



# Social and structural determinants of COVID-19 vaccine uptake among racial and ethnic groups

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## Abstract

Latino, Black, American Indian/Alaska Native (AI/AN), and Native Hawaiian or Other Pacific Islander people have the highest hospitalizations and death rates from COVID-19. Social inequalities have exacerbated COVID-19 related health disparities. This study examines social and structural determinants of COVID-19 vaccine uptake. Results from logistic regressions suggest Latino and Black people were less likely to be vaccinated. People that did not have health insurance, a primary care doctor and were unemployed were more than 30% less likely to be vaccinated for COVID-19. Greater perceived health inequalities in one's neighborhood and perceived racial/ethnic discrimination were associated with a decreased odds in being vaccinated. People that suffered the loss of a household member from COVID-19 were three times more likely to have been vaccinated. Establishing policies that will increase access to health insurance and create jobs with living wages may have lasting impacts. Furthermore, collaboration with local and national community organizations can enhance the development of sustainable solutions.

**Keywords** Coronavirus · COVID-19 · Vaccine uptake · Social determinants · Racial and ethnic groups · Health disparities

The SARS-CoV-2 (COVID-19) pandemic has had a devastating impact worldwide. As of December 3, 2022, the United States (U.S.) has more than 98 million reported cases and 1 million deaths related to COVID-19 (Centers for Disease Control and Prevention [CDC], 2022a). While race and ethnicity-specific data, especially subgroup differences on COVID-19 cases, hospitalizations, and deaths, are limited and extremely variable across states, national data suggests American Indian/Alaska Native (AI/AN), Black,

and Latino<sup>1</sup> people have been disproportionately affected. In the U.S., when compared to Non-Hispanic Whites, AI/AN, Blacks, and Latinos have had nearly twice the age-adjusted rates of hospitalizations, and deaths from COVID-19 (CDC, 2022b). Native Hawaiians and Pacific Islanders (NHPI) have had some of the highest COVID-19 death rates in nearly all 20 states reporting data, and, in some states, NHPI deaths have exceeded the death rates of other racial and ethnic groups (Penaia et al., 2021; Cha et al., 2021). Social and structural determinants of health are contributors of health disparities in COVID-19 among Latinos, Blacks, AI/AN, and NHPI communities and require greater attention to develop solutions that can help achieve health equity (Hooper et al., 2020).

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<sup>1</sup> In this manuscript, we use Latinos and Hispanics interchangeably and Blacks or African Americans interchangeably. We recognize the heterogeneity within each racial and ethnic group and the expected variations by ancestry, sociodemographics, and differences in preferred terms.

## COVID-19 vaccines and reasons for hesitancy

As of November 30<sup>th</sup>, 2022, over 80% of the total U.S. population and 91% of the adult population aged 18 years of age or older were partially vaccinated (CDC, 2022c). Multinational clinical studies suggest that vaccines are effective against COVID-19, with the Pfizer-BioNTech and Moderna vaccines having greater than 90% protection against COVID-19 (Polack et al., 2020; Baden et al., 2021). Despite the rapid proliferation and distribution of COVID-19 vaccines in the U.S., national race, and ethnicity data available on vaccination rates in the U.S. suggests that when compared to Non-Hispanic Whites, Blacks, AI/AN and Latinos are less likely to be vaccinated (CDC, 2022d), and more vaccine hesitant (Nguyen et al., 2021). Long-term side effects and adverse reactions are common reasons contributing to COVID-19 vaccine hesitancy since the initial distribution of the vaccine (Nguyen et al., 2021). Another reason that is most salient among Blacks and Latinos is limited knowledge about the vaccine (Nguyen et al., 2021). Experiencing discrimination within the health care system has also been linked to greater vaccine hesitancy, especially among African American, AI/AN and Latinos (Sanchez et al., 2021).

## Social and structural determinants of COVID-19 vaccination

COVID-19 related health disparities, including vaccination rates, are influenced by social and structural factors. With respect to political affiliation, Republicans are more likely to be vaccine hesitant than Democrats (Viswanath et al., 2021; Wang & Liu, 2021). A lower intention to get vaccinated among Republicans (Fridman et al., 2021) can be partly explained by the politicization of COVID-19 since the beginning of the pandemic by leading politicians (e.g., Donald Trump), media coverage (e.g., ease of dissemination of misinformation), and partisan division in perceived seriousness of the virus (Bolsen & Palm, 2022). Older age, a household income of \$50,000 or more, and having a bachelor's degree or higher are social determinants associated with less hesitancy to get vaccinated for COVID-19 (Wang & Liu, 2021). Close contact with family members or friends that have been affected by COVID-19 is also linked to a greater intent to get vaccinated for COVID-19 (Wang & Liu, 2021). Individuals who had health insurance and who perceived that their primary care provider would recommend they get vaccinated against COVID-19 were more willing to get vaccinated (Reiter et al., 2020).

Structural determinants of COVID-19 disproportionately impact non-White racial/ethnic groups (Thakur et al., 2020). The term structural has been used to refer to injustices that

occur through reinforcing systems of oppression, including but not limited to institutions or policies relevant to housing, education, employment, health care, and criminal justice and have an adverse impact on health outcomes (Bailey et al., 2017; Krieger, 2019). Common measures used to assess for the presence of structural oppression (e.g., racism, sexism, genderism) are individual or explicit self-reports of exposure to discrimination and are the focus of this article. For a detailed description of measurements related to structural factors see Krieger, 2019 and Adkins-Jackson et al., 2022. Although less studied, structural factors are linked with greater vaccine hesitancy (Savoia et al., 2021; Willis et al., 2022). For example, experiencing discrimination was associated with a lower likelihood of getting vaccinated for COVID-19 prior to the approval of vaccines (Savoia et al., 2021). In another study, conducted after vaccines were approved, lifetime experiences of racial discrimination were linked with greater COVID-19 vaccine hesitancy (Willis et al., 2022).

## Objectives of the present study

Given the devastating and disproportionate impact COVID-19 has had on marginalized communities in the U.S. and worldwide, identifying the social and structural determinants of vaccine uptake is a critical step towards addressing the existing disparities in infection, hospitalization, and death from COVID-19. The objective of this paper is threefold. The first objective examines and documents social and economic factors, including racial and ethnic group differences, on the uptake of the COVID-19 vaccine. We hypothesize a lower percentage of racial and ethnic minority groups will be vaccinated for COVID-19 relative to Non-Hispanic Whites. The second objective examines and documents challenges of obtaining the COVID-19 vaccine among unvaccinated respondents. We hypothesize communities disproportionately impacted by COVID-19, including AI/AN, Latinos, and African Americans will report greater barriers to obtaining the COVID-19 vaccine. The third objective is to identify the socioeconomic and structural determinants associated with vaccine hesitancy among racial and ethnic groups. We hypothesize social economic status, younger age, loss of resources, being uninsured, greater perceived racial and ethnic discrimination, and perceived health inequalities in their neighborhood will be associated with reduced uptake of the COVID-19 vaccine. Given the politicization related to COVID-19, we hypothesize that political affiliation other than Republican and a disruption of community networks from COVID-19 would be linked to greater vaccine uptake.

Using a national and racially and ethnically diverse U.S. sample of adults, we extend prior research by examining

associations between being vaccinated for COVID-19 with two structural factors, discrimination, and perceived health inequalities in their neighborhood. We also build off prior research that finds a relationship between sociodemographic and economic factors and COVID-19 vaccine hesitancy. Identifying determinants of COVID-19 hesitancy and vaccination can inform interventions and policies as new variants emerge.

## Method

### Theoretical frameworks

This study is guided by two frameworks. The first framework is the social determinants of health (SDOH; World Health Organization, Commission on Social Determinants of Health [WHO CSDH], 2008), which refers to the “circumstances in which people grow, live, work, and age, and the systems put in place to deal with illness,” (WHO CSDH, 2008, pg. 3) that have indirect and direct effects on health (Braveman et al., 2011). Common determinants of health are access to medical care, income, education, employment, and social position (Braveman & Gottlieb, 2014). Racial and ethnic minorities face additional determinants of health, such as discrimination, which can affect behavior and health outcomes (Braveman & Gottlieb, 2014). The SDOH included in this study are income, education level, insurance status, having a primary care provider, loss of social and economic resources including, loss of a household member, reduced pay, and job. Although they could also be labeled as social determinants, perceived racial and ethnic discrimination and health inequalities in their neighborhoods were recognized as structural factors.

The second guiding framework is the social ecological model for health promotion and behavior (McLeroy et al., 1988). This model focuses on five levels that may influence health related behaviors and conditions: intrapersonal or individual characteristics, interpersonal, institutional, community level, and policy factors (McLeroy et al., 1988). In this study, we included measures that capture intrapersonal, interpersonal, institutional, and community factors. Intrapersonal factors included concerns about getting COVID-19. The frequency of arguing with family or friends about getting vaccinated and having a household member die from COVID-19 were interpersonal factors included that are likely to affect one’s decision to be vaccinated for COVID-19. Institutional factors were having health insurance and a primary care provider, which can be critical to receiving reliable information about the COVID-19 vaccine. Community-level factors include political affiliation, perceived discrimination toward members of their own racial and ethnic

groups, and perceived health inequalities within their own neighborhood.

### Study design and procedure

Data are from a larger national study led by The African American Research Collaborative to investigate knowledge and attitudes toward COVID-19 vaccines among adults from all racial and ethnic backgrounds that were residing in the U.S. (for a full description of partners and methodology, see African American Research Collaborative, 2021). All questions were developed, reviewed, and adapted by collaboration with the African American Research Collaborative and data scientists, pollsters, social scientists, public health professionals and medical doctors. Participants were selected using a mixed-mode randomized stratified sample with oversamples of racial and ethnic minorities. Pre-stratification quota were used to randomly select and potentially recruit within a particular area, and derive representative sample sizes for key sociodemographic variables, including gender, race and ethnicity, immigration status, and political ideology. Data were collected from May 7 – June 7, 2021 among adults 18 years of age and older living in the U.S. A total of 12,288 adults completed the survey over the phone (31%) and online (69%). For a more detailed description of the methods see de St Maurice et al., 2021.

## Measures

### Sociodemographic and other COVID-19 vaccine questions

Social background questionnaire included racial and ethnic background (Latino/Hispanic, African American/Black, Asian American and Pacific Islander (AAPI), AI/AN, and White). For this study, when referring to Black, AAPI, AI/AN, and White respondents, this includes people that identified as non-Hispanic. Other questions included age, gender, foreign-born status, income, highest level of education completed, employment status, political affiliation, health insurance coverage and having a primary care doctor. Age was categorized by the following groups in years: 18–29, 30–39, 40 to 49, 50–59, 60 to 69, and 70 and above. Gender was coded as 1 = Female and 0 = Male. Given the limited respondents that identified as non-binary or none of the response choices, we did not include those respondents in the regression analyses.

This paper also focuses on specific questions related to COVID-19. Respondents rated their concerns about getting COVID-19 by answering the question, “How concerned are you that you might get COVID-19?” and selecting one of

four response options: not at all concerned, a little concerned, moderately concerned, and very concerned. For frequency of arguments and disagreements, respondents were also asked, “How often have you had arguments or disagreements with your family or close friends about whether someone should get the COVID-19 vaccine? Response options were based on a four-point Likert scale (e.g., often, sometimes, rarely, and never). To capture losses related to COVID-19, the following question was asked: “Do you know someone who has died because of COVID-19.” Responses to this question included: (1) Yes, someone in my household; (2) yes, family outside of my household; (3) yes, someone else I know died; and (4) no, nobody I know has died because of COVID-19.

### COVID-19 vaccine hesitancy and uptake

COVID-19 vaccination status was assessed by asking respondents if they had received a COVID-19 vaccine, with the following response options: received both doses, received one dose, and waiting for the second, received one dose of the COVID-19 vaccine that only requires one dose and have not received any COVID-19 vaccine. Respondents that had not received the vaccine were coded as 0=no and respondents that had received any dose of the vaccine were coded as 1=yes. Respondents that reported not being vaccinated for COVID-19 ( $N=3,541$ ) were also asked the follow-up question: “Do you have any hesitancy or concerns about getting the COVID-19 vaccine?” The response options for this question were “Yes, I have some hesitancy or concerns”, and “No, I do not have any hesitancy or concerns”, which were coded as 1 and 0, respectively for purposes of analyses.

### Challenges of obtaining the COVID-19 vaccine

Respondents were asked about the challenges that may have hindered their ability to getting vaccinated (e.g., worried about side-effects, physical limitations, inability to access the internet and sign-up, needing transportation, not being able to take time off from work, and having a medical reason that makes them ineligible).

### Structural factors

Questions on perceived discrimination toward their own racial and ethnic group in the U.S. and perceived health inequalities in their neighborhood, were also included and were based on Likert scales from strongly disagree to strongly agree. The measures of perceived discrimination and health inequalities were single item measures. For perceived discrimination, participants were asked “Do you agree or disagree that discrimination against (their racial/

ethnic group) people in the United States exists today? Responses were based on a four-point Likert scale from strongly disagree to strongly agree. For perceived inequalities, respondents were asked the following: “People who live in locations where I lived struggle with many health inequalities and lack access to advanced medical care.” Response options were based on a five-point Likert scale and included strongly disagree to strongly agree.

### Analyses

All data analyses were conducted using Stata and alpha was set a 0.05. Descriptive statistics were performed for all study variables of interest and chi-square analyses were performed to examine vaccine uptake by sociodemographic variables and challenges of obtaining the COVID-19 among unvaccinated respondents. Don’t know and refused responses on questions of interest (e.g., perceived health inequalities) were excluded from the analysis. We perform a multivariate logistic regression to identify social and structural determinants of COVID-19 vaccine uptake. In this study, social and economic factors included education, income, having someone in their household die from COVID-19, loss of job, reduction in pay, having health insurance and a primary care provider, frequency in arguing with family about getting vaccinated, and concerned with getting COVID-19. Structural factors included perceived discrimination toward members of their racial/ethnic group and perceived health inequalities in their neighborhood.

COVID-19 vaccine status was regressed on racial and ethnic backgrounds (i.e., Latino origin, AI/AN, AAPI, and Black), age, gender, education status, nativity, political affiliation, insurance status, losing a job or receiving a pay cut during COVID-19, being unemployed, income, not having a primary care provider, frequency of arguments with family about the COVID-19 vaccine, concerned with getting COVID-19, having a household member previously die from COVID-19, perceived discrimination toward their racial and ethnic group in the U.S., and perceived health inequalities in neighborhood. The following groups were used as comparisons: non-Hispanic Whites for racial and ethnic background; male for gender; foreign-born for nativity; and Republican for political affiliation.

### Results

As seen in Table 1, 71% of all respondents were vaccinated for COVID-19. Approximately 53% of all respondents were female. Most respondents were born in the U.S. (83%) and identified as Democrat (51%). Most respondents reported

**Table 1** Sociodemographic variables by vaccination status

	Unvaccinated	Vaccinated	p-value
n	3541	8741	
Latino/Hispanic	889 (25.1)	2053 (23.5)	0.060
American Indian/Alaska Native	698 (19.7)	1221 (14.0)	< 0.001
Asian American and Pacific Islander	472 (13.3)	1808 (20.7)	< 0.001
Black	771 (21.8)	1510 (17.3)	< 0.001
Age			< 0.001
18 to 29	976 (27.6)	1585 (18.1)	
30 to 39	937 (26.5)	2090 (23.9)	
40 to 49	631 (17.8)	1546 (17.7)	
50 to 59	482 (13.6)	1164 (13.3)	
60 to 69	348 (9.8)	1320 (15.1)	
70 and above	167 (4.7)	1036 (11.9)	
Identify as			< 0.001
Male/Man	1399 (39.5)	4198 (48.0)	
Female/Woman	2103 (59.4)	4488 (51.3)	
Non-binary	28 (0.8)	50 (0.6)	
None of these	11 (0.3)	5 (0.1)	
Education			< 0.001
HS or less	1338 (37.8)	2051 (23.5)	
Some coll/AA	1302 (36.8)	2742 (31.4)	
Coll grad/post	901 (25.4)	3948 (45.2)	
US Born	2997 (84.6)	7156 (81.9)	< 0.001
Dem	1372 (38.7)	4849 (55.5)	< 0.001
Independent or other party	1419 (40.1)	2561 (29.3)	< 0.001
Uninsured	494 (14.0)	574 (6.6)	< 0.001
Lost Job	793 (22.4)	1726 (19.7)	0.001
Pay cut	1142 (32.3)	2742 (31.4)	0.352
Frequency argues with family about vaccine			< 0.001
Often	1468 (41.5)	3248 (37.2)	
Sometimes	812 (22.9)	1958 (22.4)	
Rarely	833 (23.5)	2567 (29.4)	
Never	272 (7.7)	891 (10.2)	
Don't know	156 (4.4)	77 (0.9)	
Health inequality			< 0.001
Strongly agree	720 (20.3)	1356 (15.5)	
Somewhat agree	545 (15.4)	1430 (16.4)	
Neither agree nor disagree	765 (21.6)	1383 (15.8)	
Somewhat disagree	648 (18.3)	2239 (25.6)	
Strongly disagree	474 (13.4)	1970 (22.5)	
Don't know	318 (9.0)	319 (3.6)	
Refused	71 (2.0)	44 (0.5)	
Died Household from COVID-19	79 (2.2)	403 (4.6)	< 0.001
How concerned you will get COVID			< 0.001
Not at all	1057 (29.9)	1671 (19.1)	
A little	1157 (32.7)	3309 (37.9)	
Moderately	768 (21.7)	2229 (25.5)	
Very	559 (15.8)	1532 (17.5)	
Perceived discrimination			0.602
Strongly agree	393 (11.1)	1026 (11.7)	
Somewhat agree	452 (12.8)	1066 (12.2)	
Somewhat disagree	970 (27.4)	2352 (26.9)	
Strongly disagree	1726 (48.7)	4297 (49.2)	
No primary care provider	1257 (35.5)	1673 (19.1)	< 0.001

**Table 1** (continued)

	Unvaccinated	Vaccinated	p-value
Unemployed	1169 (33.0)	2051 (23.5)	< 0.001
Combined household income < \$24,999	975 (27.5)	1543 (17.7)	< 0.001
\$25,000 to \$49,999	906 (25.6)	1797 (20.6)	
\$50,000 to \$79,999	627 (17.7)	1717 (19.6)	
\$80,000 to \$99,999	260 (7.3)	936 (10.7)	
\$100,000 to \$150,000	282 (8.0)	1127 (12.9)	
>\$150,000	138 (3.9)	668 (7.6)	
Don't know	150 (4.2)	245 (2.8)	
Refused	203 (5.7)	708 (8.1)	

having health insurance (91%) and nearly one in four participants did not have a primary care provider.

### Vaccination status by sociodemographic variables

As seen in Table 1, AAPI respondents (79%) had the highest rates of vaccination, followed by non-Hispanic Whites (75%), Latinos (70%), Blacks (66%) and AI/AN (64%). Greater vaccination rates were also found among those that were older with more than 80% of those aged 60 years of age or older being vaccinated. See Table 1 for sociodemographic variables by vaccination status.

### Challenges of getting vaccinated among unvaccinated

There were some differences in challenges of getting vaccinated between racial and ethnic groups. Specifically, 11% of Latinos and 13% AAPI that were not vaccinated reported not being able to go during the hours when vaccines are offered as a challenge to getting vaccinated. Not having access to transportation were reported as common challenges among AAPI (8%), Blacks (7%), Latinos (7%) and AI/AN (7%). 8% of AAPI and AI/AN respondents reported being ineligible to get vaccinated for COVID-19 due to a medical reason. 7% of Blacks and Latinos reported having a difficult time finding out how to make an appointment to get vaccinated.

### Social and structural determinants of COVID-19 vaccine uptake

To identify social and structural determinants of COVID-19 vaccine uptake, vaccine status was regressed on social and structural determinants (see [analyses](#) section above) As seen in Table 2, when compared to non-Hispanic White, Black (OR = 0.75,  $p < .001$ ) and Latino people (OR = 0.85,  $p = .014$ ) were 25% and 15% less likely to be vaccinated, respectively. A 10-year increment in age was linked with being 33% more likely to be vaccinated. Democrats (OR = 2.34,

$p < .001$ ) and Independents or respondents from another political party (OR = 1.41,  $p < .001$ ) were more likely to be vaccinated.

People that were uninsured and did not have a primary care provider were 39% and 38%, less likely to be vaccinated for COVID-19, respectively. People that had lost someone in their household from COVID-19 were three times as likely of being vaccinated for COVID-19. Structural determinants of COVID-19 vaccine uptake included perceived health inequalities and lack of access to medical care in their neighborhood (OR = 0.99,  $p < .001$ ) and perceived discrimination toward their own racial and ethnic group in the U.S (OR = 0.94,  $p = .002$ ). People that reported greater perceived health inequalities were 1% less likely of being vaccinated for COVID-19. Similarly, people reporting greater perceived racial and ethnic discrimination were 6% less likely of being vaccinated for COVID-19. Table 2 provides a list of social and structural determinants of COVID-19 vaccine uptake with their respective OR, 95% confidence intervals (CI), standard errors (SE), and  $p$  values.

### Discussion

This study examines and documents determinants of vaccine uptake in a diverse sample of racial and ethnic groups. A lower percentage of Black and AI/AN respondents reported being vaccinated for COVID-19. After accounting for determinants of COVID-19 vaccine uptake, we find that Latino and Black people were less likely of being vaccinated for COVID-19. Most sociodemographic and economic factors, including age, education level, political affiliation, being unemployed, insurance status and not having a primary care provider were associated with greater COVID-19 vaccine uptake. People that had lost a family member in their household to COVID-19 were three times more likely to have been vaccinated for COVID-19. Furthermore, people that reported greater perceived discrimination of their racial and ethnic group in the U.S. and perceived health inequalities in

**Table 2** Logit model on social determinants of COVID-19 vaccine uptake

Vaccinated	Odds Ratio	[95% CI]	Std. Err	z	P > z
Latino/Hispanic	0.85	[0.75, 0.97]	0.05	-2.47	0.014
American Indian/ Alaska Native	1.10	[0.74, 1.63]	0.22	0.48	0.630
Asian American and Pacific Islander	1.27	[1.06, 1.52]	0.12	2.56	0.011
Black	0.75	[0.66, 0.85]	0.05	-4.37	0.000
Age	1.33	[1.30, 1.36]	0.02	21.67	0.000
Female	0.63	[0.58, 0.68]	0.03	-11.62	0.000
Education	1.42	[1.35, 1.49]	0.04	13.80	0.000
US born	0.76	[0.66, 0.87]	0.05	-3.94	0.000
Democrat	2.34	[2.11, 2.59]	0.12	16.23	0.000
Independent or other party	1.41	[1.28, 1.56]	0.07	6.67	0.000
Uninsured	0.61	[0.53, 0.71]	0.04	-6.67	0.000
Lost job	1.13	[1.02, 1.26]	0.06	2.24	0.030
Pay cut	0.99	[0.90, 1.08]	0.05	-0.21	0.830
Frequency argues with family about vaccine	0.99	[0.98, 0.99]	0.00	-7.64	0.000
Health inequality	0.99	[0.99, 0.99]	0.001	-9.64	0.000
Died household from COVID	3.08	[2.36, 4.03]	0.42	8.28	0.000
How concerned you will get COVID	1.12	[1.08, 1.17]	0.02	5.69	0.000
Perceived discrimination	0.94	[0.90, 0.98]	0.02	-3.11	0.002
No primary care provider	0.62	[0.56, 0.68]	0.03	-9.69	0.000
Unemployed	0.74	[0.67, 0.80]	0.03	-6.88	0.000
Combined house- hold income	1.00	[1.00, 1.01]	0.00	6.34	0.000
Constant	0.30	[0.23, 0.40]	0.04	-8.77	0.000
Observations	12,282				
LR chi <sup>2</sup> (21)	2372.01				
Prob > chi <sup>2</sup>	0.0000				
Log likelihood	-7637.3768				
Pseudo R <sup>2</sup>	0.1344				

Note. For gender, smaller response choices were not included. Responses of don't know and refused were also excluded

their neighborhood were less likely to have been vaccinated for COVID-19.

In this study, racial and ethnic minority groups were less likely to be vaccinated than non-Hispanic Whites. Our findings are consistent with other research that found greater vaccine hesitancy among non-Hispanic Black and Latino people (Khubchandani et al., 2021; Willis et al., 2021; Viswanath et al., 2021). Latino and Black people were less likely to be vaccinated even after controlling for social, demographic, and structural factors, suggesting this difference may not be based solely on those factors. Since race and ethnicity represent social constructs with varied life experiences and meanings, measures that capture more structural factors have greater potential to identify and address the root causes of disparities (Bonilla-Silva, 1997).

Differences in COVID-19 vaccination between racial and ethnic groups remain important to address, especially among groups that may be at a higher risk of mortality or being hospitalized from health complications related to COVID-19. For example, older Black and Latino adults may experience excess mortality rates from COVID-19 given the high prevalence of preexisting health conditions (Garcia et al., 2021). While there has been considerable progress in access to COVID-19 vaccines and treatment, lower vaccination rates among Latino and Black communities highlight an ongoing need to create solutions that address the social and structural determinants of health.

Not having access to transportation, not being able to go during the hours when vaccines are offered and having a difficult time figuring out how to make an appointment were the most salient challenges among racial and ethnic minority groups that were unvaccinated. Results are consistent with prior research that found that geographical inaccessibility, including long travel distances, and fewer vaccination sites in lower-income neighborhoods with a large percentage of Latino and Black residents (Williams et al., 2021). Our findings add to the growing literature on common challenges that unvaccinated racial and ethnic minority groups faced during May and June of 2021. It is possible that these structural issues remain a challenge, especially as COVID-19 restrictions continue to fade. As seen early on during the distribution of COVID-19 vaccines, establishing nontraditional vaccine, and testing sites, including mobile clinics, community centers, churches, and schools in neighborhoods and at workplaces where Black and Latino people live, or work remain appropriate solutions. The ongoing changes related to the COVID-19 pandemic presents researchers, clinicians, and policy leaders the opportunity to consistently monitor and address the ongoing challenges that unvaccinated communities continue to face.

A greater percentage of AAPI and AI/AN that were not vaccinated for COVID-19 reported believing they were

ineligible because of medical reasons. Given that reasons for ineligibility of COVID-19 vaccination due to medical reasons are scarce, one explanation for this finding is the potential misunderstanding of ineligibility guidelines among individuals living with preexisting health conditions. People with a history of anaphylaxis and health conditions that compromise their immune systems such as, cancer or those that have received an organ transplant are recommended to consult with their healthcare provider about their risk of getting vaccinated versus not (CDC, 2022e).

It is possible that cardiovascular diseases and other conditions (obesity, diabetes) that have been cited as placing people at greater risk for more severe problems from COVID-19 (CDC, 2022e) may be causing confusion on eligibility for the COVID-19 vaccine among AI/AN, AAPI and other racial and ethnic minority groups. However, since we did not have access to their electronic health record, we could not confirm or differentiate between people that may have been ineligible due to a medical reason or people that may have misunderstood the eligibility guidelines. Although some research suggests greater rates of any fatal drug-induced anaphylaxis in the U.S. among African American people (Jerschow et al., 2014), anaphylaxis following COVID-19 vaccination is rare and necessary precautions such as monitoring symptoms post-vaccination have been implemented that reduce the risk of health complications (Lamprey, 2021). Addressing safety concerns and educating people about eligibility, benefits, and risks of getting vaccinated, especially among those with health conditions will continue to help address COVID-19 health disparities.

Social and economic determinants associated with vaccine uptake were also supported. Several indicators of social economic status, younger age, loss of resources, being uninsured, and not having a primary care provider were related to a lower likelihood of being vaccinated for COVID-19. Our results are consistent with a previous review that found greater hesitancy to being vaccinated for COVID-19 among individuals that were younger, had lower-income, and education (Khubchandani et al., 2021). The results from this study align with prior research highlighting greater COVID-19 vaccine hesitancy among people without health insurance (Reiter et al., 2020; Ku, 2022). People without a primary care provider were also less likely of being vaccinated. In combination, this suggests that policies aimed at increasing and facilitating access to affordable health insurance and a primary care provider may provide people with greater opportunities to discuss any concerns and learn about their health risks from providers and other health professionals.

People that had lost their job because of the COVID-19 pandemic were more likely to be vaccinated. Given the economic impact of the COVID-19 pandemic, a greater motivation to return to work, protect and provide economically

for their family may influence people to get vaccinated quicker for COVID-19 (Vargas & Sanchez, 2020). Vaccination requirements for employment may have also been an influential factor contributing to greater vaccination rates.

The present study found that Democrats and Independents were more likely to be vaccinated for COVID-19 than Republicans. This is consistent with previous research on the political discord over COVID-19 vaccination (Willis et al., 2022). One explanation for differences by political affiliation in COVID-19 vaccine uptake is the politicization of the COVID-19 pandemic since the Trump administration (Bolsen & Pam, 2022). The Trump administration's inaction, denial of the existence and severity of the COVID-19 pandemic heightened mistrust, and national defiance of public health measures and guidelines (Bailey & Moon, 2020). The transition to a Biden administration brought greater attention to addressing the COVID-19 pandemic and structural injustices. However, it is possible that the Trump administration's practices, and denial continue to influence the behavior of Republicans. Thus, igniting more confusion on the safety of the COVID-19 vaccine.

People that lost a household member from COVID-19 were more likely to be vaccinated against COVID-19. This is similar to other research that found less vaccine hesitancy among individuals that had lost a family member from COVID (Lazarus et al., 2022). Loss of family members has a detrimental economic and emotional impact on families. COVID-19 uptake and other related public health initiatives should consider effective messaging strategies, which may include impactful stories by health care professionals and community members that have experienced a high burden of COVID-19 related health disparities. People that perceived greater racial/ethnic discrimination and health inequalities, including lack of advanced medical care in their neighborhood were less likely to be vaccinated against COVID-19. This study adds to the existing research demonstrating a relationship between greater perceived racial and ethnic discrimination and COVID-19 vaccine hesitancy (Willis et al., 2022). Since the question used to assess for discrimination was not specific, it is likely that some respondents may have been thinking about some of their own experiences, which may have included discrimination in medical institutions. Given the known detriments and delay in health care (Klonoff, 2009; Williams & Mohammed, 2009), experiencing discrimination in medical institutions may be a further hindrance and contribute to COVID-19 vaccine hesitancy and mistrust. To our knowledge this is one of the first studies to investigate perceived health inequalities and the relationship with being vaccinated for COVID-19 during the initial release of the vaccine. It is possible that the perceived health inequalities in their neighborhood underscores multiple structural factors, including proximity to



health care and environmental pollutants. Although more research with improved measures is warranted, these results may have important clinical implications for COVID-19 vaccination and preventative health behaviors. Addressing neighborhood inequalities by improving access to health care can further reduce health disparities related to COVID, including health complications and mortality, especially among people that are not vaccinated. In addition to assessing policies requiring vaccination, future work on COVID-19 vaccine hesitancy should examine the utility of provider training to respond in a culturally appropriate manner (Braun & O’Leary, 2020; Finney Rutten et al., 2019).

This study has limitations to consider. First, this was a cross-sectional study thus, causality of social and structural determinants of vaccine uptake cannot be made. Although systematic and methodological efforts were made to recruit a representative sample across sociodemographic variables, these results may not generalize to the overall U.S. population. Longitudinal research may benefit from examining and identifying determinants of vaccine hesitancy among unvaccinated respondents and acceptance of COVID-19 boosters and vaccination of children. A second limitation is that this study aggregates racial and ethnic groups and does not examine subgroup differences. Differences in vaccine hesitancy found among Latino people from different ancestries are also likely to be found among other racial and ethnic minority groups (Sanchez & Peña, 2021). To continue advancing our understanding and developing appropriate solutions, future research needs to disaggregate race and ethnicity data within subgroups and by intersectional identities, including ancestry, nativity, and sexual orientation.

A third limitation of this study is the use of individual level factors as indicators of structural determinants. Advancing our understanding on the mechanisms in which structural factors affect COVID-19 vaccination and other health disparities will require researchers to evaluate other structural factors such as, area-based measures of proximity to hospitals, clinics, primary care providers, or vaccination sites (Asabor et al., 2022). Structural factors may also be captured with indexes and latent factors through structural equation modeling and multilevel analyses (Adkins-Jackson et al., 2022). For example, indexes capturing rates of incarceration, police violence, immigrant detention, and deportation, which are salient issues affecting racial and ethnic minorities (Perreira & Pedroza, 2019; Bailey et al., 2021; LeMasters et al., 2022; Egede & Walker, 2020) could accentuate how these structural factors are shaping COVID-19 vaccination and other health disparities. Despite these limitations, there is substantial evidence suggesting measures of self-perceptions may be equally important as other objective measures for predicting health outcomes and behaviors (Ferrer & Klein, 2015; Blazer, 2008). In the context of

COVID-19 vaccination, perceived measures of inequalities may highlight motivation to change, which can serve as an important target for health interventions and ultimately lead to changes in behavior (Ferrer & Klein, 2015).

## Conclusion

The ongoing hospitalizations and deaths from COVID-19, especially among the unvaccinated remains concerning. Awareness of social and structural factors contributing to getting vaccinated for COVID-19 remains a public health concern in need of culturally sensitive interventions. Policy solutions that can address the deeper structural causes of COVID-19 inequities may include increasing access to affordable and quality health care, improving living conditions and access to economic resources, and implementing effective policies that promote accountability and address discrimination across institutions known to influence health-related behaviors. Furthermore, as the U.S. continues to deal with COVID-19, innovative approaches will be critical to address health and social justice outcomes.

**Authors’ contributions** All authors contributed to the study conception and design. Data analyses were performed by Gabriel R. Sanchez and Matthew R. Schwartz. The first draft of the manuscript was written by Juan M. Peña and Alexandra Hernandez-Vallant and all authors revised previous versions of the manuscript. All authors read and approved the final manuscript.

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**Data availability** Data are currently restricted. Full descriptive statistics of the data can be found at: <https://africanamericanresearch.us/covid-poll-methodology/>.

**Code availability** Not applicable.

## Declarations

**Conflict of interest** The authors have no conflicts of interest to disclose.

**Ethics approval** Permission to use data was granted to Gabriel R. Sanchez by the research team.

**Consent to participate** All respondents consented to participate in

their preferred language.

**Consent for publication** Not applicable.

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