



Acceptability of COVID-19 vaccines among Black immigrants living in the United States

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ABSTRACT

Background: Coronavirus disease 2019 (COVID-19) has disproportionately affected the Black community in the United States (U.S.). The emergency authorization of three COVID-19 vaccines in the U.S.—issued between December 2020 and February 2021—will significantly reduce hospitalizations and deaths due to COVID-19. To date, no published study on COVID-19 vaccine acceptability among Black individuals in the U.S. has examined the unique experiences of Black immigrants.

Methods: Between January and February 2021, we conducted an online quantitative survey of first and second generation Black immigrants across the U.S. (n = 388). We fit bivariate and multivariable multinomial logistic regression models to examine acceptability of the COVID-19 vaccines.

Results: Overall, 57% of participants reported that they would get the COVID-19 vaccine immediately if it was available to them or had already received at least one dose of the vaccine, 37% would delay getting the vaccine, and 6% indicated that they would never get the vaccine. Compared to participants who reported that they would get the COVID-19 vaccine immediately/had already received at least one dose, participants who indicated that they would never get the vaccine were more likely to have an associate's degree or lower [adjusted odds ratio (aOR) 9.25; 95% confidence interval (CI): 2.34 to 36.6] and a bachelor's degree (aOR 3.79; 95% CI: 1.14 to 12.6) compared to having a master's degree or higher. Additionally, compared to participants who reported that they would get the COVID-19 vaccine immediately/had already received at least one dose, participants who indicated that they would delay getting the COVID-19 vaccine were more likely to: identify as female (aOR 2.62; 95% CI: 1.45 to 4.72), identify as heterosexual (aOR 4.33; 95% CI: 1.46 to 12.9), report having been employed in healthcare operations and care delivery in the previous 6 months (aOR 2.08; 95% CI: 1.02 to 4.25), and history of a laboratory-confirmed COVID-19 diagnosis (aOR 2.44; 95% CI: 1.15 to 5.19).

Conclusion: Our results suggest that COVID-19 vaccine hesitancy may be high among Black immigrants in the U.S. We found that lower educational attainment, being female, and employment in healthcare setting were associated with vaccine refusal and delay. Culturally-relevant interventions are needed to ensure optimal vaccination rates among this vulnerable population.

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Introduction

As of August 7, 2022, there has been over 92 million diagnosed cases of coronavirus disease 2019 (COVID-19) and over 1 million deaths attributed to COVID-19 in the United States (U.S.). Various studies have shown a significantly higher rate of COVID-19 cases and deaths among Blacks in the U.S., compared to Whites [1–3].

According to the Centers for Disease Control and Prevention (CDC), Blacks in the U.S. are three times more likely to be hospitalized due to COVID-19, and two times more likely to die from COVID-19 compared to Whites. Studies have examined the racial disparity of COVID-19 outcomes through the lens of structural racism and the disproportionate burden of underlying comorbid health conditions (i.e. diabetes, asthma, hypertension, asthma, obesity, etc.) in the Black community, which is significantly associated with COVID-19 related hospitalization [4–6] and death [6–8]. Additionally, societal inequities such as limited access to COVID-19 testing [9], living in more crowded conditions and high density

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neighborhoods [10], being employed in public-facing occupations (e.g. fast food restaurants, grocery stores, and transportation services) that prevent adequate physical distancing [10], amongst other factors, have fueled the observed racial disparity in COVID-19 outcomes in the U.S.

Black immigrants are one of the fastest growing immigrant groups in U.S., with a 52% increase in population size between 2010 and 2018, according to the U.S. Census Bureau. Currently, there are an estimated 4.2 million Black immigrants in the U.S., with a majority emigrating from the Caribbean (e.g. Jamaica, Haiti, and Trinidad and Tobago) and sub-Saharan Africa (e.g. Nigeria, Ethiopia, and Kenya). The unique experiences of Black immigrants in the U.S. as it relates to acculturation, language barriers, insecure immigration status, stress, limited employment opportunities, amongst others, may contribute to negative health outcomes [11]. There have been documented differences in health behaviors and outcomes between U.S. born and non-U.S. born Black communities, specifically related to HIV testing and knowledge, substance use, and self-rated physical and mental health [12–14]. This provides evidence of the heterogeneity in health behavior and outcomes among the Black community in the U.S. and the advantages of collecting and disaggregating health data by nativity and country of birth.

Between December 2020 and February 2021, the U.S. Food and Drug Administration (FDA) issued emergency use authorization to three vaccines (Pfizer-BioNTech, Moderna, and Janssen) for the prevention of COVID-19. As of August 3, 2022, over 604 million doses of the COVID-19 vaccine had been administered, with 79% of the total U.S. population having received at least one dose of the vaccine. However, there is a disparity in COVID-19 vaccination rates among sub-populations including racial and ethnic minority communities. Data from the CDC showed that during the first month of COVID-19 vaccinations, the Black community made up only 5.4% of individuals vaccinated [15]. As of July 11, 2022, the Kaiser Family Foundation reported that only 59% of Blacks had received at least one dose of the COVID-19 vaccines compared to 64% of Whites.

One explanation for this observed difference is vaccine hesitancy, which has been widely documented among racial minority populations. A study of over 2,000 adults in the U.S. found that while 69% of participants were willing to get the COVID-19 vaccines, the biggest predictor of not being willing to take the vaccines was identifying as being non-Latinx, Black [16]. Another study of adults in the United Kingdom had similar findings, with racial minority groups being less willing to take the COVID-19 vaccines, once it became publicly available [17]. These findings provide evidence that the availability of highly effective COVID-19 vaccines does not equate to overwhelming acceptability among the Black community, especially given the history of medical mistrust and its impact on (dis)engagement in health behaviors that has been widely documented among Black communities in the U.S. [18–21].

The history of mass vaccination campaigns—often championed by western actors—in countries with majority Black citizenship across the world has implications for the COVID-19 vaccination effort among Black immigrants in the U.S. [22]. A systematic review of barriers to childhood vaccination among parents/caretakers in sub-Saharan Africa included limited knowledge of immunization, long distance to immunization locations, lack of financial resources, and distrust in vaccines and immunization programs [23]. While there has been some empirical research on the anticipated acceptability of the COVID-19 vaccines among the Black community in the U.S., almost all of these studies have been focused on African Americans and they have rarely disaggregated the race/ethnicity category by nativity and/or immigration identity.

To our knowledge, no published study on COVID-19 vaccine acceptability among Black individuals in the U.S. has examined the unique experiences of first and second generation Black immigrants. Consequently, due to lack empirical data, there is limited knowledge on the acceptability of the COVID-19 vaccines among Black immigrants in the U.S. More research on this topic is needed as the lived experiences, ideology, health-seeking behaviors, and past vaccination experiences of Black immigrants might differ significantly from U.S. born Blacks. The current study examined acceptability of the COVID-19 vaccines among first- and second-generation Black immigrants in the U.S.

Methods

Study design

Between January and February 2021, we conducted an online, non-representative, cross-sectional survey to assess COVID-19 vaccine acceptability among first- and second- generation Black immigrants in the U.S. Inclusion criteria were: 1) being 18 years of age or older; 2) current residence in the U.S.; and 3) being first (i.e. born in African or Caribbean country) or second (i.e., at least one parent born in an African or Caribbean country) generation Black immigrant. We recruited participants via online social media, outreach to community-based organizations (CBOs) that serve Black immigrants across the U.S., and non-random snowball sampling [24]. Advertisements were placed on Facebook to target individuals whose country of origin was listed as an African or Caribbean country or who expressed interest in activities related to those countries. Additionally, we provided recruitment materials to various CBOs that provide social services (e.g. food, health services, legal representation, etc.) to Black immigrant communities across the U.S. We also encouraged study participants to share the study link with their social networks. All interested participants were provided with a web link to an eligibility screener and those who were eligible provided informed consent and completed the survey. A total of 552 potential participants were screened for eligibility and 388 met eligibility criteria (70%). The survey took about 7–10 min to complete and participants received no monetary compensation for their participation. The Institutional Review Board at the Harvard T.H. Chan School of Public Health deemed the study eligible for exemption from additional IRB review.

Measures

Outcome of interest. Our outcome of interest was willingness to take a COVID-19 vaccine. This was assessed by asking participants: “When the COVID-19/coronavirus vaccine becomes available to you for free, would you get vaccinated?” with response options ‘no, I will never get the vaccine,’ ‘yes, I would get it immediately it is available,’ ‘yes, but I would wait 3–6 months after it is available,’ ‘yes, but I would wait 6–12 months after it is available,’ or ‘yes, but I would wait 1 year or more after it is available.’ Due to participants not being forced to answer this question, 286 of the 378 participants (76%) who provided demographic characteristics responded. Participants who had received at least one dose of the COVID-19 vaccine at the time of survey completion were put in the ‘yes, I would get it immediately it is available’ response category. Due to small cell counts, we combined participants who responded that they would wait 3–6 months, 6–12 months, and 1 year or more into one category and utilized the following three categories for our analyses: “will never get COVID-19 vaccine,” ‘will get vaccine immediately available/already received vaccine,’ and ‘will delay getting vaccine.’ Individuals who responded that they would never get the vaccine were asked to select possible reasons

for their decision and were given the ability to select multiple reasons.

Demographic Characteristics and COVID-Related Factors. We assessed age, gender, sexual orientation, country of birth, ethnicity, marital status, employment status, annual household income, educational attainment, and employment in healthcare operations/care delivery in the previous 6 months. We asked if participants had ever been tested for COVID-19, had a personal laboratory-confirmed COVID-19 diagnosis, history of hospitalization due to COVID-19 complications, personally knew someone who had died from COVID-19, and if they had received at least one dose of the COVID-19 vaccines.

Data analysis

We assessed the distribution (percentages and means) of all variables by acceptability of the COVID-19 vaccines. Chi-square global tests of independence were used to assess independent associations between variables. We fit multinomial logistic regression models to assess acceptability of the COVID-19 vaccines. The reference category was participants who stated they would get vaccine immediately available/already received vaccine. Variables that were significant at $p < 0.1$ in the bivariate multinomial logistic regression models were retained in the multivariable multinomial logistic regression model. Data were analyzed using SAS version 9.4 (Cary, NC).

Results

Participant characteristics

Sample characteristics are presented in [Table 1](#).

Acceptability of COVID-19 vaccine

Overall, 57% of participants reported that they would get the COVID-19 vaccine immediately if it was available to them /had already received at least one dose of the vaccine, 37% would delay getting the vaccine, and 6% indicated that they would never get the vaccine. ([Table 2](#)). The reasons why participants indicated they would never get the COVID-19 vaccines were: believing the vaccines were developed too quickly (56%), having distrust in the U.S. government and scientific community due to past historical events such as the Tuskegee syphilis experiments (39%), not having enough information to feel comfortable taking the vaccines (28%), waiting to see the possible long-term effects on those who took the vaccines (28%), and believing the vaccines are not safe (22%).

In the bivariate multinomial analysis ([Table 3](#)), compared to participants who reported that they would get the COVID-19 vaccine immediately if it was available to them /had already received at least one dose of the vaccine, participants who indicated that they would never get a COVID-19 vaccines were more likely to have an associate's degree or lower [odds ratio (OR) 9.25; 95% confidence interval (CI): 2.34 to 36.6] or have a bachelor's degree (OR 3.79; 95% CI: 1.14 to 12.6) compared to having a master's degree or higher. Additionally, compared to participants who reported that they would get the COVID-19 vaccine immediately if it was available to them /had already received at least one dose of the vaccine, participants who indicated that they would delay getting the COVID-19 vaccines were more likely to: identify as female (OR 2.50; 95% CI: 1.41 to 4.42), identify as heterosexual (OR 4.36; 95% CI: 1.76 to 10.8), and have a history of laboratory-confirmed COVID-19 diagnosis (OR 2.52; 95% CI: 1.21 to 5.25).

Table 1
Demographic and health-related characteristics of participants (N = 388).

Demographic Characteristics	Total sample (mean, SD)/(n,%)
Age (in years)	36.1 (10.4)
Gender	
Male	123 (33.6)
Female	240 (65.6)
Gender non-confirming	3 (0.8)
Sexual Orientation	
Straight/Heterosexual	241 (84.3)
Lesbian/Gay	24 (8.4)
Bisexual	15 (5.2)
Asexual	3 (1.1)
Other	3 (1.1)
Born in the United States	
Yes	140 (38.3)
No	226 (61.8)
Ethnicity	
Africa-born Black	141 (48.1)
U.S.-born African Black	48 (16.4)
Caribbean-born Black	27 (9.2)
U.S.-born Caribbean Black	45 (15.4)
African American	13 (4.4)
Biracial	4 (1.4)
Other	15 (5.1)
Marital Status	
Single	164 (56.2)
Married/Domestic partnership	110 (37.7)
Divorced	14 (4.8)
Widowed	3 (1.0)
Separated	1 (0.3)
Employment Status	
Employed for wages	215 (73.9)
Student	42 (14.4)
Self-employed	15 (5.2)
Out of work for less than 1 year	9 (3.1)
Out of work for 1 year or more	5 (1.7)
Homemaker	3 (1.0)
Retired	2 (0.7)
Annual household income	
Less than \$25,000	25 (8.6)
\$25,000-\$34,999	18 (6.2)
\$35,000-\$49,999	20 (6.9)
\$50,000-\$69,999	62 (21.2)
\$70,000-\$99,999	47 (16.1)
\$100,000-\$149,999	51 (17.5)
\$150,000 or higher	69 (23.6)
Highest level of education	
High school graduate	3 (1.0)
Some college credit, no degree	10 (3.4)
Trade school/Technical college/Vocational training	5 (1.7)
Associate's degree	9 (3.1)
Bachelor's degree	85 (29.0)
Master's degree	111 (37.9)
Professional degree	50 (17.1)
Doctorate degree	20 (6.8)
Employed in healthcare operations/care delivery in previous 6 months	
Yes	113 (38.8)
No	178 (61.2)
Health-Related Characteristics	
Ever tested for COVID-19	
Yes	208 (72.0)
No, tried and unable to get tested	4 (1.4)
No, did not try to get tested	77 (26.6)
Laboratory confirmed COVID-19 diagnosis	
Yes	35 (12.1)
No	254 (87.9)
Ever hospitalized due to COVID-19 complications	
Yes	2 (0.7)
No	287 (99.3)
Personally know someone who has died from COVID-19	
Yes	153 (52.9)
No	136 (47.1)
Received at least one dose of COVID-19 vaccine	
Yes	61 (21.1)
No	228 (78.9)

Table 2
Bivariate correlates of acceptability of the COVID-19 vaccines.

Demographic Characteristics	Will never get vaccine (n = 17, 5.9%)	Will get vaccine immediately available/already received vaccine (n = 164, 57.3%)	Will delay getting vaccine (n = 105, 36.7%)	P-value
Age (in years)				0.36
20–30	4 (23.5)	60 (36.6)	47 (44.8)	
31–40	7 (41.2)	68 (41.5)	37 (35.2)	
41+	6 (35.3)	36 (21.9)	21 (20.0)	
Gender				0.006
Male	6 (35.3)	63 (38.4)	21 (20.0)	
Female	11 (64.7)	101 (61.6)	84 (80.0)	
Sexual Orientation				0.003
Heterosexual	14 (87.5)	126 (78.8)	97 (94.2)	
Non Heterosexual	2 (12.5)	34 (21.3)	6 (5.8)	
Born in the United States				0.35
Yes	5 (29.4)	62 (37.8)	47 (44.8)	
No	12 (70.6)	102 (62.2)	58 (55.2)	
Ethnicity				0.07
U.S. or Caribbean-born Black	6 (35.3)	33 (20.1)	32 (30.5)	
U.S. or Africa-born Black	7 (41.2)	112 (68.3)	64 (61.0)	
Other	4 (23.5)	19 (11.6)	9 (8.6)	
Marital Status				0.40
Single	11 (64.7)	85 (51.8)	66 (63.5)	
Married/Domestic partnership	5 (29.4)	68 (41.5)	32 (30.8)	
Other	1 (5.9)	11 (6.7)	6 (5.8)	
Employment Status				0.47
Employed for wages	11 (68.8)	123 (75.0)	78 (74.3)	
Student	1 (6.3)	23 (14.0)	16 (15.2)	
Other	4 (25.0)	18 (11.0)	11 (10.5)	
Annual household income				0.62
Less than \$49,999	4 (25.0)	31 (18.9)	26 (24.8)	
\$50,000–\$99,999	5 (31.3)	67 (40.9)	34 (32.4)	
\$100,000 or higher	7 (43.8)	66 (40.2)	45 (42.9)	
Highest level of education				0.004
Associate's degree or lower	5 (29.4)	12 (7.3)	8 (7.6)	
Bachelor's degree	7 (41.2)	41 (25.0)	36 (34.3)	
Master's degree or higher	5 (29.4)	111 (67.7)	61 (58.1)	
Employed in healthcare operations/care delivery in previous 6 months				0.09
Yes	3 (18.8)	71 (43.3)	36 (34.6)	
No	13 (81.3)	93 (56.7)	68 (65.4)	
Ever tested for COVID-19				0.42
Yes	10 (58.8)	118 (72.0)	78 (74.3)	
No	7 (41.2)	46 (28.0)	27 (25.7)	
Laboratory confirmed COVID-19 diagnosis				0.03
Yes	1 (5.9)	14 (8.5)	20 (19.1)	
No	16 (94.1)	150 (91.5)	85 (80.9)	
Personally know someone who has died from COVID-19				0.28
Yes	6 (35.3)	91 (55.5)	55 (52.4)	
No	11 (64.7)	73 (44.5)	50 (47.6)	

In the multivariable, multinomial logistic model (Table 3) compared to participants who reported that they would get the COVID-19 vaccine immediately if it was available to them /had already received at least one dose of the vaccine, participants who indicated that they would delay getting the COVID-19 vaccines were more likely to: identify as female (aOR 2.62; 95% CI: 1.45 to 4.72), identify as heterosexual (aOR 4.33; 95% CI: 1.46 to 12.9), and report having been employed in healthcare operations and care delivery in the previous 6 months (aOR 2.08; 95% CI: 1.02 to 4.25) and have a history of laboratory-confirmed COVID-19 diagnosis (OR 2.44; 95% CI: 1.15 to 5.19).

Discussion

This is the first known study to assess the acceptability of COVID-19 vaccines among first- and second- generation Black immigrants in the U.S. These findings illuminate the factors associated with COVID-19 vaccine hesitancy among communities that are disproportionately affected by the ongoing pandemic and the need for public health programming to ensure equitable access

to COVID-related health information and data as vaccination rates plateau and COVID-19 cases continue to rise across the U.S.

Participants with lower education attainment were most likely to indicate no intention of ever getting the COVID-19 vaccines. This finding is consistent with previous studies that found higher education attainment to be associated with higher likelihood of COVID-19 vaccine acceptance among U.S. adults [25–28]. It is important to note that education attainment is associated with health literacy [29], suggesting that higher educated individuals may have intentions on getting the COVID-19 vaccines because they have better access to and understanding of health-related information, which might make them more comfortable with taking a new vaccine. Consequently, detailed and concise explanations of how the COVID-19 vaccines were developed through easy to understand illustrations and visual aids might be an effective health communication strategy to employ for individuals who may not be as familiar with scientific research processes and procedures. More generally, media campaigns that prominently features a diverse composition of the Black community (i.e. U.S-born and non-US born) encouraging people to get vaccinated against COVID-19 should be developed and distributed widely.

Table 3
Factors associated with acceptability of the COVID-19 vaccines, bivariate and multivariable.

Demographic Characteristics	Multinomial Logistic Regression for COVID-19 vaccine acceptability ^a		Multivariable, multinomial Logistic Regression for COVID-19 vaccine acceptability ^b	
	Will never get vaccine OR (95% CI)	Will delay getting vaccine OR (95% CI)	Will never get vaccine aOR (95% CI)	Will delay getting vaccine aOR (95% CI)
Age (in years)				
20–30	Ref	Ref		
31–40	1.54 (0.43–5.54)	0.70 (0.40–1.21)		
41+	2.50 (0.66–9.46)	0.75 (0.39–1.44)		
Gender				
Male	Ref	Ref	Ref	
Female	1.14 (0.40–3.26)	2.50 (1.41–4.42)**		2.62 (1.45–4.72)*
Sexual Orientation				
Heterosexual	1.89 (0.41–8.71)	4.36 (1.76–10.81)**		4.33 (1.46–12.89)**
Non Heterosexual	Ref	Ref		Ref
Born in the United States				
Yes	0.69 (0.23–2.04)	1.33 (0.81–2.19)		
No	Ref	Ref		
Ethnicity				
U.S. or Caribbean-born Black	Ref	Ref		
U.S. or Africa-born Black	0.34 (0.11–1.09)	0.59 (0.33–1.05)		
Other	1.16 (0.29–4.63)	0.49 (0.19–1.24)		
Marital Status				
Single	Ref	Ref		
Married/Domestic partnership	0.57 (0.19–1.71)	0.61 (0.36–1.03)		
Other	0.70 (0.08–5.98)	0.70 (0.25–2.00)		
Employment Status				
Employed for wages	Ref			
Student	2.49 (0.71–8.64)	0.96 (0.43–2.15)		
Other	0.49 (0.06–3.95)	1.10 (0.55–2.21)		
Annual household income				
Less than \$49,999	Ref	Ref		
\$50,000–\$99,999	0.58 (0.15–2.30)	0.61 (0.31–1.18)		
\$100,000 or higher	0.82 (0.22–3.02)	0.81 (0.43–1.55)		
Highest level of education				
Associate's degree or lower	9.25 (2.34–36.6)**	1.21 (0.47–3.13)		1.46 (0.75–2.85)
Bachelor's degree	3.79 (1.14–12.6)*	1.60(0.93–2.76)		1.00 (0.32–3.18)
Master's degree or higher	Ref	Ref		Ref
Employed in healthcare operations/care delivery in previous 6 months				
Yes	0.30 (0.08–1.10)	0.69 (0.42–1.15)		2.08 (1.02–4.25)*
No	Ref	Ref		Ref
Ever tested for COVID-19				
Yes	0.56 (0.20–1.55)	1.13 (0.65–1.96)		
No	Ref	Ref		
Laboratory confirmed COVID-19 diagnosis				
Yes	0.67 (0.09–5.43)	2.52 (1.21–5.25)**		2.44 (1.15–5.19)*
No	Ref	Ref		Ref
Personally know someone who has died from COVID-19				
Yes	0.44 (0.15–1.24)	1.00 (0.58–1.72)		
No	Ref	Ref		

^ap <.05, ^{**}p <.01, ^{***}p <.001.

^a Multinomial regression, dependent variable = will get vaccine immediately.

^b Multivariable multinomial regression, dependent variable = will get vaccine immediately, includes variables that were significant at the p < 0.1 level in the bivariate model.

The reasons why participants indicated they would never get the COVID-19 vaccines were: believing the vaccines were developed too quickly (56%), having distrust in the U.S. government and scientific community due to past historical events such as the Tuskegee syphilis experiments (39%), not having enough information to feel comfortable taking the vaccines (28%), waiting to see the possible long-term effects on those who took the vaccines (28%), and believing the vaccines are not safe (22%). Concerns about the vaccines being developed too quickly can be potentially allayed by providing additional information about how breakthroughs in vaccine technology helped hasten the COVID-19 vaccine development process. The expressed distrust in the U.S. government and scientific community due to historical events and practices are valid and should be acknowledged. These concerns can be addressed by engaging community members in the development of their own messaging and utilizing trusted messen-

gers, such as healthcare providers who mirror the target population, faith leaders, and non-U.S.-born Black individuals who have already been vaccinated. There is also a need for an increase in workforce racial diversity in the medical, public health, and pharmaceutical sectors. However, it is also important to note that the current study found that working in healthcare was associated with increased COVID-19 vaccines hesitancy. Consequently, in addition to a more diverse healthcare workforce, it may be important to better understand and address hesitancy among healthcare workers in general.

It is important that health information campaigns about the COVID-19 vaccines explain the benefits of vaccination in an easy and concise manner, to maximize likelihood of vaccination. Additionally, it is important that vaccine delivery outlets (e.g., local health departments, healthcare systems, pharmacies, grocery stores, etc.) that serve this community tailor their health messag-

ing to more effectively encourage vaccination and reduce vaccine hesitation. This includes providing vaccine-related health information in multiple languages, utilizing other mediums such as religious institutions, social media groups, and cultural organizations as dissemination avenues for information about the COVID-19 vaccines and vaccination locations. Increasing access is also important to promote vaccine acceptability. Flexible vaccination appointments (such as evenings and weekends) and language translation services (as applicable) should be made available to those who need them. These measures might increase COVID-19 vaccination rates among first and second generation Black immigrants in the U.S., especially given the recent spike in COVID-19 infections rates due to the newly discovered and highly contagious Omicron sub-variant (BA.5).

We found that women more commonly reported intentions to delay getting the COVID-19 vaccines compared to men. There has been mixed results on gender differences in acceptability of the COVID-19 vaccines. Some studies have demonstrated lower intentions of vaccinations among women [16,26,28] while others have found higher intentions among women compared to men [27,30]. For women of child-bearing age and those planning on getting pregnant, weighing the possible benefits and risks of receiving the COVID-19 vaccines could be a top priority. On July 30, 2021, the American College of Obstetricians and Gynecologists and the Society for Maternal-Fetal Medicine recommended that anyone who is pregnant should be vaccinated against Covid-19. This recommendation, by the premier professional organization for obstetricians and gynecologists in the U.S., could be cited to assuage COVID-19 vaccine concerns of women who are pregnant or planning on becoming pregnant. Additionally, women may delay getting the COVID-19 vaccines due to being the primary caregivers in the family and busy daily schedules may pose a major barrier to seeking information about the vaccine, signing up to get vaccinated, and finding time to make it to a vaccination appointment. More research is needed to delineate gender differences in COVID-19 acceptability and public health interventionists should consider these differences in their outreach efforts.

Participants who reported employment in healthcare operations and care delivery in the previous 6 months were twice as likely to report delaying getting the COVID-19 vaccines. Studies have shown that Black healthcare workers were less likely to report COVID-19 vaccine acceptance and uptake compared to White healthcare workers [31–33]. A survey of healthcare personnel in a large urban hospital found a range of COVID-19 vaccine hesitancy by job category, with the highest acceptability being among physicians (82%) and lowest being among radiology technicians (33%) [34]. While only 8% of respondents planned on never getting the vaccines, 65% of them were African American and the reasons given for this decision were: concerns over the vaccines being new, worries about potential side effects, and previous COVID infection [34]. We also found in our analyses that individuals with a history of laboratory-confirmed COVID-19 diagnosis were twice as likely to have intentions to delay COVID-19 vaccination. Other studies have found that individuals with a previous COVID-19 diagnosis were less likely to have intentions to receive the COVID-19 vaccines [35–37]. Currently, the CDC currently recommends that “vaccination should be offered to persons regardless of history of prior symptomatic or asymptomatic SARS-CoV-2 infection.” It is important that COVID-19 vaccination campaigns stress the need for widespread vaccination, regardless of previous COVID infection and/or diagnosis. Research has demonstrated that healthcare provider recommendation is a significant predictor of willingness to take the COVID-19 vaccines [16] and vaccinated healthcare providers are more likely to recommend vaccination to others [38]. More research is needed on the factors that influence the healthcare workforce’s decision processes on vaccination

uptake. This information will provide much needed insight into vaccine hesitancy in the general population. A possible solution could be instituting education programming within the healthcare setting that features peer ambassadors who have been vaccinated sharing their vaccine decision process and vaccination experience. Additionally, instituting a COVID-19 vaccine mandate for continued employment in a healthcare setting might prove to be highly effective. High COVID-19 vaccine acceptance among the healthcare workforce will not only provide much needed protection for these crucial frontline workers, but might encourage members of the general public who remain skeptical to get vaccinated.

This study has several limitations. The cross-sectional design limits our ability to draw causal inferences. In addition, many of the measures relied on participant recall/self-report, which may have contributed to social desirability bias. Our study sample was recruited via social media and non-random snowball sampling, limiting our ability to generalize our findings to the entire Black immigrant population in the U.S. Additionally, our sample was skewed towards women (66%), heterosexuals (84%), first and second generation African Blacks (65%), and individuals with a bachelor’s degree or higher (91%), which is not representative sample of the diversity observed among first and second generation Black immigrants in the U.S. Additionally, the sample may have been skewed towards participants with access to healthcare services. Also, prior adverse reactions to vaccinations—which wasn’t assessed in the current study—could have significantly affected acceptability to the COVID-19 vaccines. Despite these limitations, our study is the first to examine COVID-19 vaccine acceptability among first and second general Black immigrants in the U.S.

Conclusions

Overall, 57% of participants reported that they would get the COVID-19 vaccine immediately if it was available to them or had already received at least one dose of the vaccine, 37% would delay getting the vaccine, and 6% indicated that they would never get the vaccine. We believe that evidence-based and culturally-relevant health interventions are needed to ensure optimal vaccination rates among this vulnerable population. Actively engaging religious institutions, CBOs, cultural organizations, and key opinion leaders is pivotal to ensure optimal uptake of the COVID-19 vaccines among first and second generation Black immigrants in the U.S.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

- [1] Kirby T. Evidence mounts on the disproportionate effect of COVID-19 on ethnic minorities. *Lancet Respiratory Med* 2020;8(6):547–8.
- [2] Millett GA et al. Assessing differential impacts of COVID-19 on Black communities. *Ann Epidemiol* 2020.
- [3] Kullar R, Marcelin JR, Swartz TH, Piggott DA, Macias Gil R, Mathew TA, et al. Racial disparity of coronavirus disease 2019 in African American Communities. *J Infect Dis* 2020;222(6):890–3.
- [4] Killerby ME, et al. Characteristics associated with hospitalization among patients with COVID-19—Metropolitan Atlanta, Georgia, March–April 2020. *Morbidity and Mortality Weekly Report*, 2020. 69(25): p. 790.
- [5] Garg S, Kim L, Whitaker M, O’Halloran A, Cummings C, Holstein R, et al. Hospitalization rates and characteristics of patients hospitalized with laboratory-confirmed coronavirus disease 2019—COVID-NET, 14 States, March 1–30, 2020. *Morb Mortal Wkly Rep* 2020;69(15):458–64.
- [6] Price-Haywood EG, Burton J, Fort D, Seoane L. Hospitalization and mortality among black patients and white patients with Covid-19. *N Engl J Med* 2020;382(26):2534–43.

- [7] Williamson EJ, Walker AJ, Bhaskaran K, Bacon S, Bates C, Morton CE, et al. Factors associated with COVID-19-related death using OpenSAFELY. *Nature* 2020;584(7821):430–6.
- [8] Jordan RE, Adab P, Cheng K. Covid-19: risk factors for severe disease and death. 2020, British Medical Journal Publishing Group.
- [9] Mody A, et al. Understanding Drivers of COVID-19 Racial Disparities: A Population-Level Analysis of COVID-19 Testing among Black and White Populations. *Clinical Infectious Diseases*; 2020.
- [10] Hooper MW, Nápoles AM, Pérez-Stable EJ. COVID-19 and racial/ethnic disparities. *JAMA* 2020;323(24):2466–7.
- [11] Singh GK, Miller BA. Health, life expectancy, and mortality patterns among immigrant populations in the United States. *Can J Public Health* 2004;95(3):114–21.
- [12] Ojikutu B, Nnaji C, Sithole J, Schneider KL, Higgins-Biddle M, Cranston K, et al. All black people are not alike: differences in HIV testing patterns, knowledge, and experience of stigma between US-born and non-US-born blacks in Massachusetts. *AIDS Patient Care STDs* 2013;27(1):45–54.
- [13] Elo IT, Culhane JF. Variations in health and health behaviors by nativity among pregnant Black women in Philadelphia. *Am J Public Health* 2010;100(11):2185–92.
- [14] Cabral H, Fried LE, Levenson S, Amaro H, Zuckerman B. Foreign-born and US-born black women: differences in health behaviors and birth outcomes. *Am J Public Health* 1990;80(1):70–2.
- [15] Painter EM, Ussery EN, Patel A, Hughes MM, Zell ER, Moulia DL, et al. Demographic Characteristics of Persons Vaccinated During the First Month of the COVID-19 Vaccination Program—United States, December 14, 2020–January 14, 2021. *Morb Mortal Wkly Rep* 2021;70(5):174–7.
- [16] Reiter PL, Pennell ML, Katz ML. Acceptability of a COVID-19 vaccine among adults in the United States: How many people would get vaccinated? *Vaccine* 2020;38(42):6500–7.
- [17] Thorneloe R, et al. Willingness to receive a COVID-19 vaccine among adults at high-risk of COVID-19: a UK-wide survey; 2020.
- [18] Powell W, Richmond J, Mohottige D, Yen I, Joslyn A, Corbie-Smith G. Medical mistrust, racism, and delays in preventive health screening among African-American men. *Behav Med* 2019;45(2):102–17.
- [19] Hammond WP, Matthews D, Mohottige D, Agyemang A, Corbie-Smith G. Masculinity, medical mistrust, and preventive health services delays among community-dwelling African-American men. *J Gen Intern Med* 2010;25(12):1300–8.
- [20] Adams LB, Richmond J, Corbie-Smith G, Powell W. Medical mistrust and colorectal cancer screening among African Americans. *J Community Health* 2017;42(5):1044–61.
- [21] Sheppard VB, Mays D, Tercyak KP, LaVeist T. Medical mistrust influences black women's level of engagement in BRCA1/2 genetic counseling and testing. *J Natl Med Assoc* 2013;105(1):17–22.
- [22] Afolabi AA, Ilesanmi OS. Dealing with vaccine hesitancy in Africa: the prospective COVID-19 vaccine context. *Pan African Med J* 2021;38.
- [23] Bangura JB, Xiao S, Qiu D, Ouyang F, Chen L. Barriers to childhood immunization in sub-Saharan Africa: A systematic review. *BMC Public Health* 2020;20(1). <https://doi.org/10.1186/s12889-020-09169-4>.
- [24] Goodman LA. Snowball sampling. *Ann Math Stat* 1961;32(1):148–70.
- [25] Malik AA et al. Determinants of COVID-19 vaccine acceptance in the US. *EClinicalMedicine* 2020;26:100495.
- [26] Fisher KA, Bloomstone SJ, Walder J, Crawford S, Fouayzi H, Mazor KM. Attitudes toward a potential SARS-CoV-2 vaccine: a survey of US adults. *Ann Intern Med* 2020;173(12):964–73.
- [27] Nguyen KH, Srivastava A, Razzaghi H, Williams W, Lindley MC, Jorgensen C, et al. COVID-19 Vaccination Intent, Perceptions, and Reasons for Not Vaccinating Among Groups Prioritized for Early Vaccination—United States, September and December 2020. *Morb Mortal Wkly Rep* 2021;70(6):217–22.
- [28] Khubchandani J, Sharma S, Price JH, Wiblehauser MJ, Sharma M, Webb FJ. COVID-19 Vaccination Hesitancy in the United States: A Rapid National Assessment. *J Community Health* 2021;46(2):270–7.
- [29] Paasche-Orlow MK, Parker RM, Gazmararian JA, Nielsen-Bohman LT, Rudd RR. The prevalence of limited health literacy. *J Gen Intern Med* 2005;20(2):175–84.
- [30] Lazarus JV et al. A global survey of potential acceptance of a COVID-19 vaccine. *Nat Med* 2020:1–4.
- [31] Oliver K, et al. Factors associated with COVID-19 vaccine receipt at two integrated healthcare systems in New York City: A Cross sectional study of healthcare workers. medRxiv; 2021.
- [32] Grumbach K, Judson T, Desai M, Jain V, Lindan C, Doernberg SB, et al. Association of Race/Ethnicity With Likelihood of COVID-19 Vaccine Uptake Among Health Workers and the General Population in the San Francisco Bay Area. *JAMA Internal Med* 2021;181(7):1008. <https://doi.org/10.1001/jamainternmed.2021.1445>.
- [33] Momplaisir FM, et al., Racial Differences in COVID-19 Vaccine Hesitancy Among Health Care Workers in Two Large Academic Hospitals. Available at SSRN 3805854; 2021.
- [34] Amin D, Palter J. COVID-19 vaccination hesitancy among healthcare personnel in the emergency department deserves continued attention. *Am J Emergency Med*; 2021.
- [35] Hosek MG, Chidester AB, Gelfond J, Taylor BS. Low Prevalence of COVID-19 Vaccine Hesitancy in Students Across Health Science Disciplines in Texas. *Vaccine: X* 2022;10:100154. <https://doi.org/10.1016/j.ivacx.2022.100154>.
- [36] Belingheri M, Roncalli M, Riva MA, Paladino ME, Teruzzi CM. COVID-19 vaccine hesitancy and reasons for or against adherence among dentists. *J Am Dental Assoc* 2021;152(9):740–6.
- [37] Pacella-LaBarbara ML, Park YL, Patterson PD, Doshi A, Guyette MK, Wong AH, et al. COVID-19 vaccine uptake and intent among emergency healthcare workers: a cross-sectional survey. *J Occup Environ Med* 2021; 63(10):852–6.
- [38] Paterson P, Meurice F, Stanberry LR, Glismann S, Rosenthal SL, Larson HJ. Vaccine hesitancy and healthcare providers. *Vaccine* 2016;34(52):6700–6.