

# COVID-19 Vaccine Hesitancy Among Health Care Workers in Four Health Care Systems in Atlanta

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Coronavirus disease 2019 (COVID-19) vaccine hesitancy among health care workers (HCWs) undermines community vaccine confidence. Predictors and reasons for HCW hesitancy in the Atlanta region were evaluated using a survey between May and June 2021. Vaccine hesitancy was highest in younger and less educated HCWs. Interventions to address vaccine hesitancy in HCWs are necessary.

**Keywords.** COVID-19 vaccines; vaccines; vaccine hesitancy.

Vaccines play a pivotal role in controlling the coronavirus disease 2019 (COVID-19) pandemic, but vaccine hesitancy continues to undermine pandemic mitigation. In December 2020, the US Food and Drug Administration authorized 2 COVID-19 vaccine products for emergency use, followed by a third in February 2021. More than 1 year later, Georgia has one of the lowest vaccination rates in the country [1].

Health care workers (HCWs) play a crucial role in promoting immunization programs, fostering vaccine acceptance in the community, and interrupting transmission in the health care

setting. Previous studies have identified varying HCW hesitancy across different racial/ethnic groups and clinical roles [2–9]. We surveyed HCWs in 4 major health care systems in Atlanta, Georgia, to identify predictors of vaccine hesitancy and evaluate HCW attitudes and perceptions regarding COVID-19 vaccines to inform efforts to increase vaccine confidence.

## METHODS

We conducted an anonymous cross-sectional survey (using Qualtrics) of HCWs via email from May to June 2021. Question items included demographics, role (clinical or nonclinical), personal or family history of COVID-19 infection, and whether the HCW had personally cared for patients with COVID-19. General attitudes and perceptions about COVID-19 vaccines and reasons for not receiving the vaccine were collected using a 5-point Likert scale for agreement. We defined “vaccine-hesitant” individuals as those who had neither received nor planned to receive the COVID-19 vaccine at the time of the survey.

Vaccine hesitancy was dichotomized to vaccine hesitant and not vaccine hesitant. We compared basic descriptive variables using chi-square and *t* tests. We used a multivariate logistic regression model controlling for age, sex, race, ethnicity, and education to estimate adjusted measures of association and performed frequency distribution of reasons for not getting a COVID-19 vaccine among the vaccine hesitant. Statistical analyses were performed using SAS 9.4.

This study protocol was deemed to be exempt from human subjects research review by the Emory University Institutional Review Board.

## RESULTS

Approximately 30 000 HCWs worked in the participating health care systems. A total of 5329 HCWs responded to the survey (response rate, 17.76%); 5281 (99.10%) completed all questionnaire sections. Of the 5329 respondents, 551 (10.34%) were vaccine hesitant. HCWs in this survey were predominantly female (79.32%), White (46.26%), and non-Hispanic (88.77%), with educational attainment above a Bachelor’s degree (41.20%); these percentages were similar to the overall population of HCWs sampled. About two-thirds of respondents (63.84%) provided direct COVID-19 patient care.

Among the 551 (10.34%) vaccine-hesitant respondents, a smaller proportion of clinical HCWs were vaccine hesitant than nonclinical HCWs (9.82% vs 11.26%). Among clinical health care roles, paramedics/EMTs (29.03%), nurses (13.46%), technologists (13.19%), and medical/nursing assistants (15.20%) were more vaccine hesitant than other clinical health care roles.

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Clinical HCWs who cared for COVID-19 patients were more vaccine hesitant than those who did not (10.71% vs 7.84%) (Table 1). Vaccine hesitancy was higher in those with a previous diagnosis of COVID-19 (19.69%) than those without (8.78%).

In the adjusted multivariate analysis, individuals in the age group 18–35 years (odds ratio [OR], 8.81; 95% CI, 3.81–20.38) had the highest odds of being vaccine hesitant as compared with those age 66 years or older. Non-Hispanic HCWs had increased odds (OR, 2.79; 95% CI, 1.60–4.84) of vaccine hesitancy compared with Hispanic HCWs. Those with a Bachelor's (OR, 2.29; 95% CI, 1.79–2.92) and those with less than a Bachelor's (OR, 2.96; 95% CI, 2.28–3.84) were more vaccine hesitant than those with more than a Bachelor's degree. Among clinical health care roles, paramedics/EMTs (OR, 12.89; 95% CI, 5.44–30.56), nurses (OR, 6.46; 95% CI, 3.23–12.90), technologists (OR, 5.75; 95% CI, 2.72–12.16), and medical/nursing assistants (OR, 5.59; 95% CI, 2.47–12.64) were more vaccine hesitant than physicians. After adjustment, no significant association was observed for female gender, Black race, or those taking care of COVID-19 patients (Table 2).

Among all HCWs ( $n = 5329$ ), 27% felt that COVID-19 vaccines were developed too fast, 45% doubted vaccines' effectiveness against new variants, and 32% were concerned about side effects; 40% felt that COVID-19 vaccines should be mandated for HCWs (Supplementary Figure 1). Among vaccine-hesitant HCWs ( $n = 551$ ), primary concerns were vaccine side effects (47.37%), wanting to wait for more people to get vaccinated (28.68%), and limited knowledge about the vaccines (20.69%) (Supplementary Figure 1).

## DISCUSSION

COVID-19 vaccine hesitancy remains a significant barrier to controlling the COVID-19 pandemic. Ten percent of HCWs in our survey were COVID-19 vaccine hesitant. Vaccine hesitancy was associated with younger age ( $\leq 35$ ), lower educational attainment, and non-Hispanic ethnicity. There was no significant difference between the White and Black individuals. Previous studies conducted earlier in the pandemic observed significant differences but this may reflect changing perspectives in the Black community over the course of the pandemic and vaccine administration [9, 10]. Nurses made up 34% of all respondents and of these, 11% were vaccine hesitant (Table 1). Overall, nurses were 6 times more likely than physicians to be vaccine hesitant. HCWs with prior COVID-19 infections were also highly vaccine hesitant (19.7%), possibly reflecting the misconception that natural immunity adequately protects against reinfection. The topmost concerns about COVID-19 vaccination included side effects, efficacy, and safety concerns based on the speed at which vaccine development occurred; these are consistent with other literature reflecting similar concerns in the community (Supplementary Figure 2) [11].

Interestingly, vaccine-hesitant nurses in our survey were relatively evenly distributed across different groups. This may reflect inherent sociocultural beliefs irrespective of clinical role, age, race, ethnicity, or educational level. In addition to nurses, we observed others that have direct contact working alongside nurses (technologists, paramedics/EMTs, and medical/nursing assistants) were more vaccine hesitant. Nurses are large in number and influential in their positions and interface with other HCWs of all educational levels and ages. One recent study demonstrated that the decision to vaccinate was highly influenced by what the health care workers' colleagues and others close to them thought about the vaccine and least influenced by mass media marketing [12]. Assumptions about nursing knowledge and level of vaccine confidence should not be made given the myriad of external influences that may be confounding decision-making. Utilizing nurses' human connection skills, medical background, and extensive interfacing with other HCWs across educational levels creates opportunity for promoting vaccine uptake among HCWs and the community. Leveraging their position in society and their large numbers is an important piece of vaccine promotion, and these individuals should be directly involved with policy-making and communication campaigns.

COVID-19 vaccine mandates may threaten the workforce and health care infrastructure as we lose HCWs who opt out of COVID-19 vaccines at a time when they are needed the most. In some areas, vaccine mandates have been accepted with minimal loss of workforce, but in others, especially in the nursing field, there has been a loss of workforce, leading to reliance on temporary staffing at high pay rates [13]. HCWs are considered role models in their families and communities [14]. Increased efforts are needed to increase HCW trust and confidence in COVID-19 vaccines, allowing HCWs to be effective champions for wider dissemination in the community.

One major strength of this study is the large sample size, spanning 4 health systems, representing diverse race, ethnicity, gender, and age groups. Limitations include potential selection bias related to the low response rate (17.76%); also, vaccine-hesitant HCWs may have been less likely to respond, likely to maintain social desirability especially in the health care setting, though the demographic similarity of the sample to the overall HCW population may indicate a reduced likelihood of such bias. Our survey was completed in mid-2021 and may not reflect current vaccine hesitancy rates, especially after COVID-19 vaccine mandates began. Regardless, these data remain relevant as new vaccines directed at emerging variants and the need for boosters remain significant controversies in the discussion of vaccine mandates for HCWs.

As vaccine mandates roll out across the country, vaccine-hesitant HCWs must choose between their livelihoods and their beliefs. Strategies to increase vaccine uptake and combat

**Table 1. Sample Characteristics of Health Care Workers Compared by COVID-19 Vaccine Status in 4 Major Health Care Systems of Greater Atlanta, May 2021 (n = 5329)**

Demographics*	Frequency (%) (n = 5329)	COVID-19 Vaccination Status, No. (%)		COVID-19 Vaccination Status, No. (%)		Chi-square P Value
		Vaccine Hesitant (n = 551)	Non-Vaccine Hesitant (n = 4778)	Vaccine Hesitant (n = 551)	Non-Vaccine Hesitant (n = 4778)	
<b>Age group</b>						
18–35 y	1282 (24.28)	191 (14.90)	1091 (85.10)	191 (35.44)	1091 (23.01)	<.0001
36–45 y	1216 (23.03)	133 (10.94)	1083 (89.06)	133 (24.68)	1083 (22.84)	
46–55 y	1333 (25.24)	132 (9.90)	1201 (90.10)	132 (24.49)	1201 (25.33)	
56–65 y	1221 (23.12)	77 (6.31)	1144 (93.69)	77 (14.29)	1144 (24.12)	
≥66 y (ref.)	229 (4.34)	6 (2.62)	223 (97.38)	6 (1.11)	223 (4.70)	
<b>Gender</b>						
Male (ref.)	975 (18.46)	68 (6.97)	907 (93.03)	68 (12.62)	907 (19.13)	<.0001
Female	4189 (79.32)	414 (9.88)	3775 (90.12)	414 (76.81)	3775 (79.61)	
Other response <sup>a</sup>	117 (2.22)	57 (48.72)	60 (51.28)	57 (10.58)	60 (1.27)	
<b>Race</b>						
White (ref.)	2443 (46.26)	216 (8.84)	2227 (91.16)	216 (40.07)	2227 (46.96)	<.0001
Black	2038 (38.59)	232 (11.38)	1806 (88.62)	232 (43.04)	1806 (38.09)	
Asian	390 (7.38)	8 (2.05)	382 (97.95)	8 (1.48)	382 (8.06)	
Native American	9 (0.17)	1 (11.11)	8 (88.89)	1 (0.19)	8 (0.17)	
Other response <sup>b</sup>	401 (7.59)	82 (20.45)	319 (79.55)	82 (15.21)	319 (6.73)	
<b>Ethnicity</b>						
Hispanic (ref.)	275 (5.21)	16 (5.82)	259 (94.18)	16 (2.97)	259 (5.46)	<.0001
Non-Hispanic	4688 (88.77)	431 (9.19)	4257 (90.81)	431 (79.96)	4257 (89.77)	
Other response <sup>c</sup>	318 (6.02)	92 (28.93)	226 (71.07)	92 (17.07)	226 (4.77)	
<b>Education</b>						
More than Bachelor's (ref.)	2176 (41.20)	124 (5.70)	2052 (94.30)	124 (23.01)	2052 (43.27)	<.0001
Bachelor's degree	1628 (30.83)	200 (12.29)	1428 (87.71)	200 (37.11)	1428 (30.11)	
Less than Bachelor's	1279 (24.22)	176 (13.76)	1103 (86.24)	176 (32.65)	1103 (23.26)	
Other response <sup>d</sup>	198 (3.75)	39 (19.70)	159 (80.30)	39 (7.24)	159 (3.35)	
<b>Previous diagnosis of COVID**</b>						
No (ref.)	4523 (84.88)	397 (8.78)	4126 (91.22)	397 (72.05)	4126 (86.35)	<.0001
Yes	711 (13.34)	140 (19.69)	571 (80.31)	140 (25.41)	571 (11.95)	
<b>≥1 family member's previous diagnosis of COVID***</b>						
No (ref.)	1966 (36.89)	201 (10.22)	1765 (89.78)	201 (36.48)	1735 (36.94)	.8033
Yes	3237 (60.74)	324 (10.01)	2913 (89.99)	324 (58.80)	2913 (60.97)	
<b>Health care worker role</b>						
Clinical (ref.)	3402 (63.84)	334 (9.82)	3068 (90.18)	334 (60.62)	3068 (64.21)	.0946
Nonclinical	1927 (36.16)	217 (11.26)	1710 (88.74)	217 (39.38)	1710 (35.79)	
<b>Clinical health care roles (n = 3402)</b>						
Physician/resident (ref.)	616 (18.11)	12 (1.95)	604 (98.05)	12 (3.59)	604 (19.69)	<.0001
Nurse	1211 (35.60)	163 (13.46)	1048 (86.54)	163 (48.80)	1048 (34.16)	
Technologist	326 (9.58)	43 (13.19)	283 (86.81)	43 (12.87)	283 (9.22)	
Advanced practice provider	240 (7.05)	13 (5.42)	227 (94.58)	13 (3.89)	227 (7.40)	
Medical/nursing assistant	204 (6.00)	31 (15.20)	173 (84.80)	31 (9.28)	173 (5.64)	
Pharmacist	128 (3.76)	4 (3.13)	124 (96.88)	4 (1.20)	124 (4.04)	
Paramedic/EMT	79 (2.32)	23 (29.11)	56 (70.89)	23 (6.89)	56 (1.83)	
Other response <sup>e</sup>	598 (17.58)	45 (7.53)	553 (92.47)	45 (13.47)	553 (18.02)	
<b>Took care of COVID patients (n = 3402)</b>						
No (ref.)	1021 (30.00)	80 (7.84)	941 (92.16)	80 (23.95)	941 (30.67)	.0381
Yes	2194 (64.50)	235 (10.71)	1959 (89.29)	235 (70.36)	1959 (63.85)	
Not sure	187 (5.50)	19 (10.16)	168 (89.84)	19 (5.69)	168 (5.48)	

Abbreviations: COVID-19, coronavirus disease 2019; EMT, Emergency Medical Technician.

\*Demographic data missing for 48 respondents.

\*\*Ninety-six selected "not sure" (not shown).

\*\*\* One hundred twenty-six selected "not sure" (not shown).

<sup>a</sup>Other responses included "nonbinary" and "prefer not to answer."

<sup>b</sup>Other responses included "multiracial" and not specified/"prefer not to answer."

<sup>c</sup>Other responses included "prefer not to answer."

<sup>d</sup>Other responses included "professional certificate" and "prefer not to answer."

**Table 2. Predictors of COVID-19 Vaccine Hesitancy Among HCWs in 4 Major Health Care Systems of Greater Atlanta, May 2021 (n = 5329)**

Predictors	Odds Ratio (95% CI)	
	Unadjusted Estimates	Adjusted Estimates*
<b>Age group</b>		
18–35 y	6.51 (2.85–14.85)	8.81 (3.81–20.38)
36–45 y	4.56 (2.00–10.47)	5.30 (2.28–12.31)
46–55 y	4.09 (1.78–9.37)	3.77 (1.63–8.76)
56–65 y	2.50 (1.08–5.81)	2.31 (0.98–5.41)
≥66 y	Ref.	Ref.
<b>Gender</b>		
Male	Ref.	Ref.
Female	1.46 (1.12–1.91)	1.30 (0.99–1.71)
Other response <sup>a</sup>	12.67 (8.17–19.64)	6.62 (3.93–11.15)
<b>Race</b>		
White	Ref.	Ref.
Black	1.32 (1.09–1.61)	1.18 (0.95–1.46)
Asian	0.22 (0.11–0.44)	0.17 (0.08–0.35)
Native American	1.29 (0.16–10.35)	1.94 (0.23–16.41)
Other response <sup>b</sup>	2.65 (2.00–3.51)	1.53 (1.09–2.16)
<b>Ethnicity</b>		
Hispanic	Ref.	Ref.
Non-Hispanic	1.64 (0.98–2.74)	2.79 (1.60–4.84)
Other response <sup>c</sup>	6.59 (3.76–11.54)	1.53 (1.09–2.16)
<b>Education</b>		
More than Bachelor's	Ref.	Ref.
Bachelor's degree	2.32 (1.83–2.93)	2.29 (1.79–2.92)
Less than Bachelor's	2.64 (2.08–3.36)	2.96 (2.28–3.84)
Other response <sup>d</sup>	4.06 (2.74–6.02)	2.07 (1.27–3.37)
<b>Health care worker role</b>		
Clinical	Ref.	Ref.
Nonclinical	1.17 (0.97–1.40)	1.08 (0.89–1.32)
<b>Previous diagnosis of COVID</b>		
No	Ref.	Ref.
Yes	2.55 (2.06–3.15)	2.36 (1.88–2.96)
<b>≥1 family member's previous diagnosis of COVID</b>		
No	Ref.	Ref.
Yes	0.98 (0.81–1.18)	0.99 (0.81–1.21)
<b>Clinical health care roles**</b>		
Physician/resident	Ref.	Ref.
Nurse	7.83 (4.32–14.18)	6.46 (3.23–12.90)
Technologist	7.65 (3.97–14.72)	5.75 (2.72–12.16)
Advanced practice provider	2.88 (1.30–6.41)	2.70 (1.17–6.24)
Medical/nursing assistant	9.02 (4.53–17.93)	5.59 (2.47–12.64)
Pharmacist	1.62 (0.52–5.12)	1.41 (0.42–4.70)
Paramedic/EMT	20.67 (9.77–43.74)	12.89 (5.44–30.56)
Other response <sup>e</sup>	4.10 (2.14–7.82)	3.10 (1.53–6.27)
<b>Took care of COVID patients**</b>		
No	Ref.	Ref.
Yes	1.41 (1.08–1.84)	1.25 (0.94–1.66)
Not sure	1.33 (0.79–2.25)	1.04 (0.59–1.82)

Abbreviations: COVID-19, coronavirus disease 2019; EMT, Emergency Medical Technician.

\*Adjusted for age, sex, race, ethnicity, and education. Excluded 48 samples due to missing demographic data.

\*\*Among clinical health care workers (n = 3402).

<sup>a</sup>Other responses included “nonbinary” and “prefer not to answer.”

<sup>b</sup>Other responses included “multiracial” and not specified/“prefer not to answer.”

<sup>c</sup>Other responses included “prefer not to answer.”

<sup>d</sup>Other responses included “professional certificate” and “prefer not to answer.”

misinformation should be directed at younger age groups and those with lower education status, especially those who are “on the fence,” who are more likely to be influenced than those who are adamantly opposed [15]. Appealing to trusted colleagues to assist with vaccine promotion in these age groups could be an effective measure to decrease vaccine hesitancy. In addition, community outreach to external community organizational leadership could also promote vaccine uptake not only in the community but also among the HCWs who belong to these trusted communities.

As new COVID-19 variants continue to emerge, vaccine clinical guidance is evolving (eg, adding booster doses), and future pandemics will continue to occur. Further training of frontline HCWs, especially nurses, in techniques such as motivational interviewing or decision aids to build confidence to counter misconceptions is urgently needed. Formal training in these techniques should be integrated into health care organizations to promote trust and increase vaccine uptake.

### Supplementary Data

Supplementary materials are available at Open Forum Infectious Diseases online. Consisting of data provided by the authors to benefit the reader, the posted materials are not copyedited and are the sole responsibility of the authors, so questions or comments should be addressed to the corresponding author.

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