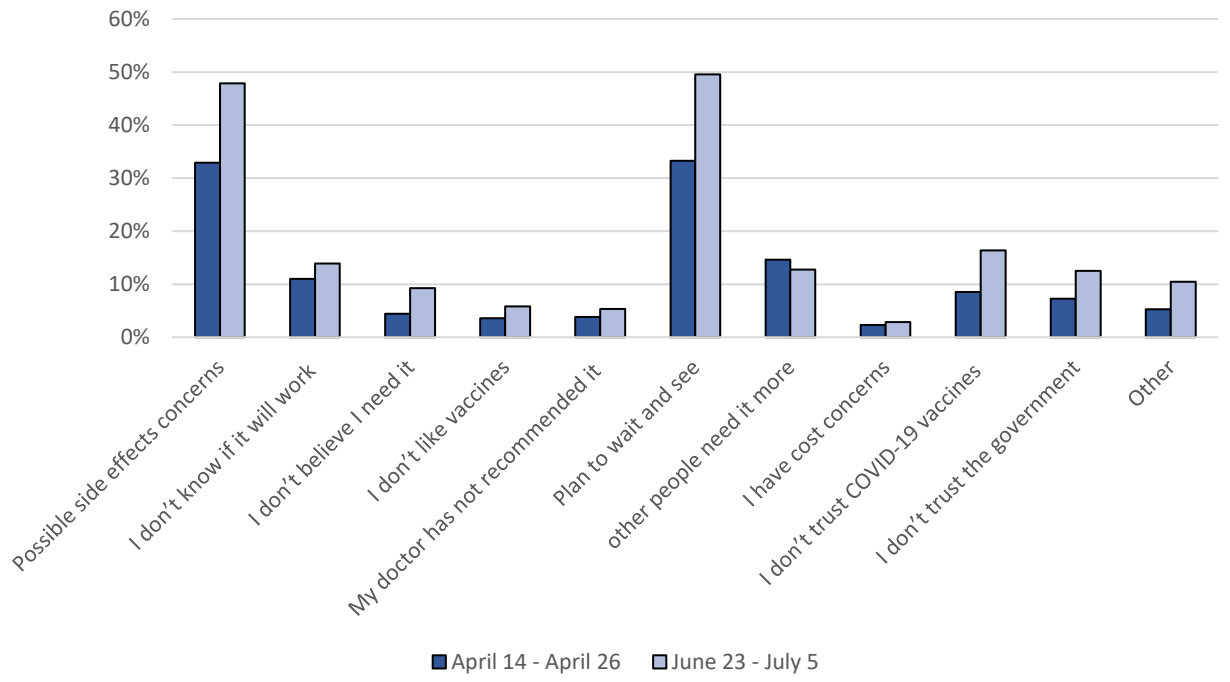
Reasons for Not Vaccinating

Figure 3 shows the reasons given for not yet receiving the vaccine among those who indicate willingness to be vaccinated. One-third of the unvaccinated but willing cited vaccine safety concerns and planning to "wait and see" in April, and this proportion increased to 50 percent by early July. The percentage of respondents who cited other reasons for being unvaccinated remained relatively unchanged over time except for those citing "I don't trust COVID-19 vaccines", which rose from 9 percent to 16 percent between mid-April and early July.[12] We also

[12] We also examined a separate measure that excluded those who responded "unsure" from the unvaccinated but willing and we find similar results. See Appendix Figure S- 1.

examined reasons for not receiving a COVID-19 vaccine by region (Northeast, Midwest, South, and West) for the survey administered June 23-July 5, 2021, and found similar patterns to those shown in Figure 3. In particular, vaccine safety concerns and plans to "wait and see" were the most common reasons for not vaccinating across all four regions, although they were more frequently cited in the Midwest than in other regions (see Appendix Figure S- 2).

Figure 3. Reasons for Not Receiving a COVID-19 Vaccine Among Those Indicating Willingness to be Vaccinated



Note: Respondents may select multiple reasons for not receiving a COVID-19 vaccine.
Source: ASPE analysis of Household Pulse Survey, April 14-26 and June 23-July 5, 2021

Discussion

Many factors influence vaccine decision-making, including cultural norms, social and peer influences, political views, and other factors that are specific to an individual or group, as well as concerns regarding specific vaccines.[13] Our analysis shows that willingness to get vaccinated

[13] CDC. Vaccinate with Confidence: Strategy to Reinforce Confidence in COVID-19 Vaccines. Available at https://www.cdc.gov/vaccines/covid-19/vaccinate-with-confidence.html, last accessed July 21, 2021.

for COVID-19 among the unvaccinated differs across racial and ethnic groups, ages, education, socioeconomic status, and geographic areas.

Our analysis also shows that the percent of unvaccinated but willing has decreased since mid-April 2021; in part, this simply reflects that a growing share of the "willing" has actually now been vaccinated. Others have found similar results. A Kaiser Family Foundation report finds that as case rates hit record lows and widespread re-opening across the United States, more than three quarters of adults respond being optimistic that the U.S. is nearing the end of the pandemic.[14] This optimism, however, may lead unvaccinated adults to believe that there is no need for more people to be vaccinated. This mindset may be reflected in the increase between April and July of unvaccinated adults indicating that they plan to "wait and see."

As case rates continue to rise despite the availability of effective COVID-19 vaccines, outreach efforts and targeted vaccination campaigns may persuade remaining unvaccinated but willing adults to receive the COVID-19 vaccine. Our data show that the unvaccinated but willing are a larger share of younger adults, people without health insurance, Blacks, and Hispanics. While these groups have been highlighted in previous research as more likely to be vaccine hesitant, reframing the outcomes around "unvaccinated but willing" shows there is actually room for progress in vaccination rates in these populations.

Our findings also indicate that many areas with lower vaccination rates, including states in the South and several rural portions of large states (including Texas, New York, and Alaska), may have sizable numbers of individuals who are unvaccinated but willing. Overcoming a tendency to "wait and see" and addressing access barriers in these regions will be critical to increasing national vaccination rates.

Other studies have shown that young adults, despite having the highest cumulative case rate of any age group,[15] may not be motivated to receive the vaccine due to a perception that they are not high-risk or that they are unlikely to become seriously ill.[16] Although COVID-19 vaccines are available to everyone free of charge, concerns about the cost of receiving a COVID-19 vaccine may remain an issue for some populations, such as the uninsured. Previous studies have also found that Hispanic and Black adults are more likely to indicate that they are concerned about missing work to be vaccinated, and those who reported that their employer provided paid time off to be vaccinated or to recover from side effects were more likely to be vaccinated than

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[14] Hamel, L., Lopes, L., Kearney, A., et al. KFF COVID-19 Vaccine Monitor, June 2021, Available at https://www.kff.org/coronavirus-covid-19/poll-finding/kff-covid-19-vaccine-monitor-june-2021/, last accessed June 30, 2021.

[15] CDC. COVID Data Tracker: Demographic Trends of COVID-19 cases and deaths in the US reported to CDC. Available at https://covid.cdc.gov/covid-data-tracker/#demographics, accessed July 16, 2021.

[16] Adams, S., Schaub, J., Nagata, J., Park, M., Brindis, C., Irwin, C. (2021). Young Adult Perspectives on COVID-19 Vaccinations. *Journal of Adolescent Health.* Available at https://www.jahonline.org/article/S1054-139X(21)00285-8/fulltext, accessed July 16, 2021.

those whose employers did not.[17] These studies suggest that improved education about the risk of COVID-19, benefits of being vaccinated, and that COVID-19 vaccines are available free of charge, as well as ensuring that issues relating to accessibility are addressed, may increase vaccination rates among these populations.

Emerging challenges necessitate further research on this subject. For example, with the authorization of the Pfizer vaccine for children over the age of 12, it is important to understand the factors that motivate adults to seek out vaccination for their adolescents, and how the issues outlined above may contribute to delayed vaccination for children. Additionally, recent changes to labeling to address rare adverse events in response to COVID-19 vaccines[18,19] may further contribute to adults delaying vaccination despite willingness to be vaccinated. Future research should continue to explore reasons for not vaccinating against COVID-19, including in children who are already eligible and those younger children who may soon become eligible for vaccination.[20]

Limitations

This analysis does not attempt to include all potential variables that may impact the decision to vaccinate. In other reports, we have examined access to vaccinations and administration rates across states.[21,22] Thus, our estimates should be used with caution when attempting to generalize beyond the factors examined herein. Importantly, our estimates of the unvaccinated but willing do not directly account for local administrative data on vaccination rates, instead

[17] Hamel, L., Lopes, L., Kearney, A., et al. KFF COVID-19 Vaccine Monitor, June 2021, Available at https://www.kff.org/coronavirus-covid-19/poll-finding/kff-covid-19-vaccine-monitor-june-2021/, last accessed June 30, 2021.

[18] FDA News Release: Coronavirus (COVID-19) Update: June 25, 2021. Available at https://www.fda.gov/news-events/press-announcements/coronavirus-covid-19-update-june-25-2021, last accessed July 16, 2021.

[19] Perrone M., and Mike Stobbe. FDA adds warning about rare reaction to J&J COVID-19 Vaccine, *AP News,* July 13, 2021. Available at. https://apnews.com/article/business-science-health-coronavirus-pandemic-coronavirus-vaccine-8c7e69806af9b0fe3b158382b2f57c4f, last accessed July 16, 2021.

[20] Kates, J., Artiga, S., Orgera, K., Tolbert, J. The Next Stage of COVID-19 Vaccine Roll-out in United States: Children under 12, July 30, 2021. Available at https://www.kff.org/policy-watch/the-next-stage-of-covid-19-vaccine-roll-out-in-united-states-children-under-12/, last accessed August 4, 2021.

[21] Kolbe, A. Factors influencing variation between states in efficiency of COVID-19 vaccine administration. Washington, DC: Office of the Assistant Secretary for Planning and Evaluation, U.S. Department of Health and Human Services. April 2021. Available at https://aspe.hhs.gov/pdf-report/covid-19-vaccine-administration; last accessed May 25, 2021.

[22] Kolbe, A. Disparities in COVID-19 Vaccination Rates across Racial and Ethnic Minority Groups in the United States. Washington, DC: Office of the Assistant Secretary for Planning and Evaluation, U.S. Department of Health and Human Services. April 2021. Available at https://aspe.hhs.gov/pdf-report/covid-19-vaccination-disparities; last accessed May 25, 2021.

relying on self-reported vaccination at the state level. Our analysis also does not account for other factors that may be important in understanding vaccination decision but that are not captured in the survey. Therefore, our estimates of unvaccinated but willing should not be used in isolation. Users should also be aware of limitations with vaccination data; systematic missing data may result in underestimation of local vaccination rates. Additional local contextual information, including trends and data related to vaccine access, community morbidity and mortality, and social vulnerability can provide additional insights and applicability.

Our estimates use individual level responses intended to capture sentiment within different geographic levels in the U.S. at the time of the survey; careful consideration is advised when examining questions outside of the time period or geographic level assessed in this analysis. Our estimates are subject to greater sampling error and uncertainty due to predictive modeling, and therefore they should be used with caution for purposes that require precise estimates. Due to nonresponse bias, the HPS may not be fully representative of all U.S. adults, and survey-based estimates for vaccination rates may not match data from other sources. In particular, although the patterns are similar to CDC vaccine administration data, the HPS tends to overestimate vaccination rates, which suggests that unvaccinated adults are underrepresented and that our estimates are underestimated.[23,24,25] For instance, the vaccination rate calculated from the July HPS suggests that the national vaccination rate was 80 percent in July and consequently 20 percent of the population remained unvaccinated. By contrast, CDC data for early July indicated that the percent of unvaccinated adults was 32 percent, which suggests that estimates are off by a factor of 1.6. Finally, due to data limitations, our analysis does not incorporate measures that capture access barriers, which are likely to be important in understanding individuals' decisions to vaccinate, particularly in populations that may experience barriers based on geography or lack of health care providers.

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[23] Nguyen, K.H., Lu P., Meador, S., Hung, M., Kahn, K. et al. "Comparison of COVID-19 vaccination coverage estimates from the Household Pulse Survey, Omnibus Panel Surveys, and COVID-19 vaccine administration data, United States, March 2021". Centers for Disease Control and Prevention Publications and Resources, June 15, 2021. Available at: https://www.cdc.gov/vaccines/imz-managers/coverage/adultvaxview/pubs-resources/covid19-coverage-estimates-comparison.html; last accessed July 17, 2021.

[24] Bradley, V.C., Kuriwaki, S., Isakov, M., Sejdinovic, D., et al. "Are We There Yet? Big Data Significantly Overestimates COVID-19 Vaccination in the U.S.", Cornell University arXiv, June 2021. Available at https://arxiv.org/pdf/2106.05818.pdf; last accessed July 17, 2021.

[25] U.S. Census Bureau. Household Pulse Survey Technical Documentation. Available at https://www.census.gov/programs-surveys/household-pulse-survey/technical-documentation.html; last accessed May 20, 2021.

Conclusions

The unvaccinated but willing population, although decreasing over time, still represents a significant percentage of the U.S. population, slightly under 10 percent as of early July 2021. Our results suggest that targeted strategies to improve access and vaccine safety information for Blacks, Hispanics, younger adults, those without a college degree, as well as those living in rural areas in several states, may help persuade the unvaccinated but willing group to vaccinate.

Appendix 1. Supplementary Analysis

Table A 1. The Percent of Unvaccinated but Willing Over Time in the Household Pulse Survey				
Demographic Characteristic	April 14 - April 26	June 23 – July 5	Change	p-value
Male	20%	7%	-12%	0.000
Female	18%	9%	-9%	0.000
Age: 18-24	34%	15%	-19%	0.000
Age: 25-39	27%	12%	-15%	0.000
Age: 40-54	21%	10%	-11%	0.000
Age: 55-64	13%	5%	-7%	0.000
Age: 65+	6%	3%	-3%	0.000
White (non-Hispanic)	16%	6%	-9%	0.000
Black (non-Hispanic)	25%	17%	-8%	0.006
Asian (non-Hispanic)	16%	4%	-12%	0.007
Other/Multiple Race	21%	11%	-10%	0.009
Hispanic	27%	11%	-15%	0.006
Non-College White (non-Hispanic)	19%	8%	-11%	0.000
College White (non-Hispanic)	9%	3%	-7%	0.002
Non-College Black (non-Hispanic)	28%	20%	-8%	0.009
College Black (non-Hispanic)	17%	8%	-9%	0.007
College Non-College Asian (non-Hispanic)	21%	6%	-15%	0.015
College Asian (non-Hispanic)	12%	2%	-10%	0.006
Non-College Other/Multiple Race	24%	12%	-11%	0.011
College Other/Two-Race	13%	7%	-7%	0.012
Non-College Hispanic	29%	12%	-17%	0.007
College Hispanic	13%	5%	-8%	0.007

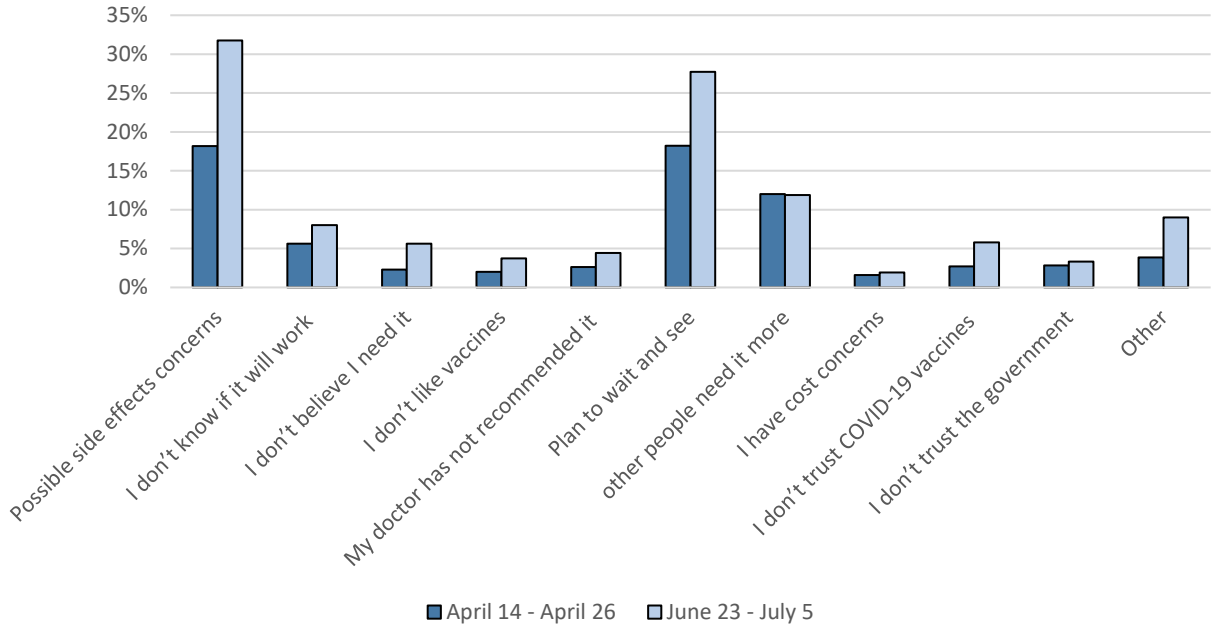
Notes: Willing is defined to include those who responded, "unsure", or "will probably" or "will definitely" intend to receive a COVID-19 vaccine when available. P-value is of the difference in means between April 14-April 26, 2021 and June 28-July 5, 2021. The Household Pulse Survey overestimates vaccination coverage relative to actual vaccination rates. Currently, approximately 70% of U.S. adults have received at least one dose of the COVID-19 vaccine. Therefore, our estimates of the unvaccinated but willing population are likely underestimated.
Source: ASPE analysis of the Household Pulse Survey for April 14-26, 2021 and June 23-July 5, 2021

Table A 2. Odds Ratios: Predicting Unvaccinated but Willing							
Demographic Characteristic		Odds Ratio	Standard Error	Z-Statistic	p-value	95%CI	95%CI
Age	18-24	Ref.					
	25-39	0.88	0.12	-0.97	0.33	0.67	1.14
	40-54	0.67	0.10	-2.79	0.01	0.50	0.89
	55-64	0.35	0.06	-6.65	0.00	0.25	0.47
	65+	0.16	0.03	-8.60	0.00	0.11	0.25
Gender	Male	0.81	0.06	-2.83	0.01	0.70	0.94
	Female	Ref.					
Race/Ethnicity	White, not Hispanic	Ref.					
	Black, not Hispanic	2.01	0.23	6.13	0.00	1.61	2.51
	Hispanic	1.12	0.13	0.94	0.35	0.89	1.40
	Asian, not Hispanic	0.65	0.15	-1.84	0.07	0.41	1.03
	Other/Multiple race	1.24	0.19	1.40	0.16	0.92	1.67
College * Race/Ethnicity	White, not Hispanic	Ref.					
	Black, not Hispanic	1.16	0.22	0.81	0.42	0.81	1.68
	Hispanic	1.12	0.24	0.51	0.61	0.73	1.70
	Asian, not Hispanic	0.79	0.27	-0.68	0.50	0.40	1.55
	Other/Multiple Race	1.64	0.44	1.82	0.07	0.96	2.78
Education	Less than high school	Ref.					
	High school	0.93	0.14	-0.45	0.66	0.69	1.26
	Some college	0.63	0.09	-3.11	0.00	0.47	0.84
	College or higher	0.32	0.05	-6.85	0.00	0.23	0.45
Marital status	Married	Ref					
	Widowed	1.24	0.27	0.98	0.33	0.80	1.91
	Divorced/Separated	1.41	0.15	3.30	0.00	1.15	1.72
	Never Married	1.11	0.10	1.15	0.25	0.93	1.32
	Missing	1.24	0.27	0.98	0.33	0.80	1.91
Health Insurance	Private Health Insurance	Ref.					
	Medicare	1.12	0.19	0.67	0.50	0.81	1.55
	Medicaid	1.43	0.19	2.66	0.01	1.10	1.86

Table A 2. Odds Ratios: Predicting Unvaccinated but Willing							
Demographic Characteristic		Odds Ratio	Standard Error	Z-Statistic	p-value	95%CI	95%CI
	Other Health Insurance	1.37	0.46	0.94	0.35	0.71	2.64
	Uninsured	1.47	0.19	2.89	0.00	1.13	1.90
	Missing Health Insurance	1.12	0.16	0.80	0.42	0.85	1.47
Income	Less than $25,000	Ref.					
	$25,000-$35,000	1.03	0.15	0.21	0.84	0.78	1.37
	$35,000-$50,000	0.75	0.11	-2.00	0.05	0.56	0.99
	$50,000-$75,000	0.81	0.12	-1.40	0.16	0.61	1.09
	$75,000-$100,000	0.44	0.07	-5.02	0.00	0.32	0.61
	$100,000-$150,000	0.36	0.06	-6.46	0.00	0.27	0.49
	$150,000-$200,000	0.29	0.06	-5.70	0.00	0.19	0.44
	More than $200,000	0.27	0.06	-5.50	0.00	0.17	0.43
	Did not report	0.78	0.13	-1.51	0.13	0.57	1.08
	Constant	0.19	0.06	-5.60	0.00	0.10	0.34

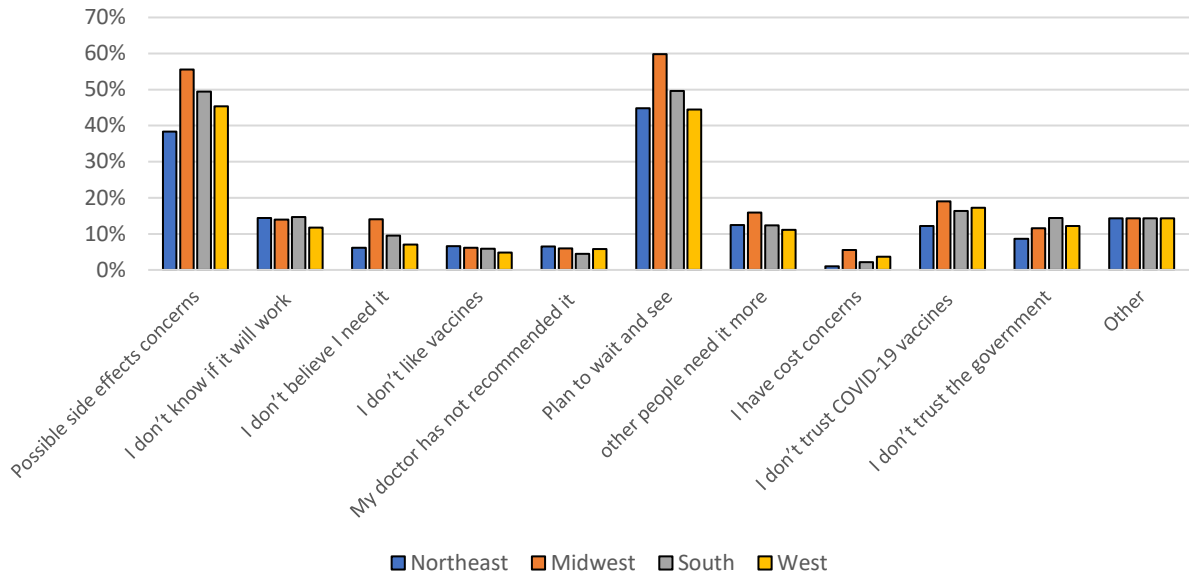
Note: Willing is defined to include those who responded, "unsure", or "will probably" or "will definitely" intend to receive a COVID-19 vaccine when available. The model uses state fixed effects. CI denotes confidence interval.
Source: ASPE analysis of the Household Pulse Survey for June 23-July 5, 2021

Figure S- 1. Reasons for Not Receiving a COVID-19 Vaccine Among Those Indicating Willingness to be Vaccinated, Excluding the "Unsure"



Note: Respondents may select multiple reasons for not receiving a COVID-19 vaccine. This figure excludes respondents indicating they are "unsure" about receiving a COVID-19 vaccine from the unvaccinated but willing.
Source: ASPE analysis of Household Pulse Survey, April 14-26 and June 23-July 5, 2021

Figure S- 2. Reasons for Not Receiving a COVID-19 Vaccine Among Those Indicating Willingness to be Vaccinated by Region



Note: Respondents may select multiple reasons for not receiving a COVID-19 vaccine.
Source: ASPE analysis of Household Pulse Survey, June 23-July 5, 2021

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