



# COVID-19 Vaccine Hesitancy and Experiences of Discrimination Among Black Adults

Don E. Willis<sup>1</sup> · Jennifer A. Andersen<sup>1</sup> · Brooke E. E. Montgomery<sup>2</sup> · James P. Selig<sup>3</sup> · Sumit K. Shah<sup>4</sup> · Nickolas Zaller<sup>2</sup> · Keneshia Bryant-Moore<sup>2</sup> · Aaron J. Scott<sup>4</sup> · Mark Williams<sup>2</sup> · Pearl A. McElfish<sup>1</sup>

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## Abstract

Early in the COVID-19 vaccine rollout, Black adults consistently reported more hesitancy than White adults, but few studies have examined variation in hesitancy among Black adults or its associations with racial discrimination. Data were collected from Black Arkansas residents age 18 and older ( $n=350$ ) between July 12<sup>th</sup> and July 30<sup>th</sup>, 2021, as part of a larger survey of Arkansans ( $N=1500$ ). Participants were recruited through random digit dialing of both landline and cell phones, with oversampling of Black and Hispanic residents. Respondents reported COVID-19 vaccine hesitancy, sociodemographic information, influenza vaccination history, pandemic-related experiences, and experiences of racial discrimination. Almost half (48.9%) of Black adults in Arkansas were not hesitant towards COVID-19 vaccines, while the remainder reported some level of hesitancy. Nearly a quarter were very hesitant (22.4%), while fewer reported being somewhat (14.0%) and a little (14.7%) hesitant. Using an ordered logistic regression with partial proportional odds, we find odds of COVID-19 vaccine hesitancy decreased as age and influenza vaccination increased. Odds of COVID-19 vaccine hesitancy were 1.70 times greater for Black adults who experienced the death of a close friend/family member due to COVID-19 and 2.61 times greater for individuals reporting discrimination with police or in the courts. Within-group analysis revealed nearly half of Black adults did not report any COVID-19 vaccine hesitancy and heterogeneity among those who were hesitant. Findings suggest there may be an important link between racial discrimination in the criminal justice system and COVID-19 vaccine hesitancy among Black adults.

**Keywords** COVID-19 · Vaccine hesitancy · Black adults · Racial discrimination

## Introduction

COVID-19 was the third leading cause of death in the United States (US) in 2020 [1]. The COVID-19 pandemic is expected to reduce life expectancy by more than 2 years for Black individuals in the US, eliminating over a decade of progress in narrowing the Black-White gap in life expectancy [2]. The most effective tool for reducing COVID-19 hospitalization and death is vaccination. By May 2021, vaccinations for COVID-19 in the US were estimated to have saved 140,000 lives [3]. However, the impact vaccinations have on reducing or exacerbating racial disparities in COVID-19 deaths is contingent on equitable uptake of COVID-19 vaccines [4–7].

Vaccine hesitancy was identified as a top ten global health threat by the World Health Organization (WHO) in 2019 because it poses a serious challenge to the control or elimination of infectious diseases [8]. Vaccine hesitancy is

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✉ Pearl A. McElfish  
pamcelfish@uams.edu

<sup>1</sup> College of Medicine, University of Arkansas for Medical Sciences Northwest, 1125 N. College Ave, Fayetteville, AR 72703, USA

<sup>2</sup> Fay W. Boozman College of Public Health, University of Arkansas for Medical Sciences, 4301 W. Markham St, Little Rock, AR 72205, USA

<sup>3</sup> Fay W. Boozman College of Public Health, University of Arkansas for Medical Sciences Northwest, 1125 N. College Ave, Fayetteville, AR 72703, USA

<sup>4</sup> Office of Community Health and Research, University of Arkansas for Medical Sciences Northwest, 1125 N. College Ave, Fayetteville, AR 72703, USA

an attitude that influences vaccine-uptake related behaviors, such as delay or refusal [9–11]. Hesitancy towards a COVID-19 vaccine has been documented as higher among younger populations, women, and those without a 4-year college degree [4–6, 12, 13]. Racial differences in COVID-19 vaccine hesitancy are narrowing in the US [14, 15]; however, Black individuals have consistently reported higher levels of vaccine hesitancy than White individuals [4, 5, 13]. Although racial and ethnic disparities in vaccine hesitancy are well documented, studies have rarely explored within-group variation among Black respondents, which is necessary to thoroughly explore the diversity of experiences among Black people. Furthermore, few studies have contextualized racial disparities in vaccine hesitancy with reference to racism and experiences of discrimination. Without rigorous investigation of racism experienced by Black people in the US, highly contested theories of patient mistrust and biological differences between races are posited to explain the existence of racial health disparities [16].

Our study is informed by the Increasing Vaccination Model, which specifies social processes, such as norms and equity, as important predictors of vaccine hesitancy [9, 10]. Racial discrimination fits within the social processes category, as it indicates differential treatment by institutions and individuals based on socially constructed categories of race. To our knowledge, only two studies have focused on the relationship between racial discrimination and willingness to receive a COVID-19 vaccine. Evidence from a study conducted in the UK found an indirect effect of racial/ethnic discrimination on COVID-19 vaccine refusal through a pathway of low trust in the health system [17]. A study conducted in the US before a COVID-19 vaccine was available found experiences of racial discrimination were the only form of discrimination significantly associated with higher odds of COVID-19 vaccine hesitancy [7].

There is also limited research on the relationship between racial discrimination and vaccine hesitancy in general. This research has primarily focused on influenza vaccination and experiences of discrimination in medical settings [18, 19]. However, a full examination of the influence of racism on vaccination hesitancy requires closer investigation of experiences of racial discrimination across multiple institutions that potentially reinforce White supremacy in the US. The US criminal justice system can be considered one such institution because negative experiences with this system have systematically eroded the physical and mental health of Black people for generations through police infliction of fatal and nonfatal injuries, discriminatory arrests, disproportionately punitive legal outcomes, over-policing of Black communities, and community exposure to infectious diseases associated with mass incarceration (e.g., COVID-19 and sexually transmitted infections) [20]. Given the spillover effects of police violence and surveillance on

the health and healthcare utilization of Black individuals [21–23], overlooking experiences of discrimination across multiple settings is a major limitation of prior research on vaccine hesitancy.

The focus of this study on variation in COVID-19 vaccine hesitancy among Black adults fills an important gap in understanding how vaccine hesitancy may be related to racial discrimination. Additionally, our focus on Black adults is consistent with Public Health Critical Race (PHCR) Praxis which encourages exploring the diversity of experiences and attitudes among marginalized groups, challenging assumptions of homogeneity that exacerbate stereotypes and shifting the focus from race to racism [19, 24, 25]. Racially comparative studies erase diversity within minority populations and perpetuate a “deficits approach” wherein dominant social groups are implicitly cast as “normal” [19].

The present study is the first to investigate the relationship between racial discrimination and COVID-19 vaccine hesitancy in the US since a COVID-19 vaccine has been available. Specifically, we investigate this relationship among Black adults in the US state of Arkansas. Arkansas is an important context to examine the relationship between racial discrimination and vaccine hesitancy because the state consistently ranks high for racial resentment across time in a manner unique among US states [26]. We asked the following research questions: (1) What is the prevalence of the degrees of COVID-19 vaccine hesitancy among Black adults? (2) What sociodemographic and pandemic-related experiences are associated with COVID-19 vaccine hesitancy among Black adults? (3) Are experiences of racial discrimination associated with COVID-19 vaccine hesitancy among Black adults? Given prior research on vaccine hesitancy, we hypothesized COVID-19 vaccine hesitancy among Black adults would be associated with sociodemographics such as age, sex, and education, as well as influenza vaccination behavior over the past 5 years, prior COVID-19 infection, and COVID-19 death exposure (i.e., the loss of a close friend or family member due to COVID-19) [27, 28]. We also hypothesized COVID-19 vaccine hesitancy among Black adults would be associated with experiences of racial discrimination.

## Methods

### Procedures

Data were collected from 1500 adult Arkansas residents between July 12<sup>th</sup> and July 30<sup>th</sup>, 2021, using computer-assisted telephone interviews. Trained interviewers conducted the survey. Residents were contacted using random digit dialing of mixed telephone landlines and cell phones, with oversampling of minority residents. Respondents had

to be an adult (18 years of age or older) and an Arkansas resident to be eligible for inclusion in the study. If the person answering the call met eligibility criteria for the study, the interviewer explained what participation in the study entailed, including (1) the estimated time (10 min); (2) potential risks and benefits; (3) the voluntary nature of participation; and (4) confidentiality of responses. Respondents indicated their consent by agreeing to participate in the survey. The average length of interview was 11 min. Respondents could refuse to answer any question on the survey, or state they did not know, and still continue the survey.

Study procedures were approved by a review board for the protection of human subjects at the University of Arkansas for Medical Sciences. A total of 381 respondents self-identified as Black, including 13 individuals who selected multiple racial identities. Black adults who provided complete data ( $n = 350$ ) are included in the analyses.

## Measures

### Vaccine Hesitancy

The dependent variable in this study was COVID-19 vaccine hesitancy. Respondents were asked about their hesitancy towards being vaccinated for COVID-19 regardless of whether they had received a COVID-19 vaccine. We made small modifications to an existing vaccine hesitancy measure [29] to specifically assess hesitancy towards the COVID-19 vaccines. Respondents were asked, “Thinking specifically about the COVID-19 vaccines, how hesitant are/were you about getting vaccinated?” Response options included “not at all hesitant,” “a little hesitant,” “somewhat hesitant,” and “very hesitant.” We assessed vaccine hesitancy among both vaccinated and unvaccinated individuals based on prior scholarship which has made the case for measuring hesitancy as an attitude rather than a behavior [29, 30], as well as empirical work demonstrating that hesitancy is common even among vaccinated individuals [31]. Research which assumes the vaccinated are not hesitant risks conflating issues such as access with the attitude of hesitancy [29–31].

### Sociodemographic Characteristics

Sociodemographic measures included age, gender, and education. Age in years was estimated according to respondents’ reported birth year. Gender was reported as either woman or man. Respondents had the option of self-reporting their gender as non-binary, but only three did so. To measure education, we asked respondents their highest degree or level of school completed. Response options were less than high school, some high school, high school graduate or equivalent (e.g., GED), some college but no degree, associate’s degree, bachelor’s degree, or graduate degree. Due to low

frequency, less than high school and only some high school were combined with high school to indicate education levels of high school or lower.

### Influenza Vaccination Behavior

To measure behavior related to influenza vaccination, we asked, “How many years in the past 5 years have you gotten a seasonal influenza vaccine?” Response options included “never,” “1–2 years,” “3–4 years,” and “every year.”

### COVID-19 Infection

To measure prior infection with COVID-19, we asked, “Have you tested positive, or suspect that you have had, COVID-19?” Response options included “Yes—I tested positive for COVID-19,” “Yes—I suspect that I had COVID-19,” and “No, I do not believe I had COVID-19.” We dichotomized this measure by combining the affirmative responses.

### COVID-19 Death Exposure

To measure COVID-19 death exposure, we asked, “Has a close friend or relative died of COVID-19?” Response options were “yes” and “no.”

### Experiences of Discrimination

We measured experiences of discrimination using Krieger’s 9-item module [32, 33]. Respondents were read the prompt “Have you ever experienced discrimination, been prevented from doing something, or been hassled or made to feel inferior in any of the following situations because of your race, ethnicity, or color?” The following items included situations of racial discrimination at school, getting hired or getting a job, at work, getting housing, getting medical care, getting service in a store or restaurant, getting credit, bank loans, or a mortgage, on the street or in a public setting, and from the police or in courts. Response options included “never,” “once,” “two or three times,” and “four times or more.” These items were dichotomized to indicate whether a respondent ever experienced the type of discrimination or never experienced it.

## Analyses

We analyzed the data using STATA 15.1 SE. Twenty-nine cases (7.9%) were omitted because of incomplete data. Weights were generated using raking ratio estimation to ensure the sample was representative of the Arkansas 2019 census estimates for age, sex, and race.

We present results for the subsample of non-Hispanic Black adults ( $n = 350$ ) including weighted descriptive

statistics and bivariate analyses including Pearson  $\chi^2$  statistics with Rao and Scott second-order correction [34, 35], as well as a final generalized ordered logistic regression. The generalized ordered logistic regression was chosen due to the ordinal nature of our dependent variable. All variables met the parallel lines assumption. To identify the partial proportional odds model that best fit the data, we used an iterative process of first estimating a totally unconstrained model, followed by a series of Wald tests on each individual variable to assess whether each met the parallel lines assumption, and then re-estimating with new constraints for the least significant variables each time. The model was refitted through this process until no variable met the parallel-lines assumption, and a global Wald test indicated the final model did not violate the parallel-lines assumption ( $F = 1.02$ ;  $p = 0.433$ ). This process was achieved using the autofit option for generalized ordered logistic regression in STATA [36, 37].

## Results

We present the weighted descriptive statistics for the sample in Table 1. The average age of respondents was 50.9 years, and the majority were women (64.7%). Most had a high school diploma or less (29.9%), followed by those with some college (26.5%), a bachelor's degree (18.3%), a graduate degree (14.2%), and then an associate's degree (11.0%). Nearly half (49.2%) of respondents reported receiving an influenza shot every year over the past 5 years; however, the second most prevalent response was never (29.7%), followed by 1 to 2 years (13.6%), and 3 to 4 years (7.5%). More than one in five (22.2%) reported either testing positive for, or suspecting they had, a COVID-19 infection. Nearly a third (32.9%) experienced the loss of a close friend or family member due to COVID-19. Approximately half of the sample reported experiencing discrimination from police or in the courts (50.3%). Over half of respondents reported experiencing discrimination in school (60.7%), hiring (54.9%), work (61.5%), stores, or restaurants (68.1%), or in the street or public settings (70.6%). A third reported experiencing discrimination in housing (34.7%) and medical care (32.1%) and with credit, banking, or getting a mortgage (44.8%). Approximately half (48.9%) reported not being hesitant about getting a COVID-19 vaccination, while the remainder reported being a little hesitant (14.7%), somewhat hesitant (14.0%), or very hesitant (22.4%).

We present weighted bivariate analysis between the independent variables and COVID-19 vaccine hesitancy in Table 2. Age was negatively associated with COVID-19 vaccine hesitancy ( $p < 0.001$ ). Black adults who reported higher levels of COVID-19 vaccine hesitancy were, on average, younger. Influenza vaccination over the past 5 years was associated with COVID-19 vaccine hesitancy ( $F = 2.75$ ;

**Table 1** Weighted descriptive statistics ( $n = 350$ )

	%	$\bar{x}$
<b>Age</b>	–	50.9
<b>Gender</b>		
Men	35.3	–
Women	64.7	–
<b>Education</b>		
High school or less	29.9	–
Some college	26.5	–
Associate's degree	11.0	–
Bachelor's degree	18.3	–
Graduate degree	14.2	–
<b>Flu vaccination</b>		
Never	29.7	–
1–2 years	13.6	–
3–4 years	7.5	–
Every year	49.2	–
<b>COVID-19 infection</b>		
No	77.8	–
Yes	22.2	–
<b>COVID-19 death exposure</b>		
No	67.1	–
Yes	32.9	–
<b>Discrimination</b>		
<b>School</b>		
Never	39.3	–
Once or more	60.7	–
<b>Hiring</b>		
Never	45.1	–
Once or more	54.9	–
<b>Work</b>		
Never	38.5	–
Once or more	61.5	–
<b>Housing</b>		
Never	65.3	–
Once or more	34.7	–
<b>Medical care</b>		
Never	67.9	–
Once or more	32.1	–
<b>Stores or restaurants</b>		
Never	31.9	–
Once or more	68.1	–
<b>Credit, banking, mortgage</b>		
Never	55.2	–
Once or more	44.8	–
<b>Street or in public</b>		
Never	29.4	–
Once or more	70.6	–
<b>Police or courts</b>		
Never	49.7	–
Once or more	50.3	–
<b>COVID-19 vac. hesitancy</b>		

**Table 1** (continued)

	%	$\bar{x}$
Not at all hesitant	48.9	–
A little hesitant	14.7	–
Somewhat hesitant	14.0	–
Very hesitant	22.4	–

$p < 0.01$ ). Respondents who reported receiving an influenza vaccine more frequently had a higher prevalence of reporting they were “not at all” hesitant. Experiences of racial discrimination with hiring was significantly associated with COVID-19 vaccine hesitancy ( $F = 2.87$ ;  $p < 0.05$ ). Black adults who reported racial discrimination with hiring had a lower prevalence of both “not at all” and “very hesitant” and a higher prevalence of those who were “somewhat hesitant.” Experiences of racial discrimination with police or in courts were significantly associated with COVID-19 vaccine hesitancy ( $F = 3.21$ ;  $p < 0.05$ ). Respondents who reported racial discrimination from police or in the courts had a lower prevalence who were “not at all” hesitant, as well as a higher prevalence who were “very hesitant” compared to respondents who did not report this type of experience with discrimination. Sex, education, COVID-19 infection, COVID-19 death exposure, and other experiences of racial discrimination were not significantly associated with COVID-19 vaccine hesitancy.

We present results from a generalized ordered logistic regression of COVID-19 vaccine hesitancy in Table 3. Odds of reporting COVID-19 vaccine hesitancy were found to be associated with age, past influenza vaccination, and experiences of discrimination with police or in courts. As age increased, odds of COVID-19 vaccine hesitancy decreased (odds ratio [OR] = 0.970; 95% confidence interval [CI] [0.954, 0.985]). Compared to those who did not receive an influenza vaccine in the past 5 years, respondents who reported receiving it in the past 1–2 years were less likely to be hesitant about the COVID-19 vaccine (OR = 0.377; 95% CI [0.175, 0.811]), as were those who received it in the past 3–4 years (OR = 0.283; 95% CI [0.113, 0.710]), and those who received it every year (OR = 0.299; 95% CI [0.170, 0.528]). Odds of COVID-19 vaccine hesitancy were 1.70 times greater for individuals who reported having a close friend or family member die due to COVID-19 (OR = 1.70; 95% CI [1.04, 2.80]). Odds of COVID-19 vaccine hesitancy were 2.61 times greater for individuals who reported experiences of discrimination with police or in the courts compared to those who reported never having such an experience (OR = 2.61; 95% CI [1.36, 4.98]). Sex, education, COVID-19 infection, COVID-19 death exposure, and other experiences of racial discrimination were not significantly associated with COVID-19 vaccine hesitancy.

## Discussion

Black adults in Arkansas do not hold homogenous attitudes about COVID-19 vaccines. A slight majority expressed some level of hesitancy toward the COVID-19 vaccine. Nearly a quarter were very hesitant, and almost half expressed no hesitancy. These results are consistent with several studies reporting high levels of vaccine hesitancy among Black respondents [4–6, 12], but the results extend this body of work by revealing a diversity of attitudes towards the COVID-19 vaccine among Black adults.

We found partial support for our hypothesis of variation in COVID-19 vaccine hesitancy among Black adults by sociodemographic characteristics. Consistent with prior research in general populations, hesitancy towards the COVID-19 vaccine among Black individuals in Arkansas was negatively associated with age [4, 19]. Although studies of COVID-19 vaccine hesitancy often find associations with gender and education [4–6, 12, 13], we did not find these associations among Black adults. We found support for our hypothesis of an association between COVID-19 hesitancy and influenza vaccination over the past five years, which is consistent with prior research on hesitancy towards influenza vaccines among Black individuals [19].

We found partial support for the hypothesis of an association between COVID-19 vaccine hesitancy and pandemic-related experiences, such as COVID-19 infection or death exposure. Nearly a third of Black respondents reported the death of a friend or relative due to COVID-19, and exposure to these deaths was associated with greater odds of hesitancy towards the COVID-19 vaccine. No other studies known to us have examined this relationship with COVID-19 vaccine hesitancy, but one study did find lower odds of vaccine refusal among individuals who had experienced the death of someone close to them due to COVID-19 [38], which diverges somewhat from our finding. Scholars have argued that the disproportionate death exposure experienced by Black individuals across the life course is a uniquely stressful experience which adds to cumulative health disadvantages [39]. Our findings provide insight into another potential pathway that death exposure may impact health among Black individuals through COVID-19 vaccine hesitancy, but further research is needed to determine whether the connection is causal and if it is specific to deaths caused by COVID-19. Given the cross-sectional nature of our data, we also cannot rule out the possibility of reverse causation. For example, higher COVID-19 vaccine hesitancy may lead to lower vaccination rates and, in turn, higher incidence of COVID-19 death exposure.

We found partial support for the hypothesis of an association between COVID-19 vaccine hesitancy and

**Table 2** Weighted bivariate relationships with COVID-19 vaccine hesitancy ( $n=350$ )

	Not at all Row %	A little	Somewhat	Very	<i>p</i>
<b><sup>a</sup>Age (mean)</b>	55.0	51.9	48.5	43.0	0.000
<b>Gender</b>					0.950
Men	47.4	14.7	13.5	24.5	
Women	49.7	14.7	14.3	21.3	
<b>Education</b>					0.893
High school or less	52.9	15.3	9.4	22.4	
Some college	44.4	12.3	14.8	28.5	
Associate's degree	48.8	18.3	11.8	21.1	
Bachelor's degree	45.8	14.8	20.2	19.2	
Graduate degree	53.0	14.9	16.0	16.3	
<b>Flu vaccination</b>					0.004
Never	32.5	15.5	15.6	36.4	
1–2 years	48.2	13.3	18.7	19.8	
3–4 years	53.2	6.6	29.7	10.43	
Every year	58.3	15.8	9.4	16.5	
<b>COVID-19 infection</b>					0.508
No	50.3	15.6	12.9	21.3	
Yes	43.9	11.6	18.1	26.4	
<b>COVID-19 death exposure</b>					0.378
No	51.7	14.7	14.1	19.5	
Yes	43.1	14.7	13.9	28.3	
<b>Discrimination</b>					
<b>School</b>					0.782
Never	51.7	13.5	11.9	22.9	
Once or more	47.1	15.4	15.4	21.1	
<b>Hiring</b>					0.035
Never	52.1	14.3	7.7	25.9	
Once or more	46.3	15.0	19.2	19.6	
<b>Work</b>					0.773
Never	48.2	13.2	13.1	25.5	
Once or more	49.3	15.6	14.6	20.5	
<b>Housing</b>					0.379
Never	49.9	12.0	14.6	23.4	
Once or more	46.9	19.7	12.9	20.5	
<b>Medical care</b>					0.934
Never	49.1	15.4	13.3	22.2	
Once or more	48.5	13.2	15.6	22	
<b>Stores or restaurants</b>					0.190
Never	52.7	18.7	9.2	19.4	
Once or more	47.1	12.8	16.3	23.8	
<b>Credit, banking, mortgage</b>					0.452
Never	46.4	13.5	14.3	25.9	
Once or more	52.0	16.1	13.7	18.1	
<b>Street or in public</b>					0.120
Never	56.9	16.1	12.9	14.0	
Once or more	45.5	14.1	14.5	25.9	
<b>Police or courts</b>					0.022
Never	56.7	15.6	10.1	17.6	
Once or more	41.2	13.7	17.9	27.2	

<sup>a</sup>Ordered logistic regression was run to test significance between age and COVID-19 vaccine hesitancy

**Table 3** Generalized ordered logistic regression of COVID-19 vaccine hesitancy ( $n = 350$ )

	OR	S.E	[ 95% conf. interval]	$p$
<b>Age</b>	0.970	0.008	0.954 0.985	0.000
<b>Gender</b> (Ref: Men)				
Women	1.49	0.436	0.846 2.65	0.165
<b>Education</b> (Ref: HS or less)				
Some college	1.12	0.394	0.562 2.23	0.747
Associate's degree	1.10	0.484	0.465 2.61	0.825
Bachelor's degree	0.707	0.281	0.324 1.54	0.383
Graduate degree	0.600	0.249	0.266 1.35	0.218
<b>Flu vaccination</b> (Ref: Never)				
1–2 years	0.377	0.147	0.175 0.811	0.013
3–4 years	0.283	0.133	0.113 0.710	0.007
Every year	0.299	0.087	0.170 0.528	0.000
<b>COVID-19 infection</b> (Ref: No)				
Yes	1.32	0.393	0.734 2.37	0.354
<b>COVID-19 death exp.</b> (Ref: No)				
Yes	1.70	0.431	1.04 2.80	0.035
<b>Discrimination</b> (Ref = Never)				
School	0.816	0.242	0.456 1.46	0.493
Hiring	1.26	0.425	0.648 2.44	0.497
Work	0.606	0.180	0.339 1.09	0.092
Housing	0.847	0.272	0.451 1.59	0.607
Medical care	1.07	0.327	0.585 1.95	0.833
Stores or restaurants	1.17	0.370	0.631 2.18	0.616
Credit, banking, mortgage	0.616	0.193	0.333 1.14	0.123
Street or in public	1.30	0.584	0.539 3.14	0.559
Police or courts	2.61	0.860	1.36 4.98	0.004
Constant – Not at all hesitant	6.43	3.55	2.17 19.01	0.001
Constant – A little hesitant	3.11	1.72	1.06 9.19	0.040
Constant – Somewhat hesitant	1.35	0.742	0.462 3.96	0.580

Ref, reference group; HS, high school

experiences of racial discrimination. Although most experiences of racial discrimination were not associated with COVID-19 vaccine hesitancy, experiences of racial discrimination with police or in the courts were associated with more than double the odds of COVID-19 vaccine hesitancy. Almost half of Black adults reported experiencing discrimination from police or in the courts. This finding is consistent with past research indicating experiences of racial discrimination are associated with hesitancy towards influenza vaccines [18, 19] and one extant study, which demonstrated a relationship between experiences of racial discrimination and COVID-19 vaccine hesitancy in the US prior to the Emergency Use Authorization [7]. This finding also supports the link between social processes and vaccine hesitancy specified by the Increasing Vaccination Model [9, 10]. Although experiences of discrimination in

getting hired or finding a job were also associated with COVID-19 vaccine hesitancy in bivariate analyses, the relationship was no longer significant once we adjusted for the other independent variables in the regression analysis. Prior research investigating the role of racial discrimination on vaccine hesitancy has typically limited their analysis to discrimination in medical or health care settings [18, 19]. We did not find support of an association between discrimination in medical care and COVID-19 vaccine hesitancy; however, this should continue to be examined further in future research as it has been linked to hesitancy towards flu vaccination in earlier studies [18, 40].

Disproportionate police violence and surveillance has both direct and indirect effects on the health of Black Americans [20–22, 41]. Directly, police violence continues to disproportionately threaten the lives of Black individuals, and policing serves as a mechanism of mass incarceration [21, 42–44]. Black men face a 1 in 1000 chance of being killed by police over the course of their life—more than double the risk for white men—making it a leading cause of death [45]. Research also supports an indirect effect as racist policing practices play a significant role in shaping how Black individuals see their relationship to institutions inside *and outside* the criminal justice system, including medical institutions [23, 43, 44, 46]. Brayne posits that criminal justice contact perpetuates “system avoidance,” where individuals avoid surveilling institutions which keep formal records, and this contributes to processes of social stratification [46]. Systems avoidance should not be equated with “patient mistrust,” as it is reasonable for Black individuals to avoid institutions which have a long history of victimizing them. Brayne’s hypothesis is supported by findings that neighborhood police frisking moderates sick people’s utilization of emergency room resources [23]. Similarly, individuals who experience stops or arrests by police, or have been incarcerated, are less likely to interact with surveilling institutions such as medical institutions compared to those who have had no criminal justice contact [46]. Despite promising evidence of this indirect effect, no other studies to our knowledge have specifically investigated the role of experiences of racial discrimination with policing or courts in shaping COVID-19 vaccine hesitancy among Black adults. Our study provides additional preliminary evidence in support of “system avoidance” and suggests that these racist practices may also affect health care utilization (e.g., seeking a vaccine or willingness to be vaccinated). Our work also supports recent findings linking COVID-19 vaccine hesitancy among Black individuals to negative feelings towards police [47]. Our study suggests experiences of racial discrimination by police and/or in court are associated with increased odds of COVID-19 vaccine hesitancy, and future research should further explore whether this relationship may be driven, in part, by the kind of “systems avoidance” identified by Brayne [46]. Moreover,

our findings suggest that racial discrimination is an important social process related to vaccine hesitancy, which is consistent with the conceptual framework outlined by the Increasing Vaccination Model [9, 10].

## Limitations

We analyzed cross-sectional data and cannot establish causal relationships. Moreover, we cannot rule out possibilities of reverse causation (e.g., between COVID-19 vaccine hesitancy and COVID-19 death exposure). Self-reports of experiences of discrimination, though reliable and validated [32, 33], may not include all experiences of discrimination. Furthermore, although experiences of racial discrimination are linked to structural racism [32], our analysis has been limited to the individual-level experience rather than the contextual analyses necessary to understand the impact of structural racism. Future research should explore the impact of structural racism on COVID-19 vaccine hesitancy, as well as its interactions with indicators of interpersonal racism such as experiences of discrimination. Finally, our sample is constrained geographically to the state of Arkansas and may not be generalizable to populations outside the state.

## Conclusions

Disparities in vaccine hesitancy and uptake threaten to widen racial health disparities even further. Researchers must recognize the diversity of experiences and opinions among Black adults and consider how experiences of racial discrimination across many settings and institutions may shape variation in vaccine hesitancy. This is an important first step towards understanding the impact of structural racism on the health of oppressed individuals and populations in the US. Documentation of racial health disparities and hesitancy towards vaccination without proper contextualization can perpetuate racial myths and serve as a means for avoiding discussions about the deleterious effect of racism on health and health behaviors [48–50]. Recognizing racial health disparities are driven by racism, not race, should lead public health researchers to further investigate the role of social experiences such as racial discrimination in understanding vaccine hesitancy [51]. Although racial discrimination is an important social determinant of health, discussion of racism and racial discrimination is noticeably absent from multiple large reviews of vaccine hesitancy [30, 52].

Moreover, rather than focusing solely on discrimination within medical settings, addressing COVID-19 vaccine hesitancy among Black adults requires a broader focus including reform within law enforcement and the criminal justice system [19, 53]. The need to address racism within the medical establishment has been clearly articulated [53],

but attention to racial discrimination in policing and courts also appears to be critical in efforts to address COVID-19 vaccine hesitancy. Police reform is necessary, but, alone, it will be insufficient [20]. There are, however, steps that could be taken to begin reducing the negative impact of policing on the health of Black individuals. As other scholars have noted, prioritization of vaccination in jails and prisons combined with decarceration could be an initial first step toward minimizing COVID-19 spread in carceral facilities and their surrounding communities [54, 55]. Reliance on police as mental health first responders perpetuates stigma towards seeking treatment and leads directly to injuries and deaths in Black communities [56]. Mental health and social services can replace a police response in many situations, amounting to a reduction in policing and an increase in the provision of appropriate care [20]. Programs like Crisis Assistance Helping Out On The Streets (CAHOOTS) and Support Team Assisted Response (STAR) have shown some promise by decoupling policing and crisis response [56]. As important as these steps may be, more fundamental changes within the criminal justice system may be necessary to reduce vaccine hesitancy and, ultimately, enhance the public health.

**Author Contribution** DEW, PAM, and JPS initiated and designed the study. DEW led the survey design. DEW performed the statistical analysis in consultation with JPS, JAA, and AJS. DEW prepared the first draft of the manuscript, with significant contributions from all the authors in developing a final draft. All the authors were involved in the interpretation of findings. All the authors participated in the manuscript preparation and approved the final manuscript. All the authors attest they meet the ICMJE criteria for authorship.

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## Declarations

**Competing Interests** The authors declare no competing interests.

**Ethics Approval** Study procedures were approved by a review board for the protection of human subjects at the University of Arkansas for Medical Sciences.

**Consent to Participate** Interviewers explained to respondents what participation in the study entailed, including (1) the estimated time (10 min); (2) potential risks and benefits; (3) the voluntary nature of participation; and (4) confidentiality of responses. Respondents indicated their consent by agreeing to participate in the survey.

**Consent to Publish** N/A.



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