

RESEARCH PAPER



## Factors influencing intent to receive COVID-19 vaccination among Black and White adults in the southeastern United States, October – December 2020

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### ABSTRACT

Vaccination intent is foundational for effective COVID-19 vaccine campaigns. To understand factors and attitudes influencing COVID-19 vaccination intent in Black and White adults in the US south, we conducted a mixed-methods cross-sectional survey of 4512 adults enrolled in the Southern Community Cohort Study (SCCS), an ongoing study of racial and economic health disparities. Vaccination intent was measured as “If a vaccine to prevent COVID-19 became available to you, how likely are you to choose to get the COVID-19 vaccination?” with options of “very unlikely,” “somewhat unlikely,” “neither unlikely nor likely,” “somewhat likely,” and “very likely.” Reasons for intent, socio-demographic factors, preventive behaviors, and other factors were collected. 46% of participants had uncertain or low intent. Lower intent was associated with female gender, younger age, Black race, more spiritual/religious, lower perceived COVID-19 susceptibility, living in a greater deprivation area, lower reading ability, and lack of confidence in childhood vaccine safety or COVID-19 vaccine effectiveness or safety ( $p < .05$  for all). Most factors were present in all racial/gender groups. Contextual influences, vaccine/vaccination specific issues, and personal/group influences were identified as reasons for low intent. Reasons for higher intent included preventing serious illness, life returning to normal, and recommendation of trusted messengers. Hesitancy was complex, suggesting tailored interventions may be required to address low intent.

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COVID-19 vaccine; vaccine hesitancy; racial disparities; socio-demographic factors; vaccine acceptance



### Introduction

COVID-19 vaccination is a critical strategy to control the COVID-19 pandemic. This requires both effective vaccine distribution and individual willingness to be vaccinated. COVID-19 vaccine hesitancy continues to range from 24–32% of adults in the United States (U.S) in most reports.<sup>1–4</sup>


The COVID-19 pandemic has exacerbated longstanding health disparities among Black, Hispanic, and other racial/ethnic minority populations who experience more COVID-19 hospitalizations and deaths than non-Hispanic White populations.<sup>5</sup> In the U.S., COVID-19 vaccine hesitancy is somewhat higher among Hispanic adults, rural residents, and Black adults as well as other groups such as political affiliation.<sup>6</sup> Additionally, Black and Hispanic Americans have received disproportionately fewer COVID-19 vaccinations than White and Asian Americans.<sup>7</sup> In the southeastern U.S., COVID-19 vaccination rates have lagged national averages.<sup>8</sup> This raises the

concern that a combination of vaccine hesitancy and inequities in vaccine distribution could worsen COVID-19 health disparities.

Identifying factors related to vaccine hesitancy among groups at greater risk of adverse outcomes, such as Black Americans, continues to be foundational to ensuring effective vaccination campaigns. Studies have largely been conducted among non-Hispanic White adults. Few studies have been conducted to understand extensive socio-demographic, health status, or social determinants of health and how these factors are related to vaccination intent among a racially diverse population and within the U.S. south. To fill these knowledge gaps, we assessed factors and attitudes influencing intent to receive a COVID-19 vaccine among 4,512 adults enrolled in the Southern Community Cohort Study (SCCS), an ongoing study of racial and economic health disparities within a population of adults in the southeastern U.S.

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## Methods

### Study design and participants

The SCCS was established in 2002 to examine health disparities in cancer and other chronic diseases. Nearly 86,000 English-speaking adults between the ages of 40 and 79 years, two thirds Black, and living in 12 states in the southeastern U.S. were enrolled between March 2002 and September 2009. Additional study details are provided elsewhere and in the Appendix.<sup>9,10</sup> The SCCS was approved by institutional review boards at Vanderbilt University Medical Center and Meharry Medical College. Written informed consent was obtained from all participants.

### COVID-19 survey

To assess the impact of the COVID-19 pandemic on participants, we conducted a survey of COVID-19 infection, physical and emotional health status, COVID-19 related behaviors and beliefs, and household impacts. Questions cover vaccination attitudes and intentions including likelihood to choose a COVID-19 vaccine, the reasons for that choice, confidence in COVID-19 vaccine effectiveness and safety, past and planned receipt of an influenza vaccine, and attitude toward the safety of vaccines. (Table A1).<sup>11–14</sup> The survey was administered via an online platform which could be completed on a smartphone, tablet, or computer. Survey completion took approximately 20 minutes, for which participants received \$10 compensation. Following a pilot of the questionnaire, the fielding period for the full survey was October 7 – December 14, 2020. Participants were notified of the survey via a mailed newsletter or direct e-mail ( $n = 15,122$ ; Figure 1). In total, 4,512 completed the survey, including 3,630 participants who were emailed a direct invitation. Completion of all questions was achieved by 98.0% of participants. The American Association for Public Opinion Research Response Rate #1 among the participants emailed a direct invitation was 24.4%.<sup>15</sup>

### Geographic data

The residential address was used to determine the county, Census 2010 tract, and Census 2010 block group. This was linked to the Area Deprivation Index (ADI).<sup>16,17</sup> We also linked urban-rural status based on the USDA 2013 Rural-Urban continuum codes, and Pandemic Vulnerability Index (PVI)<sup>18,19</sup> and its components (PVI-social distancing, PVI-COVID-19 testing rates, PVI-residential density, PVI-air-pollution and others) from the day of survey completion. We also calculated transmittable case rate as the mean daily rate of new cases<sup>20</sup> per 100,000 in the county of residence in the 14-days prior to completing the survey.

### Statistical analysis

The analysis was based on the 4,486 of the 4,512 participants who responded to the question “If a vaccine to prevent COVID-19 became available to you, how likely are you to choose to get the COVID-19 vaccination?” with a five-point ordinal scale: 1 = very unlikely, 2 = somewhat unlikely,

3 = neither unlikely nor likely, 4 = somewhat likely, and 5 = very likely. COVID-19 vaccination intent was evaluated as the five scale items or categorized into two groups: high intent (somewhat or very likely) and low intent (somewhat or very unlikely) both of which may have been combined with uncertain/undecided (neither likely nor unlikely) intent. Analyses were conducted within the entire study population and within strata defined by age ( $<65, \geq 65$ ) and combinations of gender (male, female) and race (self-reported non-Hispanic Black, non-Hispanic White, all other racial/ethnic groups). Stratified analyses were not conducted for other racial or ethnic groups due to a small sample size.

Characteristics of the 4,486 participants or the communities in which they live, which were hypothesized to be related to vaccine likelihood, were summarized as frequencies and percentages for categorical variables and as mean and standard deviation for continuous measures. The full list of variables assessed from the COVID-19 survey, SCCS follow-up surveys, or SCCS baseline survey is available in the Appendix materials.

Proportional odds models were used to evaluate the relationship between vaccination intent and 1) characteristics of the participant or the community in which they live, or 2) reasons someone would choose to be (among those with uncertain/high intent) or not to be vaccinated (among those uncertain/low intent). We first assessed the relationship with each individual variable in models adjusted for age, race, and gender. Factors which were statistically significantly or marginally significantly associated with likelihood were included in a full model using stepwise backward selection to reduce multicollinearity and to identify factors which were independently related to vaccination likelihood. Proportional odds assumption was visually assessed by plotting each predictor against the empirical logits.<sup>21</sup> Logistic regression was used to estimate the odds of low likelihood versus uncertain/high likelihood of vaccination including the factors in the final proportional odds model. All analyses were performed using SAS 9.4 with an alpha level of 0.05. We additionally analyzed which factors in the final proportional odds model (except for age, sex, and race) contributed most to participants’ attitude toward vaccination, by comparing models with or without the variable of interest and ranking the change in log likelihood per degree of freedom. We started with a proportional odds model adjusted for age, sex, and race, and sequentially add the variable which had the highest ranking of likelihood change at each step.

The qualitative inductive, deductive content analysis approach was used to analyze and rank the open-ended responses on the reasons one chooses not to vaccinate. A hierarchical coding system was developed based on *Working Group Determinants of Vaccine Hesitancy Matrix* and an initial review of the codes.<sup>22</sup> Three analysts independently coded responses. If new meanings emerged, codes were added or modified. Coding saturation was met when no new codes emerged. Codes were placed into categories (i.e., axial coding). If there were discrepancies in coding, there was discussion until an agreement was reached. Five responses were removed due to indeterminate meaning of response. A constant comparison method was used to compare codes and identify emerging themes. Microsoft Excel was used to summarize the data by determinants of vaccine hesitancy

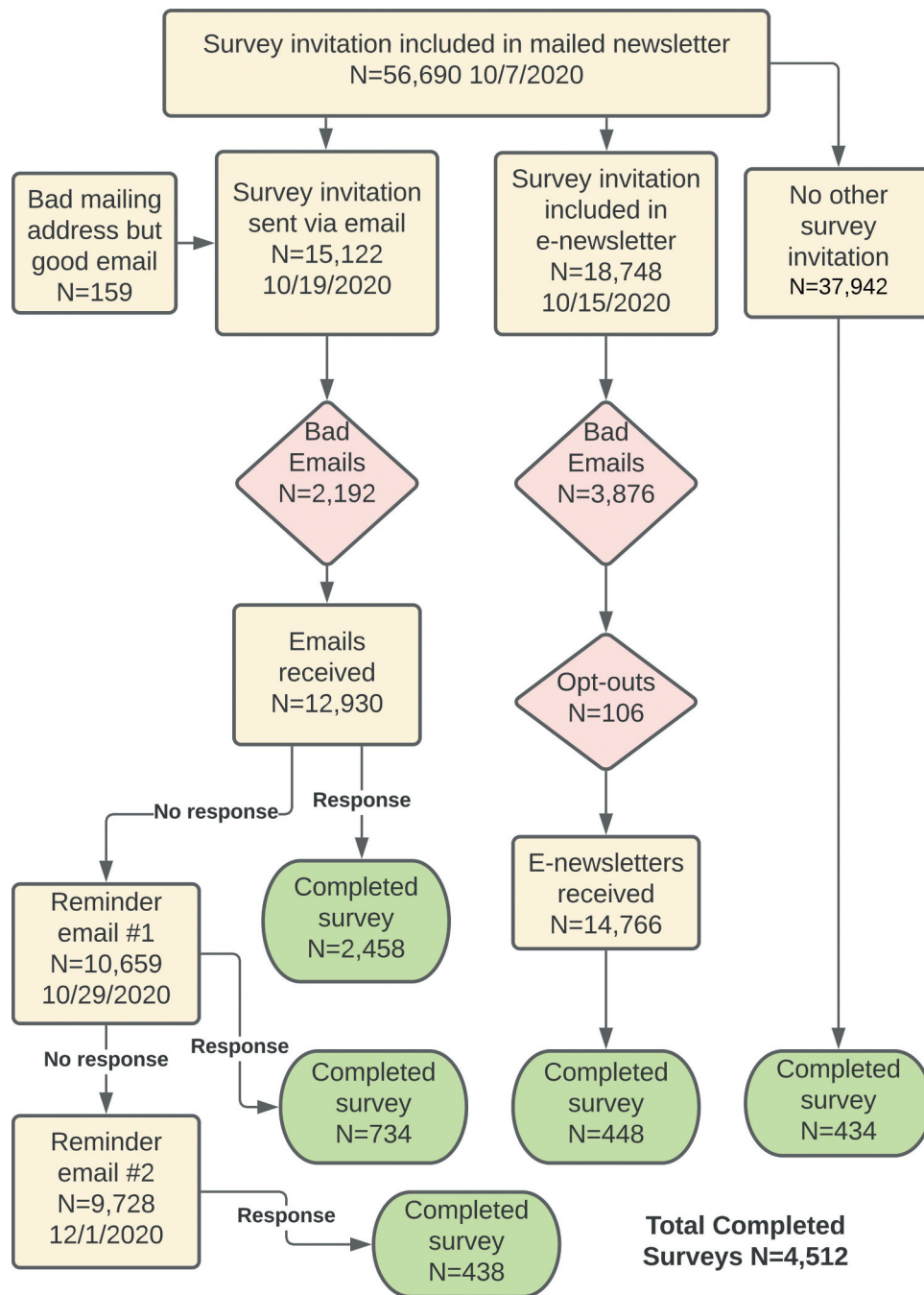


Figure 1. SCCS COVID-19 survey invitation mailing.

(i.e., themes) and their ranking of importance. To establish rigor, we used thick rich descriptions, peer debriefing, inter-coder reliability, and investigator triangulation.<sup>23</sup>

## Results

Among the 4,486 participants who completed the survey, 66% were female, 38% were Black, 55% were White, and 59% were aged 65 or older. Participants ranged in age from 51 to 94 years old. Eighteen percent of participants reported a household income of less than \$15,000, and 43% over \$50,000. Most participants had completed high school or more (96%) and had at least one major medical condition (81%). Additional characteristics are detailed in Table 1 and Table A2.

Approximately 54% of participants indicated high intent to receive COVID-19 vaccination. The proportion of participants who had a high intent varied by several characteristics. For example, White males had the highest intent (75%) while Black females (34%) reported lowest intent (Table 1). Several factors which were initially associated with intent in age-, gender-, and race-adjusted models were not independently associated with vaccine intent in the final multivariable model (e.g. health insurance status, employment status, self-reported health status, rural residence, and PVI-social distancing) (Table 1; Table A3A–A3G). In the final model (Table 2), participants who had a higher intent to be vaccinated were statistically significantly older (odds ratio (OR) = 0.99, 95% confidence interval (CI): 0.98–1.00 per one year increase;  $p = .01$ ), male (OR = 0.69, 95%

Table 1. Characteristics of study participants and COVID-19 vaccination intent.

Characteristic <sup>a</sup>	COVID-19 vaccination intent						OR (95% CI) <sup>b</sup>	p-Value
	Overall n = 4486	Very unlikely n = 868	Somewhat unlikely n = 509	Neither likely nor unlikely n = 701	Somewhat likely n = 984	Very likely n = 1424		
<b>INDIVIDUAL CHARACTERISTICS</b>								
Age (y)	66.9 (7.5)	65.2 (7.2)	65.5 (7.3)	65.8 (7.1)	67.3 (7.5)	68.8 (7.5)	0.97 (0.96–0.98)	<0.0001
<b>Gender</b>								<0.0001
Female	2954 (66%)	662 (76%)	368 (72%)	542 (77%)	639 (65%)	743 (52%)	1.00 (ref)	
Male	1532 (34%)	206 (24%)	141 (28%)	159 (23%)	345 (35%)	681 (48%)	0.55 (0.49–0.62)	
<b>Race/ethnicity</b>								<0.0001
Black	1715 (38%)	425 (49%)	293 (58%)	358 (51%)	392 (40%)	247 (17%)	1.00 (ref)	
White	2482 (55%)	398 (46%)	182 (36%)	286 (41%)	528 (54%)	1088 (76%)	0.40 (0.35–0.44)	
All other groups	289 (6%)	45 (5%)	34 (7%)	57 (8%)	64 (7%)	89 (6%)	0.59 (0.47–0.73)	
<b>Racial/gender groups</b>								<0.0001
Black women	1290 (29%)	337 (39%)	230 (45%)	283 (40%)	273 (28%)	167 (12%)	1.00 (ref)	
White women	1481 (33%)	291 (34%)	114 (22%)	214 (31%)	332 (34%)	530 (37%)	0.45 (0.40–0.52)	
Black men	425 (9%)	88 (10%)	63 (12%)	75 (11%)	119 (12%)	80 (6%)	0.73 (0.60–0.89)	
White men	1001 (22%)	107 (12%)	68 (13%)	72 (10%)	196 (20%)	558 (39%)	0.21 (0.18–0.25)	
All other racial/ethnic groups	289 (6%)	45 (5%)	34 (7%)	57 (8%)	64 (7%)	89 (6%)	0.51 (0.40–0.64)	
<b>Educational attainment</b>								<0.0001
Less than high school	186 (4%)	43 (5%)	22 (4%)	43 (6%)	36 (4%)	42 (3%)	0.90 (0.69–1.18)	
High school or some college	2159 (49%)	491 (58%)	296 (59%)	404 (59%)	462 (48%)	506 (36%)	1.00 (ref)	
College or above	2054 (47%)	311 (37%)	184 (37%)	241 (35%)	466 (48%)	852 (61%)	0.62 (0.56–0.70)	
<b>Household income</b>								<0.0001
<\$15000	827 (18%)	204 (24%)	121 (24%)	184 (26%)	166 (17%)	152 (11%)	1.00 (ref)	
\$15000 to \$49999	1708 (38%)	384 (44%)	219 (43%)	291 (42%)	381 (39%)	433 (30%)	0.92 (0.79–1.07)	
\$50000+	1947 (43%)	280 (32%)	169 (33%)	225 (32%)	436 (44%)	837 (59%)	0.59 (0.51–0.69)	
<b>Chronic disease</b>								0.33
No chronic disease	825 (19%)	158 (18%)	87 (17%)	98 (14%)	175 (18%)	307 (22%)	1.00 (ref)	
Any chronic disease	3616 (81%)	701 (82%)	420 (83%)	593 (86%)	803 (82%)	1099 (78%)	1.07 (0.93–1.23)	
Diabetes	1686 (38%)	362 (42%)	209 (42%)	309 (44%)	370 (38%)	436 (31%)	1.05 (0.93–1.19)	0.41
Chronic lung disease	1155 (26%)	253 (30%)	138 (28%)	195 (29%)	247 (26%)	322 (23%)	1.11 (0.98–1.26)	0.10
Cardiovascular disease	3040 (68%)	586 (68%)	360 (71%)	515 (74%)	677 (69%)	902 (64%)	1.06 (0.93–1.20)	0.41
Kidney disease	245 (6%)	34 (4%)	24 (5%)	49 (7%)	57 (6%)	81 (6%)	0.81 (0.64–1.04)	0.10
Cancer under active treatment	236 (5%)	37 (4%)	30 (6%)	30 (4%)	50 (5%)	89 (6%)	0.84 (0.65–1.08)	0.18
Other chronic disease	890 (20%)	170 (20%)	126 (25%)	172 (25%)	203 (21%)	219 (16%)	1.08 (0.94–1.24)	0.29
<b>Body mass index (kg/m<sup>2</sup>)</b>	30.1 (7.7)	31.2 (8.1)	31.2 (7.9)	31.5 (8.0)	29.8 (7.9)	28.4 (6.7)	1.01 (1.01–1.02)	<0.0001
<b>Self-reported health status</b>								0.71
Excellent	472 (11%)	98 (11%)	39 (8%)	60 (9%)	71 (7%)	204 (14%)	1.00 (ref)	
Very good	1613 (36%)	309 (36%)	169 (33%)	194 (28%)	362 (37%)	579 (41%)	1.09 (0.90–1.31)	
Good	1629 (36%)	315 (36%)	202 (40%)	304 (43%)	357 (36%)	451 (32%)	1.12 (0.93–1.36)	
Fair	677 (15%)	124 (14%)	92 (18%)	125 (18%)	178 (18%)	158 (11%)	1.17 (0.94–1.45)	
Poor	93 (2%)	22 (3%)	7 (1%)	18 (3%)	15 (2%)	31 (2%)	1.13 (0.76–1.69)	
<b>Smoking status</b>								0.23
nonsmoker	4007 (89%)	764 (88%)	446 (88%)	612 (88%)	871 (89%)	1314 (92%)	1.00 (ref)	
Current smoker	477 (11%)	104 (12%)	63 (12%)	87 (12%)	113 (11%)	110 (8%)	1.11 (0.94–1.32)	
<b>Employment status</b>								0.81
Not currently employed	3083 (69%)	567 (65%)	335 (66%)	491 (70%)	677 (69%)	1013 (71%)	1.00 (ref)	
Currently employed	1399 (31%)	300 (35%)	174 (34%)	210 (30%)	306 (31%)	409 (29%)	0.99 (0.87–1.11)	
<b>Time spent working within 6 ft of others (hours/day; among those working)</b>								0.06
0	467 (33%)	90 (30%)	51 (29%)	72 (34%)	93 (30%)	161 (39%)	1.00 (ref)	
0.1 to <1	310 (22%)	56 (19%)	28 (16%)	56 (27%)	72 (24%)	98 (24%)	1.04 (0.80–1.35)	
1 to <3	153 (11%)	29 (10%)	32 (19%)	17 (8%)	33 (11%)	42 (10%)	1.44 (1.04–2.00)	
≥3	467 (33%)	125 (42%)	62 (36%)	65 (31%)	107 (35%)	108 (26%)	1.27 (1.01–1.60)	
<b>Household composition</b>								0.04
Lives alone	1338 (30%)	294 (34%)	146 (29%)	238 (34%)	297 (31%)	363 (26%)	1.00 (ref)	
Lives with other adult(s) and no children	2669 (60%)	456 (53%)	295 (59%)	377 (55%)	583 (61%)	958 (68%)	0.90 (0.80–1.02)	
Lives with child(ren)	414 (9%)	108 (13%)	61 (12%)	75 (11%)	81 (8%)	89 (6%)	1.13 (0.92–1.38)	
<b>Spirituality/religiosity</b>								<0.0001
Very	2279 (52%)	526 (62%)	294 (58%)	386 (56%)	475 (49%)	598 (42%)	1.00 (ref)	
Fairly	1512 (34%)	254 (30%)	156 (31%)	229 (33%)	358 (37%)	515 (37%)	0.75 (0.66–0.84)	
Slightly/ Not at all	631 (14%)	68 (8%)	54 (11%)	74 (11%)	138 (14%)	297 (21%)	0.55 (0.47–0.65)	
<b>Health insurance status</b>								<0.0001
Any Medicare/Medicaid	2976 (66%)	530 (61%)	317 (62%)	465 (66%)	665 (68%)	999 (70%)	1.00 (ref)	
Any private/no Medicare or Medicaid	1063 (24%)	211 (24%)	118 (23%)	164 (23%)	233 (24%)	337 (24%)	0.84 (0.73–0.97)	
Only military/other	296 (7%)	82 (9%)	46 (9%)	45 (6%)	57 (6%)	66 (5%)	1.24 (0.99–1.55)	
No health insurance	142 (3%)	42 (5%)	27 (5%)	26 (4%)	28 (3%)	19 (1%)	1.55 (1.13–2.12)	
<b>Self-rated reading ability<sup>c</sup></b>	1.4 (0.8)	1.5 (0.8)	1.5 (0.8)	1.5 (0.8)	1.4 (0.7)	1.3 (0.6)	1.19 (1.10–1.27)	<0.0001
<b>Confidence in filling out medical forms<sup>d</sup></b>	1.4 (0.7)	1.4 (0.8)	1.5 (0.8)	1.5 (0.8)	1.4 (0.7)	1.3 (0.6)	1.17 (1.08–1.26)	<0.0001
<b>Need help reading materials from doctors</b>	194 (4%)	37 (4%)	36 (7%)	43 (6%)	36 (4%)	42 (3%)	1.22 (0.94–1.58)	0.13

(Continued)

Table 1. (Continued).

Characteristic <sup>a</sup>	COVID-19 vaccination intent						OR (95% CI) <sup>b</sup>	p-Value
	Overall n = 4486	Very unlikely n = 868	Somewhat unlikely n = 509	Neither likely nor unlikely n = 701	Somewhat likely n = 984	Very likely n = 1424		
<b>Experience of discrimination in healthcare due to race or socioeconomic status</b>								0.005
No experience	3641 (81%)	655 (75%)	386 (76%)	521 (74%)	800 (81%)	1279 (90%)	1.00 (ref)	
Experienced discrimination	598 (13%)	154 (18%)	94 (18%)	126 (18%)	129 (13%)	95 (7%)	1.29 (1.10–1.52)	
Unknown	247 (6%)	59 (7%)	29 (6%)	54 (8%)	55(6%)	50 (4%)	1.17 (0.93–1.48)	
<b>COVID-19 preventive behaviors</b>								
Personal protective behaviors score <sup>e</sup>	25.3 (4.7)	24.7 (6.1)	25.6 (4.5)	25.9 (4.4)	25.5 (4.2)	25.1 (4.2)	0.96 (0.95–0.97)	<0.0001
Community protective behaviors score <sup>f</sup>	18.3 (4.8)	17.3 (6.1)	18.4 (4.8)	18.5 (4.6)	18.6 (4.4)	18.6 (4.1)	0.94 (0.93–0.96)	<0.0001
<b>Perceived likelihood of getting COVID-19<sup>g</sup></b>	2.4 (1.0)	2.1 (1.1)	2.4 (1.0)	2.4 (1.1)	2.5 (1.0)	2.4 (1.0)	0.84 (0.79–0.88)	<0.0001
<b>Perceived likelihood of surviving COVID-19<sup>g</sup></b>	3.7 (1.3)	3.9 (1.3)	3.6 (1.3)	3.6 (1.2)	3.7 (1.2)	3.7 (1.3)	1.01 (0.96–1.05)	0.81
<b>COVID-19 testing</b>								0.06
Never tested	2655 (59%)	533 (62%)	281 (55%)	400 (57%)	565 (58%)	876 (62%)	1.00 (ref)	
Tested negative	1674 (37%)	310 (36%)	198 (39%)	276 (40%)	388 (40%)	502 (35%)	0.88 (0.78–0.98)	
Ever tested positive	140 (3%)	23 (3%)	29 (6%)	21 (3%)	28 (3%)	39 (3%)	0.88 (0.65–1.20)	
<b>Household member tested positive for COVID-19 (among those living with others)</b>								0.94
No	3004 (96%)	552 (97%)	335 (94%)	442 (96%)	653 (96%)	1022 (97%)	1.00 (ref)	
Yes	119 (4%)	20 (4%)	20 (6%)	17 (4%)	27 (4%)	35 (3%)	0.99 (0.71–1.38)	
<b>Had or intend to have an influenza vaccination in 2019–2021</b>								<0.0001
Yes	3478 (78%)	456 (53%)	361 (71%)	490 (70%)	841 (86%)	1330 (94%)	1.00 (ref)	
No	986 (22%)	402 (47%)	147 (29%)	206 (30%)	140 (14%)	91 (6%)	4.19 (3.66–4.79)	
<b>Childhood vaccines are safe</b>								<0.0001
Yes	4184 (94%)	714 (83%)	465 (92%)	645 (93%)	957 (98%)	1403 (99%)	1.00 (ref)	
No	264 (6%)	143 (17%)	41 (8%)	47 (7%)	19 (2%)	14 (1%)	5.38 (4.22–6.87)	
<b>Confidence in COVID-19 vaccine effectiveness<sup>h</sup></b>	3.0 (1.3)	2.0 (1.3)	2.2 (1.0)	2.7 (1.0)	3.3 (1.1)	3.9 (1.1)	0.41 (0.39–0.43)	<0.0001
<b>Confidence in COVID-19 vaccine safety<sup>h</sup></b>	3.1 (1.4)	2.0 (1.3)	2.2 (1.1)	2.7 (1.0)	3.3 (1.1)	4.0 (1.1)	0.41 (0.39–0.43)	<0.0001
<b>COMMUNITY CHARACTERISTICS</b>								
<b>Urban/rural status</b>								0.0003
Urban/suburban resident	3557 (79%)	661 (76%)	403 (79%)	556 (79%)	769 (78%)	1168 (82%)	1.00 (ref)	
Rural resident	928 (21%)	206 (24%)	106 (21%)	145 (21%)	215 (22%)	256 (18%)	1.27 (1.12–1.45)	
<b>State influenza vaccination ranking</b>	60.6 (3.9)	60.3 (3.7)	60.5 (3.8)	60.4 (4.0)	60.3 (3.9)	61.0 (3.9)	1.00 (0.98–1.01)	0.76
<b>Area Deprivation Index ranking 2018</b>	62.7 (25.4)	68.7 (23.3)	67.7 (23.6)	67.3 (24.0)	62.7 (24.8)	54.9 (26.2)	1.01 (1.01–1.01)	<0.0001
<b>COVID-19 community burden</b>	22.8 (14.7)	22.5 (14.3)	22.1 (13.8)	22.6 (14.8)	24.0 (15.1)	22.6 (14.9)	1.00 (1.00–1.00)	0.51
<b>Unicast social distancing grade</b>	0.93 (0.15)	0.92 (0.15)	0.92 (0.16)	0.92 (0.15)	0.93 (0.14)	0.94 (0.14)	0.54 (0.37–0.77)	0.0007
<b>Pandemic Vulnerability Index</b>	0.55 (0.04)	0.55 (0.04)	0.55 (0.04)	0.55 (0.04)	0.55 (0.04)	0.54 (0.05)	2.07 (0.60–7.16)	0.25

<sup>a</sup>Presented as n (%) for categorical variables and mean (standard deviation) for continuous variables.

<sup>b</sup>Odds ratios and p-values were derived from proportional odds models for risk of low intent additionally adjusted for age, sex, race. The six specific chronic diseases were additionally adjusted for each other.

<sup>c</sup>1 – Excellent, 2 – Very good, 3 – Good, 4 – Okay, 5 – Poor.

<sup>d</sup>1 – Extremely, 2 – Quite a bit, 3 – Somewhat, 4 – A little bit, 5 – Not at all.

<sup>e</sup>Sum of days per week of washing hands or using sanitizer frequently, cleaning surfaces touched, wearing face masks, and keeping 6 feet away from others. Range from 0–28.

<sup>f</sup>Sum of days per week of avoiding large gatherings, avoiding restaurants or bars, and following government guidelines. Range from 0–21.

<sup>g</sup>1 – Very unlikely, 2 – Somewhat unlikely, 3 – Neither unlikely nor likely, 4 – Somewhat likely, 5 – Very likely.

<sup>h</sup>1 – Very unconfident, 2 – Somewhat unconfident, 3 – Neither unconfident nor confident, 4 – Somewhat confident, 5 – Very confident.

CI: 0.60–0.79), White or all Other racial/ethnic groups (OR = 0.61, 95% CI 0.53–0.71 and OR = 0.68, 95%CI 0.52–0.89 respectively, versus Black participants), more highly educated (OR = 0.72, 95% CI 0.63–0.82 for college or above versus high school or some college), less spiritual/religious (OR = 0.67, 95%CI 0.55–0.81 for slightly/not at all spiritual and OR = 0.80, 95%CI 0.70–0.91 for fairly spiritual versus very spiritual/religious), had kidney disease (OR = 0.76, 95% CI 0.58–0.99 versus none), had more days of COVID-19 community protective behaviors (OR = 0.95, 95% CI 0.94–0.96), believed they were more likely to get COVID-19 (OR = 0.84, 95% CI 0.79–0.89), or had a high confidence in COVID-19 vaccine effectiveness or safety (OR = 0.64, 95%CI 0.58–0.71 for effectiveness and OR = 0.62, 95% CI 0.56–0.68 for safety). Factors associated with lower intent included no history or plan to have a flu vaccination in the past two influenza seasons

(OR = 3.02, 95% CI 2.59–3.53), not believing childhood vaccines are safe (OR = 1.93, 95% CI 1.44–2.57), a lower reading ability (OR = 1.14, 95%CI 1.05–1.24), and residing in a community with a higher ADI (OR = 1.01, 95% CI 1.00–1.01 per one unit increase;  $p = .0002$ ). In the ranking analysis for relative importance of each of the factors included in the final model, confidence in the safety of the vaccine, history of influenza vaccination, reading ability, chronic kidney disease, and educational attainment were the top five factors associated with vaccine intent (data not shown in table).

In stratified analysis, many of the factors associated with vaccination intent persisted, however, they may not have been associated with intent within all strata. For example, high educational attainment was associated with intent among women but not among men. Factors related to confidence in vaccines in general and COVID-19 vaccine specifically (had or

Table 2. Associations between individual and community characteristics and lower COVID-19 vaccination intent.

CHARACTERISTICS	Overall		Racial/Gender Groups				Age (y)		
	Proportional odds Model <sup>a</sup>		Black women	White women	Black men	White men	All other racial/ethnic groups	< 65 y	≥ 65 y
	OR (95% CI)	p-Value	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	
<b>INDIVIDUAL CHARACTERISTICS</b>									
<b>Age (per 1 year)</b>	0.99 (0.98–1.00)	0.01	1.00 (0.98–1.01)	1.00 (0.98–1.01)	0.99 (0.95–1.02)	0.97 (0.96–0.99)	0.97 (0.94–1.01)	0.98 (0.95–1.01)	1.00(0.99–1.02)
<b>Gender</b>		<0.0001							
Female	1.00 (ref)		N/A	N/A	N/A	N/A	1.00 (ref)	1.00 (ref)	1.00 (ref)
Male	0.69 (0.60–0.79)	<0.0001	N/A	N/A	N/A	N/A	0.42 (0.23–0.79)	0.85 (0.68–1.05)	0.60(0.50–0.71)
<b>Race/ethnicity</b>									
Black	1.00 (ref)		N/A	N/A	N/A	N/A	N/A	1.00 (ref)	1.00 (ref)
White	0.61 (0.53–0.71)		N/A	N/A	N/A	N/A	N/A	0.67 (0.54–0.82)	0.57(0.47–0.69)
Other/unknown racial/ethnic groups	0.68 (0.52–0.89)	<0.0001	N/A	N/A	N/A	N/A	N/A	0.76 (0.50–1.15)	0.59(0.41–0.85)
<b>Educational attainment</b>									
Less than high school	0.84 (0.61–1.14)		0.87 (0.54–1.40)	0.92 (0.51–1.67)	0.95 (0.42–2.18)	0.55 (0.17–1.83)	0.95 (0.27–3.35)	0.75 (0.49–1.15)	0.96(0.61–1.53)
High school or some college	1.00 (ref)		1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
College or above	0.72 (0.63–0.82)		0.75 (0.59–0.95)	0.62 (0.50–0.78)	1.14 (0.74–1.78)	0.79 (0.58–1.08)	0.89 (0.50–1.58)	0.71 (0.58–0.87)	0.75 (0.63–0.89)
<b>Kidney disease</b>									
None	1.00 (ref)		1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Kidney disease	0.76 (0.58–0.99)	0.04	0.88 (0.55–1.41)	0.58 (0.35–0.95)	0.48 (0.22–1.05)	0.87 (0.46–1.65)	0.78 (0.21–2.95)	1.06 (0.67–1.69)	0.62 (0.44–0.88)
<b>Spirituality/religiosity</b>		<0.0001							
Very	1.00 (ref)		1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Fairly	0.80 (0.70–0.91)		1.01 (0.79–1.28)	0.72 (0.57–0.90)	0.72 (0.47–1.10)	0.77 (0.56–1.04)	1.09 (0.61–1.95)	0.86 (0.71–1.05)	0.76 (0.64–0.91)
Slightly/Not at all	0.67 (0.55–0.81)		0.65 (0.40–1.04)	0.78 (0.56–1.07)	0.83 (0.43–1.59)	0.59 (0.41–0.84)	0.73 (0.34–1.57)	0.79 (0.59–1.06)	0.59 (0.46–0.76)
<b>Self-rated reading ability<sup>b</sup></b>		0.002							
COVID-19 preventive behaviors	1.14 (1.05–1.24)		1.13 (0.97–1.30)	1.16 (0.97–1.39)	1.21 (0.97–1.52)	1.16 (0.96–1.41)	1.43 (1.00–2.03)	1.11 (0.98–1.25)	1.18 (1.05–1.33)
Community protective behaviors score <sup>c</sup>	0.95 (0.94–0.96)	<0.0001	0.99 (0.96–1.02)	0.96 (0.94–0.98)	0.96 (0.92–1.01)	0.94 (0.92–0.97)	0.90 (0.84–0.96)	0.95 (0.93–0.97)	0.95 (0.94–0.97)
Perceived likelihood of getting COVID-19 <sup>d</sup>	0.84 (0.79–0.89)	<0.0001	0.88 (0.79–0.98)	0.79 (0.71–0.87)	0.80 (0.65–0.98)	0.84 (0.73–0.97)	1.12 (0.85–1.48)	0.80 (0.73–0.87)	0.87 (0.80–0.94)
<b>COVID-19 testing</b>		0.2							
Never tested	1.00 (ref)		1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Tested negative	0.96 (0.84–1.08)		0.95 (0.76–1.18)	0.90 (0.72–1.12)	0.70 (0.47–1.04)	1.08 (0.80–1.45)	2.10 (1.20–3.69)	0.92 (0.76–1.11)	1.00 (0.84–1.18)
Ever tested positive	0.73 (0.50–1.05)		0.90 (0.51–1.62)	0.47 (0.23–0.98)	0.63 (0.19–2.10)	0.83 (0.34–2.02)	2.10 (0.43–10.37)	0.63 (0.38–1.03)	0.84 (0.48–1.48)
<b>Had an influenza vaccination in 2019–2021</b>		<0.0001							
Yes	1.00 (ref)		1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
No	3.02 (2.59–3.53)	<0.0001	2.07 (1.61–2.68)	3.44 (2.58–4.58)	2.06 (1.31–3.23)	4.85 (3.25–7.25)	6.02 (2.97–12.19)	2.70 (2.18–3.35)	3.48 (2.77–4.37)
<b>Childhood vaccines are safe</b>									
Yes	1.00 (ref)		1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
No	1.93 (1.44–2.57)		1.52 (0.99–2.35)	3.00 (1.61–5.57)	1.88 (0.82–4.30)	4.71 (1.76–12.63)	1.42 (0.49–4.10)	1.83 (1.24–2.69)	2.01 (1.29–3.13)
<b>Confidence in COVID-19 vaccine effectiveness<sup>e</sup></b>		<0.0001							
Confidence in COVID-19 vaccine safety <sup>f</sup>	0.64 (0.58–0.71)		0.62 (0.52–0.74)	0.57 (0.48–0.69)	0.65 (0.47–0.89)	0.72 (0.58–0.88)	0.65 (0.45–0.94)	0.64 (0.55–0.74)	0.65 (0.57–0.73)
<b>COMMUNITY CHARACTERISTICS</b>		<0.0001							
Area Deprivation Index ranking 2018 (per 1 unit increase)	1.01 (1.00–1.01)	0.0002	1.00 (0.99–1.00)	1.01 (1.01–1.01)	1.00 (0.99–1.01)	1.01 (1.00–1.01)	1.00 (0.99–1.01)	1.00 (1.00–1.01)	1.01 (1.00–1.01)

<sup>a</sup>Used proportional odds method to assess vaccine hesitancy (low intent) and the final model included age, gender, race, education level, kidney disease, spirituality, self-rated reading ability, total days of community protective behaviors, perceived likelihood of getting COVID-19, COVID-19 testing status, influenza vaccination status in 2019–2021, attitude toward childhood vaccines safety, confidences in COVID-19 vaccine safety and effectiveness, and Area Deprivation Index.

<sup>b</sup>1 – Excellent, 2 – Very good, 3 – Good, 4 – Okay, 5 – Poor.

<sup>c</sup>Sum of days per week of avoiding large gatherings; avoiding restaurants or bars, and following government guidelines. Range from 0 to 21

<sup>d</sup>1- Very unlikely, 2- Somewhat unlikely, 3 – Neither unlikely nor likely, 4 – Somewhat likely, 5 – Very likely.

<sup>e</sup>1 – Very unconfident, 2 – Somewhat unconfident, 3 – Neither unconfident nor confident, 4 – Somewhat confident, 5 – Very confident.

will have a flu vaccine in past two years, belief that childhood vaccines are safe, and confidence in COVID-19 vaccine effectiveness and safety) remained strongly associated with COVID-19 vaccination intent among all racial/gender, age, and rural/urban (Table A3H-I) groups.

Reasons participants would get the vaccine were evaluated among those who indicated they had uncertain/high intent (n = 3,109, 69%; Table A4A-D; Table 3). Most participants cited protection for themselves and/or their families as reasons for getting the vaccine (≥93%). A majority of participants would get the vaccine based on the recommendation of a medical professional (88%) but relatively fewer would do so based on a political or religious leader (range of 7–22% across groups). The recommendation of friends and family was also a common reason to have the vaccination (43%). Preventing serious illness (OR 2.29, 95% CI 1.69–3.12), making efforts for life to go back to normal (OR 2.23, 95% CI 1.79–2.79), recommendation of political leaders (OR 1.80, 95% CI 1.38–2.34), and belief in vaccine

safety (OR 2.64, 95% CI 2.10–3.31) were reasons to be vaccinated that were independently, significantly, and strongly associated with higher vaccination intent within this group with uncertain/high intent. Unlike urban residents, the recommendation of medical professionals and protection for self or family were not associated with intent among rural residents.

Among participants who had low/uncertain intent (n = 2078, 46%), concern about side effects from the vaccine was the most common reason selected (80%), followed by concern about being infected with COVID-19 by the vaccine (50%), and distrust in the efficacy of vaccines (35%) (Table 3; Table A4A-D). Concern about side effects and the cost of vaccine were associated with higher intent in this group (p < .05). The open-ended other reason (29%; regardless of explanation) was the only reason showing a lower intent (OR 1.35, 95% CI 1.05–1.73). These three reasons were also the only reasons significantly associated with intent among either urban or rural residents.

**Table 3.** Associations between COVID-19 vaccination intent and reasons for getting or not getting a COVID-19 vaccine.

Reason	Overall		Racial/Gender Groups					Age (y)	
	OR (95% CI)	p-value	Black women OR (95% CI)	White women OR (95% CI)	Black men OR (95% CI)	White men OR (95% CI)	All other racial/ ethnic groups OR (95% CI)	< 65 OR (95% CI)	≥ 65 OR (95% CI)
<b>REASONS FOR GETTING COVID-19 VACCINE AMONG THOSE WITH UNCERTAIN/HIGH INTENT<sup>a</sup></b>									
It would be the best way to avoid getting seriously ill from COVID-19		<0.0001							
Yes	2.29 (1.69–3.12)		1.18 (0.63–2.21)	2.15 (1.30–3.55)	2.79 (0.97–8.05)	4.39 (2.33–8.27)	5.22 (1.07–25.39)	1.65 (1.05–2.59)	3.25 (2.12–4.98)
No	1.00 (Ref)		1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
Life won't go back to normal until most people are vaccinated		<0.0001							
Yes	2.23 (1.79–2.79)		2.37 (1.51–3.73)	2.03 (1.40–2.93)	2.50 (1.14–5.47)	1.90 (1.16–3.13)	5.76 (2.02–16.43)	2.20 (1.59–3.05)	2.34 (1.72–3.19)
No	1.00 (Ref)		1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
Recommendation of political leaders		<0.0001							
Yes	1.80 (1.38–2.34)		2.28 (1.39–3.72)	1.91 (1.15–3.17)	1.34 (0.63–2.86)	1.36 (0.79–2.32)	3.50 (0.87–14.12)	1.81 (1.21–2.71)	1.81 (1.26–2.58)
No	1.00 (Ref)		1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
I believe the vaccine is safe		<0.0001							
Yes	2.64 (2.10–3.31)		2.72 (1.79–4.16)	3.11 (2.16–4.47)	1.81 (0.80–4.11)	2.48 (1.34–4.57)	4.79 (1.72–13.34)	1.98 (1.43–2.75)	3.54 (2.57–4.88)
No	1.00 (Ref)		1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
<b>REASONS FOR NOT GETTING COVID-19 VACCINE AMONG THOSE WITH UNCERTAIN/LOW INTENT<sup>b</sup></b>									
I would be concerned about side effects from the vaccine		0.04							
Yes	0.75 (0.57–0.99)		0.80 (0.49–1.29)	0.81 (0.49–1.34)	1.05 (0.48–2.31)	0.49 (0.24–1.01)	1.00 (0.20–5.08)	0.94 (0.63–1.41)	0.67 (0.46–0.98)
No	1.00 (Ref)		1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
I would be concerned about the cost of the vaccine		<0.0001							
Yes	0.50 (0.40–0.64)		0.63 (0.44–0.90)	0.33 (0.20–0.54)	0.40 (0.19–0.86)	0.37 (0.15–0.91)	0.44 (0.13–1.47)	0.39 (0.28–0.55)	0.61 (0.43–0.86)
No	1.00 (Ref)		1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
Other reason		0.02							
Yes	1.35 (1.05–1.73)		1.26 (0.85–1.87)	1.67 (1.03–2.70)	1.55 (0.63–3.83)	1.29 (0.60–2.75)	0.85 (0.25–2.83)	1.46 (1.02–2.09)	1.26 (0.89–1.79)
No	1.00 (Ref)		1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)

<sup>a</sup>Used proportional odds model to investigate which reasons are associated with higher likelihood of vaccination among those who answered neither likely nor unlikely, somewhat likely, or very likely for vaccination. Models included all 4 reasons and were adjusted for all of the covariates included in models in Table 2.

<sup>b</sup>Used proportional odds model to investigate which reasons are associated with lower likelihood of vaccination among those who answered neither likely nor unlikely, somewhat unlikely, or very unlikely for vaccination. Models included all 3 reasons and were adjusted for all of the covariates included in models in Table 2.

**Table 4.** Qualitative coding and quantification of free text responses of other reasons to not get a COVID-19 vaccine among those with low/uncertain intent.

Category			
Subcategory	Example	Number	Percent
<b>Contextual influences</b>		<b>84</b>	<b>16.8%</b>
Communication (distrust)	<i>"Lack of trust and transparency"</i>	2	0.4%
Historical Influences	<i>"The history of African Americans and experiments"</i>	5	1.0%
Politics and Government	<i>"This presidential administration cannot be trusted"</i>	63	12.6%
Pharma	<i>"Issues with pharma"</i>	8	1.6%
Religion	<i>"Religious preference"</i>	6	1.2%
<b>Individual and Group Influences</b>		<b>110</b>	<b>22.0%</b>
Knowledge	<i>"Don't know enough about it"</i>	22	4.4%
Beliefs and Attitudes about Health, Prevention, Susceptibility	<i>"I do not get vaccines for any reason"</i>	23	4.6%
Perceptions toward Vaccine	<i>"I would not because a tracking chip may be in it"</i>	65	13.0%
<b>Vaccine and Vaccination Specific Issues</b>		<b>305</b>	<b>61.1%</b>
Costs	<i>"Cost"</i>	1	0.2%
Recommendations and their strength	<i>"If it is not recommended by medical authorities"</i>	17	3.4%
Reliability of vaccine/research process	<i>"Has not been tested enough. Rushing the process"</i>	166	33.3%
Introduction of a new vaccine	<i>"It will have to be around for years"</i>	14	2.8%
Risk/Benefit	<i>"Not safe yet. Not proven to help yet"</i>	107	21.4%

In content analysis of the open-ended reasons (Table 4), three themes emerged to describe factors contributing to vaccine hesitancy: (1) contextual influences; (2) vaccine/vaccination specific issues; and (3) individual/group influences.

The theme *vaccine/vaccination specific issues* yielded the most responses (n = 305, 61%) among those with uncertain/low intent. The most common concern was the reliability of the research process (n = 166) perceiving it was "rushed" or methods for development were unreliable, substandard, or incomplete. The risk/benefit associated with vaccination was the second most cited contextual concern (n = 107). Many wanted to know the side effects, efficacy and/or effectiveness, and vaccine ingredients. Other concerns were "newness" of the vaccine (n = 14), costs (n = 1), and lack of or need for a recommendation (n = 17). Participants preferred a recommendation from scientists, medical professionals, or government/political leaders.

*Individual/group influences* was the second most common theme (n = 110, 22.0%). Responses primarily reflected participant perceptions or beliefs toward the vaccine (n = 65, 13%). Fear of the vaccine's side effects, and conspiracy theories were common. Example conspiracy theories were "I believe it will have a tracking device (sic) in it," "I do not want to be controlled with DNA change," or "genocide on black people." Other concerns were contraindications such as allergic reactions. Some believed in natural immunity or natural remedies. Others stated lack of/need for knowledge (22, 4.4%) on the vaccine, did not take vaccines, or had low perceived susceptibility (23, 4.6%).

*Contextual influences* are "influences arising due to historic, socio-cultural, environmental, health system/institutional, economic, or political factors." While this theme has the least responses (n = 84, 16.8%), many participants state "there is too much political involvement in the vaccine [development and approval]" (n = 63, 12.6%). Some indicate distrust in the government and pharmaceutical companies (n = 8). A few participants further cited historical mistrust and abuse in research (n = 5, 1.0%) and their distrust in the communication surrounding the vaccine (n = 2, 0.4%). Lastly, spiritual beliefs influence participant decision-making. Example responses are "my faith in God," "religious preference," or "I trust the word of God for my health."

## Discussion

This large study of predominantly Black and White adults identified characteristics of participants with low and high vaccine intent as well as beliefs that influenced intent. Similar to past studies,<sup>24–29</sup> several socio-demographic factors were associated with lower intent for COVID-19 vaccination—namely, younger age, female, Black, or having high school or some college education. The increased levels of vaccine hesitancy among Black compared to White participants has been well-documented although differences are not fully explained. General vaccine hesitancy among Black Americans has been shown to be deeply rooted in mistrust in healthcare systems, the research process, and pharmaceutical companies.<sup>30,31</sup> Mistrust is built in part upon inequities in the social determinants of health. For example, roughly 20% of Black Americans have experienced discrimination in a health care setting which is similar to the prevalence reported by Black participants in this study.<sup>32,33</sup> Historical research abuses have imprinted skepticism and fear.<sup>34,35</sup> In our sample, politics around COVID-19 vaccination such as distrust of the presidential administration in fall of 2020 further fueled vaccine hesitancy. Past research indicates lower levels of trust in government negatively influences vaccine confidence.<sup>36</sup> Further, Black participants were less likely to perceive getting the vaccine as the best way to avoid serious illness. Future work should explore the behaviors perceived most effective in preventing the severity of COVID-19 among Black Americans with lower perceived susceptibility to COVID-19 in order to address misinformation around COVID-19 and the vaccine.

Personal practices and beliefs about vaccines, such as past influenza vaccination and childhood vaccination, were strongly related to intent to vaccinate within all subgroups. This suggests that interventions to increase COVID-19 vaccination must overcome these long-held beliefs and are important for all communities. It is also consistent with previous studies which have identified anti-vaccine attitudes and beliefs as barriers to vaccination.<sup>24</sup> Our study also found reading ability, history of engaging in COVID-19 preventive behaviors, and spirituality/religiosity were negatively associated with COVID-19 vaccine uptake. Individuals with a lower reading ability, even adjusted for educational attainment, may be less likely to understand COVID-19, its severity, and the purpose and development process of the vaccine. Individuals with no history of engagement in COVID-19 preventive behaviors could be less likely to adopt a new preventive behavior like



COVID-19 vaccination.<sup>37</sup> The observation of spirituality/religiosity being associated with lower likelihood of uptake is consistent with past studies.<sup>38,39</sup> This was primarily limited to older adults and White males. Low perceived risk and high-level perception of surviving COVID-19 were negative predictive factors of COVID-19 vaccination. These findings and current literature<sup>40,41</sup> provide intervention targets to apply to vaccine hesitancy that could increase uptake.

COVID-19 vaccination rates are lagging behind in rural areas of the U.S., compared to urban locations or in areas with greater social vulnerability.<sup>42</sup> However, after adjustment for other factors, rural residence was not independently related to vaccine intent in this study. In fact, most of the associations related to intent were present in both rural and urban residents, suggesting that factors which influence intent are shared across geographic areas. Likewise, most other community-level characteristics were unrelated to intent including the Pandemic Vulnerability Index. The notable exception was the relationship to lower intent for those living in a community with higher deprivation despite adjustment for individual-level socio-demographic characteristics. This suggests that under-resourced communities may have a greater need for more extensive interventions to overcome barriers to vaccination.

According to MacDonald et al., vaccine hesitancy exists on a continuum ranging from full acceptance to outright refusal.<sup>22</sup> The degree of hesitancy was measured by a five-point bipolar scale with both ends reflecting either positive or negative intent and a midpoint that reflected respondents were uncertain or undecided in their intent. Our study further identified if degree of hesitancy was determined by different factors among these adults. Protection of self and family and the recommendation of a healthcare provider were most common reasons for those with uncertain or high vaccination intent. Many also indicated that the recommendation of other trusted messengers (family and friends, political leaders, religious leaders) would influence their intent. However, these reasons were not universally important. Likewise, many of those with low or uncertain intent cited side effects, concern about being infected with COVID-19 from the vaccine, or concern that the vaccine will not work as common barriers. In our open-ended statements, participants describe vaccine specific issues (e.g., conspiracy theories, lack of information), individual influences (e.g., beliefs in natural immunity and remedies), and contextual factors (e.g., degree of political involvement in vaccine development process, distrust in pharmaceutical companies, healthcare systems, and research processes) as barriers, some of which have also been observed in other studies.<sup>24,43</sup> Collectively, findings demonstrate the complexity of vaccine hesitancy and indicate that addressing a single barrier will not address vaccine hesitancy for a majority of individuals. Intervention targets or approaches should be tailored to reasons for vaccine intent by degree of hesitancy. For example, interventions including trusted messengers may need to involve a variety of messengers based on characteristics of the target population such as religiosity which was associated with lower intent in this study and has been associated with lower likelihood of uptake in past studies.<sup>38,39</sup>

There are several strengths of the study. First, it was conducted within a well-characterized population across multiple U.S. states. The study also includes a large sample size, which permitted simultaneous evaluation of potential individual-level and

community-level factors and subgroups. Limitations include a relatively low survey response rate. Also, responders had a somewhat higher educational attainment than non-responders. However, responders are likely underrepresented in other studies and still represent a wide distribution of many socio-demographic and other factors. We were unable to evaluate racial/ethnic minority groups other than Black Americans. The survey overlapped the time period when vaccine efficacy was first reported which may have affected responses in an unknown manner. Although we were able to evaluate many factors, we were not able to evaluate every potential factor reported to be related to vaccine intent such as political affiliation. Finally, the intention to vaccinate does not always mean an individual will get vaccinated. This will be evaluated in this population in future work.

## Conclusions

In this large, mixed-methods study, we identified several socio-demographic and other factors that were independently associated with COVID-19 vaccination intent in the months leading up to vaccine availability in the U.S. Hesitancy was complex with many observed associations and variation in the associations among socio-demographic groups. Participants also cited many concerns such as safety, side effects, efficacy, and a distrust of the vaccine development process as reasons for their hesitancy. Thus, addressing these factors, recommendations of trusted messengers, and identification of additional factors which are associated with this hesitancy continue to be important for developing tailored interventions to increase vaccination rates in the U.S.

## Disclosure statement

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## Appendix

### Appendix methods

#### *Southern Community Cohort Study*

Recruitment for the SCCS was conducted primarily (86%) through Community Health Centers (CHCs), institutions which largely provide health care and preventive services to low-income and uninsured persons. Approximately 14% of participants were recruited via an age-, sex-, and race-stratified random sample of the general population. Study participants completed a survey at baseline and up to four additional surveys during the SCCS follow-up. In this analysis we incorporated responses from these prior surveys including education, spirituality/religiosity, income, discrimination in medical care, reading ability, needing help to read medical materials, and confidence filling out medical forms. In addition, chronic disease history and BMI from the most recently completed survey were used wherever missing from the COVID-19 survey (all survey instruments available at <https://www.southerncommunitystudy.org/questionnaires.html>).

#### *COVID-19 Survey*

A pilot of the COVID-19 survey was conducted between 7/20/2020 and 9/30/2020. A total of 400 SCCS participants with an e-mail address on file who completed the 3<sup>rd</sup> or 4<sup>th</sup> follow-up parent study survey were emailed a personalized e-mail invitation on 07/20/2020 to complete the survey using a unique URL to the survey consent landing page. Non-responders received up to two reminder e-mails (on 07/23/2020 and 07/28/2020) and 158 were also mailed a reminder letter on 08/3/2020. In all, 106 participants completed the pilot survey and 13 participants recorded refusal of the survey on the consent page. As a result of the pilot, the questionnaire was updated to expand questions about vaccine hesitancy.

For the primary COVID-19 survey, participants were invited by two primary methods. First, SCCS participants routinely receive an annual mailed newsletter updating participants about study activities.

Included on the mailed 2020 newsletter was an invitation to complete the COVID-19 impact survey by texting a code to an SCCS number or by using a provided URL (n = 56,690). Both options led to a study website landing page. In addition to a mailed newsletter, participants with an e-mail address on file were also emailed an e-newsletter that included a unique-to-the-participant URL (n = 18,748). In the second pathway and in addition to an e-newsletter, SCCS participants with an e-mail address on file who had not yet completed the COVID-19 impact survey and who had completed either the 3<sup>rd</sup> or 4<sup>th</sup> follow-up parent study survey were emailed a personalized invitation to complete the survey (n = 15,122). Non-responders received up to two reminder e-mails. Timings of the mailings are shown in Figure 1. Participants were considered to have completed the survey if they reached question 162 of 205.

Geocoded addresses were matched to the street level for 91% of residential addresses. ZIP code centroid was used for the 9% of addresses that did not match to a street address, or where only a post office box or rural delivery route was provided.

#### *Statistical analysis*

Variables which were assessed for association with vaccination intent included age (years), gender (male/female), race (Black, White, All other racial/ethnic groups including unknown), income (less than \$15,000, \$15,000–\$49,999, over \$50,000), education (less than high school, high school or some college, college or above), household composition (alone/with adults no children/with children no adults/with children and adults), health insurance status (any Medicare/Medicaid, any private and not Medicare/Medicaid, only military or others, no insurance), self-reported history of diabetes (yes/no), self-reported history of cardiovascular disease and/or hypertension (yes/no), self-reported history of chronic lung disease (yes/no), self-reported history of kidney disease (yes/no), self-reported history of autoimmune disease (yes/no), self-reported active cancer treatment (yes/no), BMI, self-reported health status (excellent, very good, good, fair, poor), current smoking status (current or not), current employment status (not currently employed, currently employed), hours working within 6 feet of others (0 hours, 0.1 to < 1 hour, 1 to less than 3 hours, 3 or more hours), COVID-19 testing status for self and household members (never/negative/ever positive), likelihood of contracting or surviving COVID-19 (as scales of 1 to 5 for very unlikely, somewhat unlikely, neither unlikely nor likely, somewhat likely, very likely), COVID-19 personal preventive behaviors score (sum of number of days per week for washing hands or using sanitizer frequently, cleaning touched surfaces, wearing face masks, and keeping 6 feet away from others; range of 0–28 days), COVID-19 community protective behaviors score (sum of number of days per week for avoiding large gatherings, avoiding restaurants or bars, and following government guidelines, range of 0 to 21), personal confidence on effectiveness or safety of COVID-19 vaccines (as scales of 1 to 5 for very unlikely, somewhat unlikely, neither unlikely nor likely, somewhat likely, very likely), personal attitude toward safety of childhood vaccination (safe/not safe), ever personally experienced discrimination in medical care due to race or socioeconomic status (yes/no), spirituality (very, fairly, slightly, not at all), self-reported reading ability (as a scale of 1 to 5 for excellent/very good/good/okay/poor), confidence in filling out medical forms (as a scale of 1 to 5 for extremely/quite a bit/somewhat/a little bit/not at all), help needed with reading materials from doctors (yes/no), influenza vaccine status in the last two flu seasons (vaccinated/not vaccinated), urban/rural resident, ADI (1–100) and other demographic factors.]

**Appendix Table 1.** Survey questions and sources.

Survey question	Response options	Question source
If a vaccine to prevent COVID-19 became available to you, how likely are you to choose to get the COVID-19 vaccination?	Very unlikely Somewhat unlikely Neither unlikely nor likely Somewhat likely Very likely	SCCS
Which of the following are reasons you would get a COVID-19 vaccine? Please answer yes or no for each reason. ( <i>response order was randomized</i> ) I want to protect my family I want to protect my community I want to protect myself I have a chronic health condition, such as asthma or diabetes, so it is important that I have it It would be the best way to avoid getting seriously ill from COVID-19 It would allow me to feel safe around other people Life won't go back to normal until most people are vaccinated Recommendation of medical professionals Recommendation of political leaders Recommendation of religious leaders Recommendation of friends or family I believe the vaccine is safe	Yes No	May 2020 AP-NORC Center Poll Conducted by The Associated Press-NORC Center for Public Affairs Research
Which of the following are reasons you would NOT get a COVID-19 vaccine? Please answer yes or no for each reason. ( <i>response order was randomized</i> ) I am allergic to vaccines I don't like needles I'm not concerned about getting seriously ill from COVID-19 I won't have time to get vaccinated I would be concerned about getting infected with COVID-19 from the vaccine I would be concerned about side effects from the vaccine I don't think vaccines work very well The COVID-19 outbreak is not as serious as some people say it is I would be concerned about the cost of the vaccine I think the COVID-19 vaccine will not work Other (please specify)	Yes No	May 2020 AP-NORC Center Poll Conducted by The Associated Press-NORC Center for Public Affairs Research
How confident or unconfident are you that when a vaccine becomes available for coronavirus or COVID-19 it will have been adequately tested for EFFECTIVENESS?	Very unconfident Somewhat unconfident Neither unconfident nor confident Somewhat confident Very confident	Kaiser Family Foundation, December 8, 2020
How confident or unconfident are you that when a vaccine becomes available for coronavirus or COVID-19 it will have been adequately tested for SAFETY?	Very unconfident Somewhat unconfident Neither unconfident nor confident Somewhat confident Very confident	Kaiser Family Foundation, December 8, 2020
Did you have an influenza vaccination or flu shot between September 2019 and March 2020?	Yes No	Multi-Ethnic Study of Atherosclerosis (MESA)
Will you have or did you already have an influenza vaccination or flu shot between September 2020 and March 2021?	Yes No	Multi-Ethnic Study of Atherosclerosis (MESA)
In general, do you think vaccines given to children for diseases like measles are safe?	Yes No	Economist/YouGov August 2–4 2020

Appendix Table 2. Characteristics of study participants among racial/gender and age groups.

CHARACTERISTICS <sup>a</sup>	Racial/gender groups					Age (y)	
	Black women n = 1290	White women n = 1481	Black men n = 425	White men n = 1001	All other racial/ ethnic groups n = 289	< 65 n = 1851	≥ 65 n = 2635
<b>INDIVIDUAL CHARACTERISTICS</b>							
<b>Age (y)</b>	64.5 (6.6)	67.2 (7.6)	66.4 (6.8)	69.9 (7.5)	67.1 (7.7)	59.9 (3.0)	71.9 (5.4)
<b>Gender</b>							
Female	1290 (100%)	1481 (100%)	0	0	183 (63%)	1367 (74%)	1587 (60%)
Male	0	0	425 (100%)	1001 (100%)	106 (37%)	484 (26%)	1048 (40%)
<b>Race/ethnicity</b>							
Black	1290 (100%)	0	425 (100%)	0	-	880 (48%)	835 (32%)
White	-	1481 (100%)	-	1001 (100%)	-	852 (46%)	1630 (62%)
Any Hispanic	-	-	-	-	66 (23%)	26 (1%)	40 (2%)
Asian	-	-	-	-	11 (4%)	3 (0.2%)	8 (0.3%)
American Indian	-	-	-	-	11 (4%)	8 (0.4%)	3 (0.1%)
Other racial/ethnic group	-	-	-	-	20 (7%)	10 (0.5%)	10 (0.4%)
More than one racial group	-	-	-	-	117 (40%)	46 (2%)	71 (3%)
Unknown	-	-	-	-	64 (22%)	26 (1%)	38 (1%)
<b>Educational attainment</b>							
Less than high school	79 (6%)	50 (3%)	34 (8%)	11 (1%)	12 (5%)	106 (6%)	80 (3%)
High school or some college	762 (60%)	725 (49%)	229 (55%)	331 (33%)	112 (48%)	1023 (56%)	1136 (44%)
College or above	435 (34%)	700 (47%)	154 (37%)	656 (66%)	109 (47%)	684 (38%)	1370 (53%)
<b>Household income</b>							
<\$15000	386 (30%)	210 (14%)	101 (24%)	78 (8%)	52 (18%)	489 (26%)	338 (13%)
\$15000 to \$49999	613 (48%)	589 (40%)	161 (38%)	228 (23%)	117 (40%)	670 (36%)	1038 (39%)
\$50000+	291 (23%)	680 (46%)	162 (38%)	694 (69%)	120 (42%)	691 (37%)	1256 (48%)
<b>Chronic disease</b>							
No chronic disease	136 (11%)	383 (26%)	51 (12%)	196 (20%)	59 (21%)	375 (20%)	450 (17%)
Any chronic disease	1145 (89%)	1083 (74%)	370 (88%)	792 (80%)	226 (79%)	1466 (80%)	2150 (83%)
Diabetes	703 (55%)	385 (26%)	210 (50%)	288 (29%)	100 (35%)	735 (40%)	951 (36%)
Chronic lung disease	385 (31%)	386 (27%)	95 (23%)	212 (22%)	77 (27%)	533 (30%)	622 (24%)
Cardiovascular disease	1020 (79%)	836 (57%)	327 (77%)	666 (67%)	191 (66%)	1189 (64%)	1851 (70%)
Kidney disease	78 (6%)	71 (5%)	33 (8%)	49 (5%)	14 (5%)	76 (4%)	169 (7%)
Cancer under active treatment	55 (4%)	71 (5%)	25 (6%)	63 (6%)	22 (8%)	72 (4%)	164 (6%)
Other chronic disease	332 (26%)	282 (19%)	96 (23%)	128 (13%)	52 (18%)	425 (23%)	465 (18%)
<b>Body mass index (kg/m<sup>2</sup>)</b>	32.9 (8.1)	29.3 (8.3)	29.8 (6.2)	28.1 (5.6)	28.9 (7.2)	31.7 (8.4)	28.9 (7.0)
<b>Self-reported health status</b>							
Excellent	74 (6%)	191 (13%)	29 (7%)	143 (14%)	35 (12%)	183 (10%)	289 (11%)
Very good	347 (27%)	578 (39%)	134 (32%)	434 (43%)	120 (42%)	594 (32%)	1019 (39%)
Good	587 (46%)	484 (33%)	179 (42%)	295 (29%)	84 (29%)	705 (38%)	924 (35%)
Fair	257 (20%)	192 (13%)	75 (18%)	109 (11%)	44 (15%)	312 (17%)	365 (14%)
Poor	23 (2%)	36 (2%)	8 (2%)	20 (2%)	6 (2%)	56 (3%)	37 (1%)
<b>Smoking status</b>							
nonsmoker	1129 (88%)	1333 (90%)	349 (82%)	929 (93%)	267 (93%)	1542 (83%)	2465 (94%)
Current smoker	160 (12%)	148 (10%)	76 (18%)	72 (7%)	21 (7%)	307 (17%)	170 (6%)
<b>Employment status</b>							
Not currently employed	853 (66%)	1021 (69%)	300 (71%)	706 (71%)	203 (70%)	956 (52%)	2127 (81%)
Currently employed	436 (34%)	460 (31%)	124 (29%)	293 (29%)	86 (30%)	892 (48%)	507 (19%)
<b>Time spent working within 6 ft of others (hours/day; among those working)</b>							
0	129 (30%)	170 (37%)	38 (31%)	98 (33%)	32 (37%)	271 (30%)	196 (39%)
0.1 to <1	84 (19%)	94 (20%)	43 (35%)	80 (27%)	9 (10%)	181 (20%)	129 (25%)
1 to <3	32 (7%)	46 (10%)	10 (8%)	47 (16%)	18 (21%)	98 (11%)	55 (11%)
≥3	190 (44%)	149 (32%)	33 (27%)	68 (23%)	27 (31%)	340 (38%)	127 (25%)
<b>Household composition</b>							
Lives alone	506 (40%)	480 (33%)	119 (28%)	150 (15%)	83 (29%)	518 (28%)	820 (32%)
Lives with other adult(s) and no children	567 (45%)	885 (61%)	254 (60%)	785 (79%)	178 (63%)	1057 (58%)	1612 (62%)
Lives with child(ren) and no other adult(s)	29 (2%)	11 (1%)	4 (1%)	2 (0.2%)	1 (0.4%)	32 (2%)	15 (0.6%)
Lives with both child(ren) and other adult(s)	167 (13%)	83 (6%)	43 (10%)	52 (5%)	22 (8%)	219 (12%)	148 (6%)
<b>Spirituality/religiosity</b>							
Very	811 (64%)	742 (50%)	234 (56%)	366 (37%)	126 (47%)	938 (51%)	1341 (52%)
Fairly	378 (30%)	531 (36%)	134 (32%)	376 (38%)	93 (34%)	647 (35%)	865 (33%)
Slightly	72 (6%)	139 (9%)	38 (9%)	155 (16%)	43 (16%)	187 (10%)	260 (10%)
Not at all	7 (1%)	61 (4%)	9 (2%)	99 (10%)	8 (3%)	54 (3%)	130 (5%)
<b>Health insurance status</b>							
Any Medicare/Medicaid	803 (62%)	978 (66%)	278 (66%)	724 (73%)	193 (67%)	618 (33%)	2358 (90%)
Any private/no Medicare or Medicaid	300 (23%)	397 (27%)	85 (20%)	205 (21%)	76 (26%)	870 (47%)	193 (7%)
Only military/other	125 (10%)	65 (4%)	43 (10%)	48 (5%)	15 (5%)	226 (12%)	70 (3%)
No health insurance	60 (5%)	40 (3%)	18 (4%)	19 (2%)	5 (2%)	133 (7%)	9 (0.3%)
<b>Self-rated reading ability<sup>b</sup></b>	1.5 (0.8)	1.3 (0.6)	1.7 (1.0)	1.4 (0.7)	1.4 (0.8)	1.5 (0.8)	1.4 (0.7)
<b>Confidence in filling out medical forms<sup>c</sup></b>	1.4 (0.8)	1.3 (0.6)	1.5 (0.9)	1.4 (0.7)	1.5 (0.8)	1.4 (0.8)	1.4 (0.7)
<b>Need help reading materials from doctors</b>	77 (6%)	39 (3%)	32 (8%)	29 (3%)	17 (6%)	107 (6%)	87 (3%)

(Continued)

Appendix Table 2. (Continued).

CHARACTERISTICS <sup>a</sup>	Racial/gender groups					Age (y)	
	Black women n = 1290	White women n = 1481	Black men n = 425	White men n = 1001	All other racial/ ethnic groups n = 289	< 65 n = 1851	≥ 65 n = 2635
<b>Experience of discrimination in healthcare due to race or socioeconomic status</b>							
No experience	848 (66%)	1311 (89%)	311 (73%)	932 (93%)	239 (83%)	1374 (74%)	2267 (86%)
Experienced discrimination	324 (25%)	123 (8%)	68 (16%)	40 (4%)	43 (15%)	345 (19%)	253 (10%)
Unknown	118 (9%)	47 (3%)	46 (11%)	29 (3%)	7 (2%)	132 (7%)	115 (4%)
<b>COVID-19 preventive behaviors</b>							
Personal protective behaviors score <sup>d</sup>	26.7 (3.4)	25.0 (4.9)	26.0 (4.0)	23.5 (5.4)	25.2 (4.7)	25.6 (4.6)	25.1 (4.8)
Community protective behaviors score <sup>e</sup>	19.5 (3.5)	17.8 (5.2)	18.9 (4.2)	17.2 (5.5)	18.6 (4.2)	18.2 (4.9)	18.4 (4.7)
<b>Perceived likelihood of getting COVID-19<sup>f</sup></b>	2.4 (1.1)	2.4 (1.1)	2.4 (1.1)	2.4 (1.0)	2.3 (1.0)	2.5 (1.1)	2.3 (1.0)
<b>Perceived likelihood of surviving COVID-19<sup>f</sup></b>	3.8 (1.3)	3.7 (1.3)	3.8 (1.3)	3.8 (1.2)	3.5 (1.3)	3.9 (1.2)	3.6 (1.3)
<b>COVID-19 testing</b>							
Never tested	648 (50%)	941 (64%)	227 (54%)	676 (68%)	163 (56%)	1018 (55%)	1637 (62%)
Tested negative	581 (45%)	499 (34%)	180 (43%)	298 (30%)	116 (40%)	745 (40%)	929 (35%)
Ever tested positive	59 (5%)	31 (2%)	16 (4%)	24 (2%)	10 (3%)	84 (5%)	56 (2%)
<b>Household member tested positive for COVID-19 (among those living with others)</b>							
No	735 (95%)	965 (97%)	289 (96%)	816 (97%)	199 (97%)	1263 (95%)	1741 (97%)
Yes	42 (5%)	30 (3%)	13 (4%)	27 (3%)	7 (3%)	63 (5%)	56 (3%)
<b>Had an influenza vaccination in 2019–2020</b>							
Yes	733 (57%)	1040 (71%)	239 (57%)	781 (78%)	204 (71%)	1058 (58%)	1939 (74%)
No	551 (43%)	433 (29%)	182 (43%)	216 (22%)	83 (29%)	779 (42%)	686 (26%)
<b>Intends to have or had an Influenza vaccination in 2020/21</b>							
Yes	842 (66%)	1120 (76%)	270 (64%)	825 (83%)	218 (76%)	1200 (65%)	2075 (79%)
No	437 (34%)	355 (24%)	151 (36%)	170 (17%)	70 (24%)	643 (35%)	540 (21%)
<b>Childhood vaccines are safe</b>							
Yes	1171 (92%)	1394 (95%)	385 (92%)	968 (97%)	266 (92%)	1688 (92%)	2496 (96%)
No	106 (8%)	76 (5%)	33 (8%)	26 (3%)	23 (8%)	155 (8%)	109 (4%)
<b>Confidence in COVID-19 vaccine effectiveness<sup>g</sup></b>	2.5 (1.3)	3.1 (1.3)	2.9 (1.3)	3.6 (1.3)	3.0 (1.3)	2.8 (1.3)	3.2 (1.3)
<b>Confidence in COVID-19 vaccine safety<sup>g</sup></b>	2.6 (1.3)	3.1 (1.3)	3.0 (1.3)	3.6 (1.3)	3.1 (1.3)	2.8 (1.3)	3.2 (1.4)
<b>COMMUNITY CHARACTERISTICS</b>							
<b>Urban/rural status</b>							
Urban/suburban resident	1044 (81%)	1151 (78%)	338 (80%)	778 (78%)	246 (85%)	1467 (79%)	2090 (79%)
Rural resident	246 (19%)	330 (22%)	87 (20%)	222 (22%)	43 (15%)	383 (21%)	545 (21%)
<b>State influenza vaccination ranking</b>	59.8 (3.5)	60.7 (4.2)	59.7 (3.5)	61.6 (3.8)	61.0 (3.6)	60.3 (3.8)	60.8 (3.9)
<b>Area Deprivation Index ranking 2018 (per 1 unit increase)</b>	73.6 (21.8)	57.8 (24.9)	72.0 (23.7)	52.9 (24.9)	58.8 (24.2)	66.2 (24.2)	60.1 (25.9)
<b>COVID-19 community burden</b>	22.1 (13.7)	23.9 (15.6)	23.1 (13.9)	22.1 (14.6)	22.5 (15.3)	23.2 (14.6)	22.5 (14.7)
<b>Unacast social distancing grade</b>	0.93 (0.14)	0.92 (0.15)	0.93 (0.14)	0.92 (0.16)	0.95 (0.12)	0.93 (0.14)	0.93 (0.15)
<b>Pandemic Vulnerability Index</b>	0.56 (0.04)	0.54 (0.05)	0.56 (0.04)	0.53 (0.05)	0.54 (0.04)	0.55 (0.04)	0.54 (0.05)
<b>Intent to be vaccinated</b>							
Very unlikely	337 (26%)	291 (20%)	88 (21%)	107 (11%)	45 (16%)	442 (24%)	426 (16%)
Somewhat unlikely	230 (18%)	114 (8%)	63 (15%)	68 (7%)	34 (12%)	260 (14%)	249 (9%)
Neither likely nor unlikely	283 (22%)	214 (14%)	75 (18%)	72 (7%)	57 (20%)	327 (18%)	374 (14%)
Somewhat likely	273 (21%)	332 (22%)	119 (28%)	196 (20%)	64 (22%)	383 (21%)	601 (23%)
Very likely	167 (13%)	530 (36%)	80 (19%)	558 (56%)	89 (31%)	439 (24%)	985 (37%)

<sup>a</sup>Presented as n (%) for categorical variables and mean (standard deviation) for continuous variables.

<sup>b</sup>1 – Excellent, 2 – Very good, 3 – Good, 4 – Okay, 5 – Poor.

<sup>c</sup>1 – Extremely, 2 – Quite a bit, 3 – Somewhat, 4 – A little bit, 5 – Not at all.

<sup>d</sup>Sum of days per week of washing hands or using sanitizer frequently, cleaning surfaces touched, wearing face masks, and keeping 6 feet away from others. Range from 0–28.

<sup>e</sup>Sum of days per week of avoiding large gatherings, avoiding restaurants or bars, and following government guidelines. Range from 0–21.

<sup>f</sup>1 – Very unlikely, 2 – Somewhat unlikely, 3 – Neither unlikely nor likely, 4 – Somewhat likely, 5 – Very likely.

<sup>g</sup>1 – Very unconfident, 2 – Somewhat unconfident, 3 – Neither unconfident nor confident, 4 – Somewhat confident, 5 – Very confident.

Appendix Table 3A. Simple associations between individual and community characteristics and intent to receive COVID-19 vaccination – Black females.

CHARACTERISTICS <sup>a</sup>	Black females					OR (95% CI) <sup>b</sup>	p-Value
	Very unlikely	Somewhat unlikely	Neither likely nor unlikely	Somewhat likely	Very likely		
	n = 337	n = 230	n = 283	n = 273	n = 167		
<b>INDIVIDUAL CHARACTERISTICS</b>							
<b>Age (per 1 year)</b>	63.9 (6.1)	64.1 (6.6)	64.7 (7.0)	65.0 (6.6)	65.1 (6.9)	0.98 (0.97–1.00)	0.02
<b>Educational attainment</b>							0.29
Less than high school	20 (6%)	11 (5%)	14 (5%)	19 (7%)	15 (9%)	0.72 (0.48–1.08)	
High school or some college	196 (59%)	141 (62%)	179 (64%)	156 (58%)	90 (55%)	1.00 (ref)	
College or above	117 (35%)	76 (33%)	88 (31%)	94 (35%)	60 (36%)	0.98 (0.79–1.21)	
<b>Household income</b>							0.9
<\$15000	98 (29%)	66 (29%)	98 (35%)	76 (28%)	48 (29%)	1.00 (ref)	
\$15000 to \$49999	173 (51%)	100 (43%)	125 (44%)	132 (48%)	83 (50%)	1.04 (0.83–1.30)	
\$50000+	66 (20%)	64 (28%)	60 (21%)	65 (24%)	36 (22%)	0.98 (0.75–1.28)	
<b>Any chronic disease</b>							0.75
No	38 (11%)	21 (9%)	28 (10%)	30 (11%)	19 (11%)	1.00 (ref)	
Yes	297 (89%)	209 (91%)	249 (90%)	242 (89%)	148 (89%)	1.05 (0.77–1.44)	
<b>Diabetes</b>							0.29
No	153 (46%)	109 (48%)	126 (45%)	116 (43%)	73 (44%)	1.00 (ref)	
Yes	181 (54%)	119 (52%)	156 (55%)	155 (57%)	92 (56%)	0.89 (0.72–1.10)	
<b>Chronic lung disease</b>							0.85
No	224 (68%)	161 (73%)	183 (67%)	190 (71%)	113 (68%)	1.00 (ref)	
Yes	104 (32%)	60 (27%)	91 (33%)	77 (29%)	53 (32%)	0.98 (0.78–1.23)	
<b>Cardiovascular disease</b>							0.49
No	73 (22%)	45 (20%)	59 (21%)	52 (19%)	37 (22%)	1.00 (ref)	
Yes	262 (78%)	185 (80%)	223 (79%)	221 (81%)	129 (78%)	1.10 (0.84–1.44)	
<b>Kidney disease</b>							0.24
No	309 (96%)	209 (95%)	256 (92%)	244 (92%)	151 (94%)	1.00 (ref)	
Yes	14 (4%)	12 (5%)	21 (8%)	22 (8%)	9 (6%)	0.78 (0.51–1.18)	
<b>Cancer under active treatment</b>							0.19
No	326 (97%)	217 (94%)	271 (96%)	262 (96%)	156 (94%)	1.00 (ref)	
Yes	10 (3%)	13 (6%)	11 (4%)	11 (4%)	10 (6%)	0.70 (0.41–1.20)	
<b>Other chronic disease</b>							0.89
No	249 (77%)	163 (71%)	191 (69%)	203 (76%)	123 (74%)	1.00 (ref)	
Yes	76 (23%)	65 (29%)	84 (31%)	64 (24%)	43 (26%)	0.98 (0.78–1.24)	
<b>Body mass index (kg/m<sup>2</sup>)</b>	33.7 (8.4)	33.1 (7.8)	33.0 (8.1)	32.4 (8.4)	31.5 (7.7)	1.02 (1.00–1.03)	0.01
<b>Self-reported health status</b>							0.3
Excellent	25 (7%)	14 (6%)	16 (6%)	6 (2%)	13 (8%)	1.00 (ref)	
Very good	101 (30%)	61 (27%)	60 (21%)	78 (29%)	47 (28%)	0.80 (0.51–1.25)	
Good	143 (42%)	111 (48%)	135 (48%)	134 (49%)	64 (39%)	0.75 (0.49–1.16)	
Fair	63 (19%)	43 (19%)	65 (23%)	49 (18%)	37 (22%)	0.72 (0.45–1.13)	
Poor	5 (1%)	1 (0.4%)	7 (2%)	5 (2%)	5 (3%)	0.42 (0.19–0.98)	
<b>Smoking status</b>							0.59
nonsmoker	297 (88%)	200 (87%)	249 (88%)	236 (86%)	147 (88%)	1.00 (ref)	
Current smoker	40 (12%)	30 (13%)	33 (12%)	37 (14%)	20 (12%)	0.92 (0.69–1.24)	
<b>Employment status</b>							0.26
Not currently employed	215 (64%)	141 (61%)	195 (69%)	188 (69%)	114 (68%)	1.00 (ref)	
Currently employed	122 (36%)	89 (39%)	88 (31%)	84 (31%)	53 (32%)	1.13 (0.91–1.40)	
<b>Time spent working within 6 ft of others (hours/day)</b>							0.49
0	33 (27%)	23 (26%)	29 (33%)	25 (30%)	19 (36%)	1.00 (ref)	
0.1 to <1	22 (18%)	15 (17%)	20 (23%)	13 (15%)	14 (26%)	1.03 (0.63–1.67)	
1 to <3	7 (6%)	12 (14%)	3 (3%)	6 (7%)	4 (8%)	1.23 (0.62–2.45)	
≥3	60 (49%)	38 (43%)	36 (41%)	40 (48%)	16 (30%)	1.33 (0.89–1.98)	
<b>Household composition</b>							0.64
Lives alone	144 (43%)	76 (33%)	112 (40%)	112 (42%)	62 (38%)	1.00 (ref)	
Lives with other adult(s) and no children	136 (41%)	112 (49%)	122 (44%)	124 (46%)	73 (45%)	0.91 (0.74–1.13)	
Lives with child(ren)	53 (16%)	40 (18%)	44 (16%)	31 (12%)	28 (17%)	1.01 (0.75–1.36)	
<b>Spirituality/religiosity</b>							0.003
Very	223 (68%)	143 (63%)	177 (64%)	160 (60%)	108 (65%)	1.00 (ref)	
Fairly	97 (29%)	73 (32%)	81 (29%)	84 (31%)	43 (26%)	0.96 (0.77–1.19)	
Slightly/Not at all	10 (3%)	11 (5%)	20 (7%)	23 (9%)	15 (9%)	0.49 (0.32–0.74)	
<b>Health insurance status</b>							0.64
Any Medicare/Medicaid	197 (59%)	138 (60%)	185 (66%)	169 (62%)	114 (68%)	1.00 (ref)	
Any private/no Medicare or Medicaid	84 (25%)	52 (23%)	64 (23%)	67 (25%)	33 (20%)	1.07 (0.83–1.38)	
Only military/other	40 (12%)	24 (10%)	20 (7%)	25 (9%)	16 (10%)	1.21 (0.85–1.72)	
No health insurance	15 (4%)	16 (7%)	13 (5%)	12 (4%)	4 (2%)	1.24 (0.77–2.00)	
<b>Self-rated reading ability<sup>c</sup></b>	1.5 (0.8)	1.5 (0.8)	1.6 (0.8)	1.5 (0.8)	1.4 (0.7)	1.02 (0.91–1.15)	0.72
<b>Confidence in filling out medical forms<sup>d</sup></b>	1.4 (0.8)	1.4 (0.7)	1.5 (0.8)	1.4 (0.7)	1.4 (0.8)	1.00 (0.88–1.14)	0.95
<b>Need help reading materials from doctors</b>							0.22
No	302 (94%)	204 (91%)	257 (93%)	255 (97%)	152 (94%)	1.00 (ref)	
Yes	19 (6%)	21 (9%)	19 (7%)	9 (3%)	9 (6%)	1.29 (0.86–1.95)	

(Continued)

Appendix Table 3A. (Continued).

CHARACTERISTICS <sup>a</sup>	Black females					OR (95% CI) <sup>b</sup>	p-Value
	Very unlikely n = 337	Somewhat unlikely n = 230	Neither likely nor unlikely n = 283	Somewhat likely n = 273	Very likely n = 167		
<b>Experience of discrimination in healthcare due to race or socioeconomic status</b>							0.84
No experience	226 (67%)	156 (68%)	176 (62%)	173 (63%)	117 (70%)	1.00 (ref)	
Experienced discrimination	79 (23%)	58 (25%)	79 (28%)	75 (27%)	33 (20%)	0.97 (0.78–1.22)	
Unknown	32 (10%)	16 (7%)	28 (10%)	25 (9%)	17 (10%)	0.91 (0.64–1.27)	
<b>COVID-19 preventive behaviors</b>							
Personal protective behaviors score <sup>e</sup>	26.7 (3.7)	26.5 (3.4)	26.7 (3.5)	26.6 (3.2)	27.0 (2.4)	0.99 (0.96–1.02)	0.51
Community protective behaviors score <sup>f</sup>	19.5 (3.3)	19.2 (3.9)	19.4 (3.7)	19.6 (3.3)	19.5 (3.6)	0.99 (0.97–1.02)	0.67
<b>Perceived likelihood of getting COVID-19<sup>g</sup></b>	2.2 (1.1)	2.4 (1.1)	2.4 (1.1)	2.5 (1.0)	2.4 (1.1)	0.86 (0.78–0.94)	0.001
<b>Perceived likelihood of surviving COVID-19<sup>g</sup></b>	3.9 (1.3)	3.7 (1.3)	3.6 (1.2)	3.8 (1.1)	3.8 (1.3)	1.02 (0.95–1.11)	0.56
<b>COVID-19 testing</b>							0.69
Never tested	176 (52%)	113 (49%)	139 (49%)	138 (51%)	82 (49%)	1.00 (ref)	
Tested negative	149 (44%)	99 (43%)	135 (48%)	123 (45%)	75 (45%)	0.95 (0.78–1.16)	
Ever tested positive	11 (3%)	18 (8%)	8 (3%)	12 (4%)	10 (6%)	0.83 (0.52–1.33)	
<b>Household member tested positive for COVID-19</b>							0.57
No	184 (95%)	137 (91%)	161 (95%)	155 (97%)	98 (94%)	1.00 (ref)	
Yes	9 (5%)	14 (9%)	8 (5%)	5 (3%)	6 (6%)	1.17 (0.68–2.04)	
<b>Had an influenza vaccination in 2019–2021</b>							<0.0001
Yes	185 (55%)	164 (72%)	195 (70%)	222 (82%)	145 (88%)	1.00 (ref)	
No	149 (45%)	65 (28%)	85 (30%)	49 (18%)	20 (12%)	2.55 (2.04–3.19)	
<b>Childhood vaccines are safe</b>							<0.0001
Yes	286 (86%)	210 (92%)	251 (90%)	262 (97%)	162 (98%)	1.00 (ref)	
No	46 (14%)	19 (8%)	28 (10%)	9 (3%)	4 (2%)	2.49 (1.73–3.59)	
<b>Confidence in COVID-19 vaccine effectiveness<sup>h</sup></b>	1.8 (1.1)	2.1 (1.0)	2.5 (1.0)	3.1 (1.1)	3.7 (1.3)	0.39 (0.36–0.43)	<0.0001
<b>Confidence in COVID-19 vaccine safety<sup>h</sup></b>	1.8 (1.1)	2.2 (1.1)	2.6 (1.0)	3.2 (1.1)	3.8 (1.3)	0.40 (0.36–0.44)	<0.0001
<b>COMMUNITY CHARACTERISTICS</b>							
<b>Urban/rural status</b>							0.06
Urban/suburban resident	281 (83%)	188 (82%)	232 (82%)	211 (77%)	132 (79%)	1.00 (ref)	
Rural resident	56 (17%)	42 (18%)	51 (18%)	62 (23%)	35 (21%)	0.79 (0.62–1.01)	
<b>State influenza vaccination ranking</b>	59.8 (3.5)	59.8 (3.5)	59.8 (3.6)	59.5 (3.6)	59.8 (3.4)	1.01 (0.98–1.04)	0.52
<b>Area Deprivation Index ranking 2018 (per 1 unit increase)</b>	74.1 (21.5)	72.2 (22.3)	73.3 (22.0)	72.6 (22.2)	76.6 (20.9)	1.00 (0.99–1.00)	0.53
<b>COVID-19 community burden</b>	21.1 (12.4)	21.0 (13.7)	22.1 (13.2)	24.0 (15.3)	22.7 (14.2)	0.99 (0.98–1.00)	0.01
<b>Unacast social distancing grade</b>	0.95 (0.12)	0.93 (0.15)	0.92 (0.15)	0.92 (0.14)	0.92 (0.14)	1.94 (0.97–3.88)	0.06
<b>Pandemic Vulnerability Index</b>	0.56 (0.04)	0.56 (0.04)	0.56 (0.04)	0.56 (0.04)	0.56 (0.04)	2.43 (0.19–30.60)	0.49

<sup>a</sup>Presented as n (%) for categorical variables and mean (standard deviation) for continuous variables.

<sup>b</sup>Odds ratios and p-values were derived from proportional odds models additionally adjusted for age. The six specific chronic diseases were additionally adjusted for each other.

<sup>c</sup>Scored as 1 – Excellent, 2 – Very good, 3 – Good, 4 – Okay, 5 – Poor.

<sup>d</sup>Scored as 1 – Extremely, 2 – Quite a bit, 3 – Somewhat, 4 – A little bit, 5 – Not at all.

<sup>e</sup>Sum of days per week for each of washing hands or using sanitizer frequently, cleaning surfaces touched, wearing face masks, and keeping 6 feet away from others. Range from 0 to 28

<sup>f</sup>Sum of days per week for each of avoiding large gatherings, avoiding restaurants or bars, and following government guidelines. Range from 0 to 21

<sup>g</sup>Scored as 1- Very unlikely, 2- Somewhat unlikely, 3 – Neither unlikely nor likely, 4 – Somewhat likely, 5 – Very likely.

<sup>h</sup>Scored as 1 – Very unconfident, 2 – Somewhat unconfident, 3 – Neither unconfident nor confident, 4 – Somewhat confident, 5 – Very confident.



Appendix Table 3B. Simple associations between individual and community characteristics and intent to receive COVID-19 Vaccination – White Females.

CHARACTERISTICS <sup>a</sup>	White females					OR (95% CI) <sup>b</sup>	p-Value
	Very unlikely	Somewhat unlikely	Neither likely nor unlikely	Somewhat likely	Very likely		
	n = 291	n = 114	n = 214	n = 332	n = 530		
<b>INDIVIDUAL CHARACTERISTICS</b>							
<b>Age (per 1 year)</b>	65.6 (7.7)	67.3 (7.5)	66.8 (7.5)	67.9 (7.8)	67.9 (7.4)	0.98 (0.96–0.99)	<0.0001
<b>Educational attainment</b>							<0.0001
Less than high school	14 (5%)	4 (4%)	12 (6%)	7 (2%)	13 (2%)	1.15 (0.69–1.92)	
High school or some college	180 (63%)	72 (63%)	119 (56%)	144 (44%)	210 (40%)	1.00 (ref)	
College or above	94 (33%)	38 (33%)	82 (39%)	180 (54%)	306 (58%)	0.48 (0.40–0.58)	
<b>Household income</b>							<0.0001
<\$15000	58 (20%)	23 (20%)	33 (15%)	41 (12%)	55 (10%)	1.00 (ref)	
\$15000 to \$49999	130 (45%)	55 (48%)	92 (43%)	130 (39%)	182 (34%)	0.82 (0.62–1.09)	
\$50000+	103 (35%)	36 (32%)	89 (42%)	160 (48%)	292 (55%)	0.46 (0.34–0.60)	
<b>Any chronic disease</b>							0.03
No	67 (23%)	28 (25%)	51 (24%)	86 (26%)	151 (29%)	1.00 (ref)	
Yes	220 (77%)	86 (75%)	162 (76%)	243 (74%)	372 (71%)	1.27 (1.03–1.57)	
<b>Diabetes</b>							0.09
No	199 (70%)	79 (70%)	147 (69%)	251 (76%)	407 (77%)	1.00 (ref)	
Yes	87 (30%)	34 (30%)	66 (31%)	78 (24%)	120 (23%)	1.22 (0.97–1.54)	
<b>Chronic lung disease</b>							0.11
No	191 (67%)	78 (69%)	159 (76%)	230 (73%)	395 (76%)	1.00 (ref)	
Yes	92 (33%)	35 (31%)	51 (24%)	86 (27%)	122 (24%)	1.19 (0.96–1.49)	
<b>Cardiovascular disease</b>							0.04
No	117 (40%)	46 (40%)	80 (38%)	148 (45%)	248 (47%)	1.00 (ref)	
Yes	172 (60%)	68 (60%)	133 (62%)	183 (55%)	280 (53%)	1.24 (1.01–1.52)	
<b>Kidney disease</b>							0.04
No	275 (96%)	108 (96%)	198 (94%)	314 (96%)	491 (94%)	1.00 (ref)	
Yes	10 (4%)	4 (4%)	12 (6%)	14 (4%)	31 (6%)	0.62 (0.39–0.97)	
<b>Cancer under active treatment</b>							0.32
No	276 (95%)	109 (96%)	203 (95%)	319 (96%)	500 (95%)	1.00 (ref)	
Yes	15 (5%)	5 (4%)	10 (5%)	12 (4%)	29 (5%)	0.80 (0.51–1.25)	
<b>Other chronic disease</b>							0.14
No	224 (79%)	88 (79%)	166 (79%)	258 (79%)	437 (84%)	1.00 (ref)	
Yes	59 (21%)	24 (21%)	44 (21%)	69 (21%)	86 (16%)	1.20 (0.94–1.53)	
<b>Body mass index (kg/m<sup>2</sup>)</b>	30.4 (8.5)	29.5 (9.0)	30.7 (8.8)	29.2 (9.0)	28.2 (7.3)	1.02 (1.01–1.03)	0.001
<b>Self-reported health status</b>							0.05
Excellent	35 (12%)	12 (11%)	28 (13%)	31 (9%)	85 (16%)	1.00 (ref)	
Very good	109 (37%)	49 (43%)	67 (31%)	131 (39%)	222 (42%)	1.19 (0.89–1.60)	
Good	103 (35%)	34 (30%)	84 (39%)	103 (31%)	160 (30%)	1.42 (1.05–1.93)	
Fair	36 (12%)	18 (16%)	30 (14%)	61 (18%)	47 (9%)	1.57 (1.10–2.26)	
Poor	8 (3%)	1 (1%)	5 (2%)	6 (2%)	16 (3%)	1.00 (0.53–1.91)	
<b>Smoking status</b>							0.04
nonsmoker	254 (87%)	99 (87%)	190 (89%)	299 (90%)	491 (93%)	1.00 (ref)	
Current smoker	37 (13%)	15 (13%)	24 (11%)	33 (10%)	39 (7%)	1.38 (1.01–1.88)	
<b>Employment status</b>							0.13
Not currently employed	201 (69%)	81 (71%)	144 (67%)	227 (68%)	368 (69%)	1.00 (ref)	
Currently employed	90 (31%)	33 (29%)	70 (33%)	105 (32%)	162 (31%)	0.85 (0.69–1.05)	
<b>Time spent working within 6 ft of others (hours/day)</b>							0.94
0	31 (34%)	13 (39%)	27 (39%)	34 (33%)	65 (40%)	1.00 (ref)	
0.1 to <1	16 (18%)	5 (15%)	18 (26%)	24 (23%)	31 (19%)	1.02 (0.65–1.61)	
1 to <3	6 (7%)	7 (21%)	6 (9%)	12 (12%)	15 (9%)	1.05 (0.59–1.89)	
≥3	37 (41%)	8 (24%)	19 (27%)	34 (33%)	51 (31%)	1.13 (0.76–1.69)	
<b>Household composition</b>							<0.0001
Lives alone	93 (32%)	31 (28%)	70 (33%)	101 (31%)	185 (35%)	1.00 (ref)	
Lives with other adult(s) and no children	157 (55%)	75 (67%)	125 (60%)	206 (63%)	322 (61%)	0.96 (0.78–1.18)	
Lives with child(ren)	37 (13%)	6 (5%)	14 (7%)	18 (6%)	19 (4%)	2.27 (1.52–3.40)	
<b>Spirituality/religiosity</b>							<0.0001
Very	175 (61%)	68 (60%)	102 (48%)	152 (46%)	245 (46%)	1.00 (ref)	
Fairly	87 (30%)	28 (25%)	83 (39%)	134 (40%)	199 (38%)	0.68 (0.56–0.84)	
Slightly/Not at all	25 (9%)	18 (16%)	27 (13%)	45 (14%)	85 (16%)	0.60 (0.45–0.80)	
<b>Health insurance status</b>							0.002
Any Medicare/Medicaid	187 (64%)	75 (66%)	137 (64%)	228 (69%)	351 (66%)	1.00 (ref)	
Any private/no Medicare or Medicaid	72 (25%)	30 (27%)	61 (29%)	83 (25%)	151 (28%)	0.71 (0.56–0.91)	
Only military/other	16 (6%)	6 (5%)	9 (4%)	13 (4%)	21 (4%)	1.02 (0.64–1.62)	
No health insurance	16 (6%)	2 (2%)	7 (3%)	8 (2%)	7 (1%)	1.81 (1.00–3.27)	
<b>Self-rated reading ability<sup>c</sup></b>	1.3 (0.7)	1.4 (0.6)	1.3 (0.7)	1.2 (0.5)	1.2 (0.5)	1.37 (1.17–1.60)	<0.0001
<b>Confidence in filling out medical forms<sup>d</sup></b>	1.3 (0.7)	1.5 (0.7)	1.3 (0.7)	1.2 (0.5)	1.2 (0.6)	1.25 (1.08–1.46)	0.003
<b>Need help reading materials from doctors</b>							1
No	282 (98%)	109 (96%)	204 (97%)	321 (98%)	507 (97%)	1.00 (ref)	
Yes	7 (2%)	5 (4%)	7 (3%)	5 (2%)	15 (3%)	1.00 (0.56–1.77)	

(Continued)

Appendix Table 3B. (Continued).

CHARACTERISTICS <sup>a</sup>	White females					OR (95% CI) <sup>b</sup>	p-Value
	Very unlikely n = 291	Somewhat unlikely n = 114	Neither likely nor unlikely n = 214	Somewhat likely n = 332	Very likely n = 530		
<b>Experience of discrimination in healthcare due to race or socioeconomic status</b>							0.001
No experience	243 (84%)	96 (84%)	187 (87%)	300 (90%)	485 (92%)	1.00 (ref)	
Experienced discrimination	38 (13%)	14 (12%)	21 (10%)	20 (6%)	30 (6%)	1.85 (1.33–2.59)	
Unknown	10 (3%)	4 (4%)	6 (3%)	12 (4%)	15 (3%)	1.17 (0.70–1.97)	
<b>COVID-19 preventive behaviors</b>							
Personal protective behaviors score <sup>e</sup>	23.7 (6.9)	25.0 (5.1)	25.7 (4.4)	25.3 (4.5)	25.4 (3.9)	0.96 (0.94–0.98)	<0.0001
Community protective behaviors score <sup>f</sup>	15.6 (7.2)	17.6 (5.1)	18.2 (4.5)	18.1 (4.6)	18.7 (4.0)	0.93 (0.92–0.95)	<0.0001
<b>Perceived likelihood of getting COVID-19<sup>g</sup></b>	2.1 (1.1)	2.3 (1.0)	2.5 (1.1)	2.5 (1.0)	2.5 (1.1)	0.78 (0.71–0.85)	<0.0001
<b>Perceived likelihood of surviving COVID-19<sup>g</sup></b>	3.9 (1.3)	3.6 (1.4)	3.6 (1.2)	3.6 (1.3)	3.7 (1.3)	1.01 (0.94–1.09)	0.73
<b>COVID-19 testing</b>							0.07
Never tested	201 (69%)	79 (69%)	136 (64%)	197 (60%)	328 (62%)	1.00 (ref)	
Tested negative	84 (29%)	33 (29%)	69 (33%)	129 (39%)	184 (35%)	0.80 (0.65–0.97)	
Ever tested positive	6 (2%)	2 (2%)	6 (3%)	4 (1%)	13 (2%)	0.82 (0.43–1.57)	
<b>Household member tested positive for COVID-19</b>							0.67
No	192 (98%)	81 (98%)	137 (96%)	221 (97%)	334 (97%)	1.00 (ref)	
Yes	4 (2%)	2 (2%)	6 (4%)	7 (3%)	11 (3%)	0.87 (0.45–1.67)	
<b>Had an influenza vaccination in 2019–2021</b>							<0.0001
Yes	147 (51%)	79 (69%)	159 (75%)	299 (90%)	501 (95%)	1.00 (ref)	
No	141 (49%)	35 (31%)	54 (25%)	33 (10%)	28 (5%)	6.69 (5.20–8.60)	
<b>Childhood vaccines are safe</b>							<0.0001
Yes	235 (82%)	103 (91%)	202 (96%)	328 (99%)	526 (99.6%)	1.00 (ref)	
No	53 (18%)	10 (9%)	8 (4%)	3 (1%)	2 (0.4%)	12.13 (7.31–20.15)	
<b>Confidence in COVID-19 vaccine effectiveness<sup>h</sup></b>	2.1 (1.3)	2.2 (0.9)	2.7 (1.0)	3.3 (1.1)	3.9 (1.1)	0.40 (0.37–0.44)	<0.0001
<b>Confidence in COVID-19 vaccine safety<sup>h</sup></b>	2.2 (1.3)	2.2 (1.0)	2.7 (1.0)	3.3 (1.1)	3.9 (1.1)	0.41 (0.38–0.45)	<0.0001
<b>COMMUNITY CHARACTERISTICS</b>							
<b>Urban/rural status</b>							0.0001
Urban/suburban resident	204 (70%)	83 (73%)	172 (80%)	253 (76%)	439 (83%)	1.00 (ref)	
Rural resident	87 (30%)	31 (27%)	42 (20%)	79 (24%)	91 (17%)	1.54 (1.23–1.92)	
<b>State influenza vaccination ranking</b>	60.6 (4.0)	61.2 (4.0)	60.8 (4.5)	60.4 (4.2)	60.9 (4.1)	1.00 (0.97–1.02)	0.66
<b>Area Deprivation Index ranking 2018 (per 1 unit increase)</b>	65.3 (22.4)	65.3 (22.5)	60.1 (24.7)	56.5 (25.5)	52.0 (24.9)	1.02 (1.01–1.02)	<0.0001
<b>COVID-19 community burden</b>	24.4 (15.8)	22.9 (14.2)	24.0 (17.5)	24.7 (15.0)	23.4 (15.3)	1.00 (1.00–1.01)	0.54
<b>Unacast social distancing grade</b>	0.90 (0.17)	0.89 (0.19)	0.94 (0.14)	0.92 (0.15)	0.94 (0.13)	0.31 (0.17–0.56)	0.0001
<b>Pandemic Vulnerability Index</b>	0.54 (0.04)	0.54 (0.05)	0.54 (0.05)	0.54 (0.04)	0.53 (0.05)	2.23 (0.30–16.61)	0.44

<sup>a</sup>Presented as n (%) for categorical variables and mean (standard deviation) for continuous variables.

<sup>b</sup>Odds ratios and p-values were derived from proportional odds models additionally adjusted for age. The six specific chronic diseases were additionally adjusted for each other.

<sup>c</sup>Scored as 1 – Excellent, 2 – Very good, 3 – Good, 4 – Okay, 5 – Poor.

<sup>d</sup>Scored as 1 – Extremely, 2 – Quite a bit, 3 – Somewhat, 4 – A little bit, 5 – Not at all.

<sup>e</sup>Sum of days per week for each of washing hands or using sanitizer frequently, cleaning surfaces touched, wearing face masks, and keeping 6 feet away from others. Range from 0 to 28

<sup>f</sup>Sum of days per week for each of avoiding large gatherings, avoiding restaurants or bars, and following government guidelines. Range from 0 to 21

<sup>g</sup>Scored as 1- Very unlikely, 2- Somewhat unlikely, 3 – Neither unlikely nor likely, 4 – Somewhat likely, 5 – Very likely.

<sup>h</sup>Scored as 1 – Very unconfident, 2 – Somewhat unconfident, 3 – Neither unconfident nor confident, 4 – Somewhat confident, 5 – Very confident.

Appendix Table 3C. Simple associations between individual and community characteristics and intent to receive COVID-19 vaccination – Black males.

CHARACTERISTICS <sup>a</sup>	Black males					OR (95% CI) <sup>b</sup>	p-Value
	Very unlikely n = 88	Somewhat unlikely n = 63	Neither likely nor unlikely n = 75	Somewhat likely n = 119	Very likely n = 80		
<b>INDIVIDUAL CHARACTERISTICS</b>							
<b>Age (per 1 year)</b>	66.4 (8.2)	65.9 (6.9)	66.3 (6.3)	66.1 (6.2)	67.3 (6.2)	0.99 (0.96–1.01)	0.37
<b>Educational attainment</b>							0.82
Less than high school	6 (7%)	5 (8%)	10 (14%)	7 (6%)	6 (8%)	1.06 (0.56–2.01)	
High school or some college	46 (54%)	38 (60%)	39 (53%)	69 (58%)	37 (48%)	1.00 (ref)	
College or above	33 (39%)	20 (32%)	24 (33%)	43 (36%)	34 (44%)	0.90 (0.62–1.31)	
<b>Household income</b>							0.27
<\$15000	23 (26%)	17 (27%)	23 (31%)	23 (19%)	15 (19%)	1.00 (ref)	
\$15000 to \$49999	32 (36%)	23 (37%)	29 (39%)	48 (40%)	29 (36%)	0.77 (0.49–1.20)	
\$50000+	33 (38%)	23 (37%)	22 (30%)	48 (40%)	36 (45%)	0.69 (0.44–1.08)	
<b>Any chronic disease</b>							0.06
No	15 (17%)	11 (17%)	5 (7%)	12 (10%)	8 (10%)	1.00 (ref)	
Yes	71 (83%)	52 (83%)	69 (93%)	106 (90%)	72 (90%)	0.61 (0.36–1.02)	
<b>Diabetes</b>							0.43
No	44 (50%)	30 (49%)	34 (46%)	66 (56%)	36 (46%)	1.00 (ref)	
Yes	44 (50%)	31 (51%)	40 (54%)	52 (44%)	43 (54%)	1.17 (0.80–1.70)	
<b>Chronic lung disease</b>							0.79
No	65 (77%)	45 (73%)	55 (76%)	91 (80%)	60 (76%)	1.00 (ref)	
Yes	19 (23%)	17 (27%)	17 (24%)	23 (20%)	19 (24%)	1.06 (0.69–1.62)	
<b>Cardiovascular disease</b>							0.07
No	28 (32%)	15 (24%)	13 (18%)	26 (22%)	14 (18%)	1.00 (ref)	
Yes	60 (68%)	48 (76%)	61 (82%)	93 (78%)	65 (82%)	0.67 (0.43–1.04)	
<b>Kidney disease</b>							0.21
No	77 (96%)	60 (98%)	65 (89%)	105 (90%)	69 (88%)	1.00 (ref)	
Yes	3 (4%)	1 (2%)	8 (11%)	12 (10%)	9 (12%)	0.65 (0.33–1.28)	
<b>Cancer under active treatment</b>							0.51
No	83 (95%)	59 (95%)	73 (97%)	109 (92%)	74 (93%)	1.00 (ref)	
Yes	4 (5%)	3 (5%)	2 (3%)	10 (8%)	6 (8%)	0.78 (0.36–1.65)	
<b>Other chronic disease</b>							0.5
No	72 (85%)	45 (71%)	59 (81%)	81 (70%)	64 (80%)	1.00 (ref)	
Yes	13 (15%)	18 (29%)	14 (19%)	35 (30%)	16 (20%)	0.86 (0.56–1.33)	
<b>Body mass index (kg/m<sup>2</sup>)</b>	28.3 (5.6)	31.2 (6.2)	31.0 (7.2)	29.6 (5.7)	29.5 (6.4)	0.99 (0.96–1.02)	0.53
<b>Self-reported health status</b>							0.7
Excellent	10 (11%)	1 (2%)	4 (5%)	7 (6%)	7 (9%)	1.00 (ref)	
Very good	35 (40%)	19 (30%)	21 (28%)	35 (29%)	24 (30%)	1.06 (0.52–2.17)	
Good	32 (36%)	25 (40%)	39 (52%)	45 (38%)	38 (48%)	0.81 (0.40–1.62)	
Fair	10 (11%)	16 (25%)	10 (13%)	30 (25%)	9 (11%)	0.84 (0.39–1.80)	
Poor	1 (1%)	2 (3%)	1 (1%)	2 (2%)	2 (3%)	0.69 (0.17–2.77)	
<b>Smoking status</b>							0.53
nonsmoker	74 (84%)	54 (86%)	58 (77%)	97 (82%)	66 (83%)	1.00 (ref)	
Current smoker	14 (16%)	9 (14%)	17 (23%)	22 (18%)	14 (18%)	0.87 (0.55–1.36)	
<b>Employment status</b>							0.72
Not currently employed	60 (68%)	41 (65%)	60 (80%)	82 (69%)	57 (72%)	1.00 (ref)	
Currently employed	28 (32%)	22 (35%)	15 (20%)	37 (31%)	22 (28%)	1.07 (0.73–1.57)	
<b>Time spent working within 6 ft of others (hours/day)</b>							0.59
0	12 (43%)	6 (27%)	6 (40%)	6 (16%)	8 (36%)	1.00 (ref)	
0.1 to <1	9 (32%)	6 (27%)	4 (27%)	16 (43%)	8 (36%)	0.59 (0.27–1.28)	
1 to <3	2 (7%)	2 (9%)	1 (7%)	4 (11%)	1 (5%)	0.76 (0.22–2.62)	
≥3	5 (18%)	8 (36%)	4 (27%)	11 (30%)	5 (23%)	0.67 (0.30–1.54)	
<b>Household composition</b>							0.4
Lives alone	26 (30%)	17 (28%)	26 (35%)	31 (27%)	19 (24%)	1.00 (ref)	
Lives with other adult(s) and no children	54 (61%)	35 (57%)	45 (60%)	71 (61%)	49 (61%)	0.89 (0.60–1.31)	
Lives with child(ren)	8 (9%)	9 (15%)	4 (5%)	14 (12%)	12 (15%)	0.66 (0.36–1.20)	
<b>Spirituality/religiosity</b>							0.09
Very	54 (64%)	38 (61%)	41 (56%)	64 (54%)	37 (48%)	1.00 (ref)	
Fairly	23 (27%)	19 (31%)	20 (27%)	43 (36%)	29 (38%)	0.67 (0.46–0.98)	
Slightly/Not at all	8 (9%)	5 (8%)	12 (16%)	11 (9%)	11 (14%)	0.70 (0.40–1.22)	
<b>Health insurance status</b>							0.06
Any Medicare/Medicaid	53 (60%)	38 (60%)	56 (75%)	79 (66%)	52 (66%)	1.00 (ref)	
Any private/no Medicare or Medicaid	15 (17%)	14 (22%)	9 (12%)	30 (25%)	17 (22%)	0.84 (0.53–1.33)	
Only military/other	13 (15%)	7 (11%)	9 (12%)	7 (6%)	7 (9%)	1.64 (0.91–2.96)	
No health insurance	7 (8%)	4 (6%)	1 (1%)	3 (3%)	3 (4%)	2.22 (0.92–5.35)	
<b>Self-rated reading ability<sup>c</sup></b>	1.7 (1.0)	1.8 (1.0)	1.9 (1.1)	1.7 (0.9)	1.6 (0.8)	1.09 (0.92–1.31)	0.32
<b>Confidence in filling out medical forms<sup>d</sup></b>	1.4 (0.9)	1.5 (0.8)	1.7 (1.0)	1.5 (0.9)	1.3 (0.7)	1.06 (0.88–1.29)	0.54
<b>Need help reading materials from doctors</b>							0.74
No	78 (93%)	54 (93%)	61 (86%)	106 (94%)	71 (93%)	1.00 (ref)	
Yes	6 (7%)	4 (7%)	10 (14%)	7 (6%)	5 (7%)	1.11 (0.59–2.11)	

(Continued)

Appendix Table 3C. (Continued).

CHARACTERISTICS <sup>a</sup>	Black males					OR (95% CI) <sup>b</sup>	p-Value
	Very unlikely n = 88	Somewhat unlikely n = 63	Neither likely nor unlikely n = 75	Somewhat likely n = 119	Very likely n = 80		
<b>Experience of discrimination in healthcare due to race or socioeconomic status</b>							0.08
No experience	59 (67%)	45 (71%)	52 (69%)	88 (74%)	67 (84%)	1.00 (ref)	
Experienced discrimination	19 (22%)	10 (16%)	11 (15%)	19 (16%)	9 (11%)	1.55 (0.97–2.47)	
Unknown	10 (11%)	8 (13%)	12 (16%)	12 (10%)	4 (5%)	1.57 (0.90–2.73)	
<b>COVID-19 preventive behaviors</b>							
Personal protective behaviors score <sup>e</sup>	25.5 (4.8)	26.7 (2.4)	26.1 (4.2)	26.1 (3.6)	25.5 (4.4)	1.01 (0.96–1.05)	0.82
Community protective behaviors score <sup>f</sup>	18.4 (4.9)	20.0 (2.2)	18.4 (4.4)	18.8 (4.6)	19.3 (3.7)	0.99 (0.95–1.03)	0.54
<b>Perceived likelihood of getting COVID-19<sup>g</sup></b>	2.1 (1.1)	2.5 (0.9)	2.3 (1.0)	2.6 (1.0)	2.5 (1.2)	0.75 (0.63–0.88)	0.0005
<b>Perceived likelihood of surviving COVID-19<sup>g</sup></b>	3.8 (1.4)	3.5 (1.4)	3.9 (1.3)	3.8 (1.2)	4.0 (1.2)	0.92 (0.80–1.05)	0.21
<b>COVID-19 testing</b>							0.13
Never tested	55 (63%)	32 (51%)	42 (56%)	60 (51%)	38 (48%)	1.00 (ref)	
Tested negative	30 (34%)	27 (43%)	30 (40%)	55 (47%)	38 (48%)	0.70 (0.49–0.99)	
Ever tested positive	2 (2%)	4 (6%)	3 (4%)	3 (3%)	4 (5%)	0.73 (0.30–1.81)	
<b>Household member tested positive for COVID-19</b>							0.08
No	60 (97%)	44 (100%)	48 (98%)	80 (93%)	57 (93%)	1.00 (ref)	
Yes	2 (3%)	0	1 (2%)	6 (7%)	4 (7%)	0.41 (0.15–1.12)	
<b>Had an influenza vaccination in 2019–2021</b>							<0.0001
Yes	43 (50%)	50 (79%)	42 (57%)	91 (77%)	65 (81%)	1.00 (ref)	
No	43 (50%)	13 (21%)	22 (43%)	27 (23%)	15 (19%)	2.20 (1.51–3.21)	
<b>Childhood vaccines are safe</b>							0.0006
Yes	72 (83%)	56 (90%)	70 (95%)	112 (97%)	75 (94%)	1.00 (ref)	
No	15 (17%)	6 (10%)	4 (5%)	3 (3%)	5 (6%)	3.15 (1.64–6.04)	
<b>Confidence in COVID-19 vaccine effectiveness<sup>h</sup></b>	2.0 (1.3)	2.2 (1.0)	2.9 (1.0)	3.4 (1.0)	4.0 (1.1)	0.38 (0.33–0.45)	<0.0001
<b>Confidence in COVID-19 vaccine safety<sup>h</sup></b>	2.1 (1.3)	2.2 (1.0)	3.0 (1.0)	3.4 (1.0)	3.9 (1.2)	0.41 (0.35–0.48)	<0.0001
<b>COMMUNITY CHARACTERISTICS</b>							
<b>Urban/rural status</b>							0.35
Urban/suburban resident	69 (78%)	51 (81%)	57 (76%)	92 (77%)	69 (86%)	1.00 (ref)	
Rural resident	19 (22%)	12 (19%)	18 (24%)	27 (23%)	11 (14%)	1.22 (0.80–1.86)	
<b>State influenza vaccination ranking</b>	59.9 (3.5)	59.7 (3.7)	59.5 (3.9)	59.7 (3.5)	59.7 (3.2)	1.01 (0.96–1.06)	0.73
<b>Area Deprivation Index ranking 2018 (per 1 unit increase)</b>	71.0 (26.1)	70.9 (22.4)	75.6 (21.3)	73.2 (22.2)	68.8 (26.3)	1.00 (0.99–1.01)	0.71
<b>COVID-19 community burden</b>	20.7 (11.8)	23.0 (12.5)	23.0 (14.2)	24.5 (16.1)	23.6 (13.3)	0.99 (0.98–1.00)	0.13
<b>Unacast social distancing grade</b>	0.92 (0.14)	0.94 (0.13)	0.91 (0.17)	0.93 (0.13)	0.94 (0.12)	0.54 (0.16–1.84)	0.32
<b>Pandemic Vulnerability Index</b>	0.56 (0.04)	0.57 (0.03)	0.56 (0.04)	0.57 (0.03)	0.56 (0.03)	1.11 (0.01–130.82)	0.97

<sup>a</sup>Presented as n (%) for categorical variables and mean (standard deviation) for continuous variables.

<sup>b</sup>Odds ratios and p-values were derived from proportional odds models additionally adjusted for age. The six specific chronic diseases were additionally adjusted for each other.

<sup>c</sup>Scored as 1 – Excellent, 2 – Very good, 3 – Good, 4 – Okay, 5 – Poor.

<sup>d</sup>Scored as 1 – Extremely, 2 – Quite a bit, 3 – Somewhat, 4 – A little bit, 5 – Not at all.

<sup>e</sup>Sum of days per week for each of washing hands or using sanitizer frequently, cleaning surfaces touched, wearing face masks, and keeping 6 feet away from others. Range from 0 to 28

<sup>f</sup>Sum of days per week for each of avoiding large gatherings, avoiding restaurants or bars, and following government guidelines. Range from 0 to 21

<sup>g</sup>Scored as 1- Very unlikely, 2- Somewhat unlikely, 3 – Neither unlikely nor likely, 4 – Somewhat likely, 5 – Very likely.

<sup>h</sup>Scored as 1 – Very unconfident, 2 – Somewhat unconfident, 3 – Neither unconfident nor confident, 4 – Somewhat confident, 5 – Very confident.

Appendix Table 3D. Simple associations between individual and community characteristics and intent to receive COVID-19 vaccination – White males.

CHARACTERISTICS	White males					OR (95% CI) <sup>b</sup>	p-Value
	Very unlikely	Somewhat unlikely	Neither likely nor unlikely	Somewhat likely	Very likely		
	n = 107	n = 68	n = 72	n = 196	n = 558		
<b>INDIVIDUAL CHARACTERISTICS<sup>a</sup></b>							
<b>Age (per 1 year)</b>	66.8 (7.0)	67.5 (8.3)	66.5 (6.4)	70.3 (7.4)	71.0 (7.3)	0.95 (0.93–0.96)	<0.0001
<b>Educational attainment</b>							<0.0001
Less than high school	1 (1%)	1 (1%)	3 (4%)	1 (1%)	5 (1%)	0.91 (0.30–2.73)	
High school or some college	49 (46%)	33 (49%)	38 (53%)	70 (36%)	141 (25%)	1.00 (ref)	
College or above	56 (53%)	34 (50%)	31 (43%)	125 (64%)	410 (74%)	0.51 (0.40–0.66)	
<b>Household income</b>							<0.0001
<\$15000	15 (14%)	9 (13%)	16 (22%)	15 (8%)	23 (4%)	1.00 (ref)	
\$15000 to \$49999	27 (25%)	23 (34%)	24 (33%)	46 (23%)	108 (19%)	0.66 (0.41–1.06)	
\$50000+	65 (61%)	36 (53%)	32 (44%)	135 (69%)	426 (76%)	0.40 (0.26–0.62)	
<b>Any chronic disease</b>							0.59
No	25 (23%)	17 (26%)	7 (10%)	35 (18%)	112 (20%)	1.00 (ref)	
Yes	82 (77%)	49 (74%)	64 (90%)	160 (82%)	437 (80%)	1.09 (0.80–1.47)	
<b>Diabetes</b>							0.79
No	73 (69%)	54 (79%)	50 (69%)	134 (69%)	395 (71%)	1.00 (ref)	
Yes	33 (31%)	14 (21%)	22 (31%)	61 (31%)	158 (29%)	0.96 (0.72–1.29)	
<b>Chronic lung disease</b>							0.19
No	79 (76%)	49 (74%)	50 (72%)	148 (77%)	437 (80%)	1.00 (ref)	
Yes	25 (24%)	17 (26%)	19 (28%)	45 (23%)	106 (20%)	1.22 (0.90–1.66)	
<b>Cardiovascular disease</b>							0.77
No	39 (36%)	29 (43%)	14 (20%)	62 (32%)	188 (34%)	1.00 (ref)	
Yes	68 (64%)	39 (57%)	57 (80%)	134 (68%)	368 (66%)	1.04 (0.79–1.37)	
<b>Kidney disease</b>							0.7
No	100 (95%)	61 (92%)	67 (93%)	185 (96%)	524 (95%)	1.00 (ref)	
Yes	5 (5%)	5 (8%)	5 (7%)	7 (4%)	27 (5%)	1.12 (0.63–1.97)	
<b>Cancer under active treatment</b>							0.97
No	103 (96%)	64 (94%)	68 (94%)	179 (92%)	521 (94%)	1.00 (ref)	
Yes	4 (4%)	4 (6%)	4 (6%)	16 (8%)	35 (6%)	1.01 (0.60–1.70)	
<b>Other chronic disease</b>							0.57
No	91 (87%)	53 (83%)	56 (79%)	167 (87%)	474 (88%)	1.00 (ref)	
Yes	14 (13%)	11 (17%)	15 (21%)	24 (13%)	64 (12%)	1.12 (0.77–1.62)	
<b>Body mass index (kg/m<sup>2</sup>)</b>	28.4 (5.5)	28.4 (6.1)	29.8 (5.9)	28.0 (5.3)	27.7 (5.7)	1.01 (0.98–1.03)	0.6
<b>Self-reported health status</b>							0.28
Excellent	20 (19%)	9 (13%)	4 (6%)	22 (11%)	88 (16%)	1.00 (ref)	
Very good	50 (47%)	26 (38%)	26 (36%)	88 (45%)	244 (44%)	1.19 (0.82–1.72)	
Good	23 (22%)	21 (31%)	28 (39%)	59 (30%)	164 (29%)	1.16 (0.78–1.72)	
Fair	9 (8%)	9 (13%)	11 (15%)	25 (13%)	55 (10%)	1.26 (0.78–2.03)	
Poor	5 (5%)	3 (4%)	3 (4%)	2 (1%)	7 (1%)	2.64 (1.12–6.22)	
<b>Smoking status</b>							0.25
nonsmoker	99 (93%)	62 (91%)	63 (88%)	176 (90%)	529 (95%)	1.00 (ref)	
Current smoker	8 (7%)	6 (9%)	9 (13%)	20 (10%)	29 (5%)	1.30 (0.83–2.04)	
<b>Employment status</b>							0.66
Not currently employed	64 (60%)	47 (69%)	52 (72%)	136 (69%)	407 (73%)	1.00 (ref)	
Currently employed	42 (40%)	21 (31%)	20 (28%)	60 (31%)	150 (27%)	0.94 (0.71–1.25)	
<b>Time spent working within 6 ft of others (hours/day)</b>							0.007
0	7 (17%)	8 (38%)	3 (15%)	20 (33%)	60 (40%)	1.00 (ref)	
0.1 to <1	7 (17%)	2 (10%)	12 (60%)	18 (30%)	41 (27%)	1.51 (0.85–2.68)	
1 to <3	11 (26%)	7 (33%)	2 (10%)	8 (13%)	19 (13%)	2.75 (1.43–5.28)	
≥3	17 (40%)	4 (19%)	3 (15%)	14 (23%)	30 (20%)	2.29 (1.27–4.13)	
<b>Household composition</b>							0.18
Lives alone	22 (21%)	11 (16%)	11 (15%)	34 (18%)	72 (13%)	1.00 (ref)	
Lives with other adult(s) and no children	78 (74%)	52 (78%)	55 (76%)	145 (76%)	455 (82%)	0.74 (0.53–1.03)	
Lives with child(ren)	6 (6%)	4 (6%)	6 (8%)	12 (6%)	26 (5%)	0.87 (0.48–1.55)	
<b>Spirituality/religiosity</b>							0.0001
Very	52 (50%)	27 (40%)	36 (50%)	74 (38%)	177 (32%)	1.00 (ref)	
Fairly	32 (30%)	26 (38%)	28 (39%)	73 (37%)	217 (39%)	0.66 (0.50–0.87)	
Slightly/Not at all	21 (20%)	15 (22%)	8 (11%)	49 (25%)	161 (29%)	0.52 (0.38–0.71)	
<b>Health insurance status</b>							0.005
Any Medicare/Medicaid	65 (62%)	45 (66%)	48 (67%)	146 (75%)	420 (76%)	1.00 (ref)	
Any private/no Medicare or Medicaid	27 (26%)	14 (21%)	15 (21%)	35 (18%)	114 (21%)	0.70 (0.50–0.99)	
Only military/other	10 (10%)	7 (10%)	4 (6%)	9 (5%)	18 (3%)	1.79 (1.03–3.09)	
No health insurance	3 (3%)	2 (3%)	5 (7%)	5 (3%)	4 (1%)	1.61 (0.69–3.77)	
<b>Self-rated reading ability<sup>c</sup></b>	1.5 (0.8)	1.5 (0.8)	1.6 (0.8)	1.4 (0.7)	1.3 (0.7)	1.32 (1.12–1.56)	0.0009
<b>Confidence in filling out medical forms<sup>d</sup></b>	1.4 (0.7)	1.6 (1.0)	1.5 (0.7)	1.4 (0.7)	1.3 (0.6)	1.37 (1.15–1.62)	0.0004
<b>Need help reading materials from doctors</b>							0.5
No	102 (97%)	63 (95%)	67 (96%)	184 (95%)	541 (98%)	1.00 (ref)	
Yes	3 (3%)	3 (5%)	3 (4%)	9 (5%)	11 (2%)	1.26 (0.64–2.51)	

(Continued)

Appendix Table 3D. (Continued).

CHARACTERISTICS	White males					OR (95% CI) <sup>b</sup>	p-Value
	Very unlikely n = 107	Somewhat unlikely n = 68	Neither likely nor unlikely n = 72	Somewhat likely n = 196	Very likely n = 558		
<b>Experience of discrimination in healthcare due to race or socioeconomic status</b>							0.02
No experience	92 (86%)	61 (90%)	60 (83%)	187 (95%)	532 (95%)	1.00 (ref)	
Experienced discrimination	8 (7%)	6 (9%)	7 (10%)	4 (2%)	15 (3%)	1.85 (1.04–3.32)	
Unknown	7 (7%)	1 (1%)	5 (7%)	5 (3%)	11 (2%)	1.99 (1.02–3.90)	
<b>COVID-19 preventive behaviors</b>							
Personal protective behaviors score <sup>e</sup>	20.9 (7.9)	22.1 (6.6)	23.2 (6.5)	23.8 (5.0)	24.1 (4.4)	0.94 (0.92–0.96)	<0.0001
Community protective behaviors score <sup>f</sup>	14.0 (7.7)	15.2 (7.2)	16.1 (6.2)	17.6 (5.2)	18.0 (4.4)	0.94 (0.92–0.96)	<0.0001
<b>Perceived likelihood of getting COVID-19<sup>g</sup></b>	2.0 (1.2)	2.6 (1.1)	2.5 (1.0)	2.4 (0.9)	2.3 (1.0)	0.89 (0.79–1.01)	0.08
<b>Perceived likelihood of surviving COVID-19<sup>g</sup></b>	4.1 (1.3)	3.6 (1.4)	3.6 (1.3)	3.7 (1.1)	3.8 (1.2)	1.01 (0.92–1.12)	0.8
<b>COVID-19 testing</b>							0.69
Never tested	81 (76%)	41 (61%)	46 (64%)	133 (68%)	375 (67%)	1.00 (ref)	
Tested negative	24 (22%)	23 (34%)	24 (33%)	57 (29%)	170 (31%)	0.90 (0.69–1.17)	
Ever tested positive	2 (2%)	3 (4%)	2 (3%)	6 (3%)	11 (2%)	1.11 (0.52–2.38)	
<b>Household member tested positive for COVID-19</b>							0.21
No	82 (96%)	50 (93%)	59 (98%)	154 (96%)	471 (98%)	1.00 (ref)	
Yes	3 (4%)	4 (7%)	1 (2%)	7 (4%)	12 (2%)	1.58 (0.77–3.21)	
<b>Had an influenza vaccination in 2019–2021</b>							<0.0001
Yes	55 (52%)	45 (66%)	52 (72%)	177 (90%)	534 (96%)	1.00 (ref)	
No	51 (48%)	23 (34%)	20 (28%)	19 (10%)	24 (4%)	7.84 (5.52–11.13)	
<b>Childhood vaccines are safe</b>							<0.0001
Yes	86 (82%)	66 (97%)	70 (97%)	194 (99%)	552 (99.6%)	1.00 (ref)	
No	19 (18%)	2 (3%)	2 (3%)	1 (1%)	2 (0.4%)	22.01 (9.16–52.92)	
<b>Confidence in COVID-19 vaccine effectiveness<sup>h</sup></b>	2.5 (1.5)	2.3 (1.2)	2.8 (1.0)	3.4 (1.0)	4.1 (1.1)	0.45 (0.41–0.50)	<0.0001
<b>Confidence in COVID-19 vaccine safety<sup>h</sup></b>	2.5 (1.6)	2.3 (1.2)	2.7 (1.1)	3.4 (1.0)	4.1 (1.1)	0.43 (0.39–0.48)	<0.0001
<b>COMMUNITY CHARACTERISTICS</b>							
<b>Urban/rural status</b>							0.002
Urban/suburban resident	74 (70%)	50 (74%)	46 (64%)	158 (81%)	450 (81%)	1.00 (ref)	
Rural resident	32 (30%)	18 (26%)	26 (36%)	38 (19%)	108 (19%)	1.58 (1.19–2.09)	
<b>State influenza vaccination ranking</b>	61.1 (3.9)	61.9 (4.1)	61.7 (4.0)	61.6 (3.7)	61.6 (3.8)	1.00 (0.97–1.03)	0.93
<b>Area Deprivation Index ranking 2018 (per 1 unit increase)</b>	59.3 (24.6)	57.0 (26.8)	63.0 (24.6)	54.6 (23.2)	49.2 (24.6)	1.01 (1.01–1.02)	<0.0001
<b>COVID-19 community burden</b>	22.7 (15.3)	24.6 (16.1)	21.3 (13.2)	22.8 (14.8)	21.5 (14.3)	1.01 (1.00–1.01)	0.18
<b>Unacast social distancing grade</b>	0.91 (0.17)	0.89 (0.18)	0.89 (0.19)	0.92 (0.14)	0.93 (0.15)	0.35 (0.17–0.75)	0.007
<b>Pandemic Vulnerability Index</b>	0.53 (0.05)	0.53 (0.05)	0.53 (0.05)	0.54 (0.04)	0.53 (0.05)	0.62 (0.05–8.00)	0.71

<sup>a</sup>Presented as n (%) for categorical variables and mean (standard deviation) for continuous variables.

<sup>b</sup>Odds ratios and p-values were derived from proportional odds models additionally adjusted for age. The six specific chronic diseases were additionally adjusted for each other.

<sup>c</sup>Scored as 1 – Excellent, 2 – Very good, 3 – Good, 4 – Okay, 5 – Poor.

<sup>d</sup>Scored as 1 – Extremely, 2 – Quite a bit, 3 – Somewhat, 4 – A little bit, 5 – Not at all.

<sup>e</sup>Sum of days per week for each of washing hands or using sanitizer frequently, cleaning surfaces touched, wearing face masks, and keeping 6 feet away from others. Range from 0 to 28

<sup>f</sup>Sum of days per week for each of avoiding large gatherings, avoiding restaurants or bars, and following government guidelines. Range from 0 to 21

<sup>g</sup>Scored as 1- Very unlikely, 2- Somewhat unlikely, 3 – Neither unlikely nor likely, 4 – Somewhat likely, 5 – Very likely.

<sup>h</sup>Scored as 1 – Very unconfident, 2 – Somewhat unconfident, 3 – Neither unconfident nor confident, 4 – Somewhat confident, 5 – Very confident.

Appendix Table 3E. Simple associations between individual and community characteristics and intent to receive COVID-19 vaccination – all other racial/ethnic groups.

CHARACTERISTICS <sup>a</sup>	All other racial/ethnic groups					OR (95% CI) <sup>b</sup>	p-Value
	Very unlikely	Somewhat unlikely	Neither likely nor unlikely	Somewhat likely	Very likely		
	n = 45	n = 34	n = 57	n = 64	n = 89		
<b>INDIVIDUAL CHARACTERISTICS</b>							
<b>Age (per 1 year)</b>	66.1 (8.5)	64.2 (7.6)	66.4 (7.4)	67.9 (7.9)	68.5 (7.2)	0.97 (0.95–1.00)	0.04
<b>Gender</b>							0.002
Female	34 (76%)	24 (71%)	45 (79%)	34 (53%)	46 (52%)	1.00 (ref)	
Male	11 (24%)	10 (29%)	12 (21%)	30 (47%)	43 (48%)	0.49 (0.31–0.76)	
<b>Educational attainment</b>							0.3
Less than high school	2 (6%)	1 (3%)	4 (8%)	2 (4%)	3 (4%)	1.05 (0.36–3.02)	
High school or some college	20 (61%)	12 (41%)	29 (59%)	23 (47%)	28 (38%)	1.00 (ref)	
College or above	11 (33%)	16 (55%)	16 (33%)	24 (49%)	42 (58%)	0.69 (0.42–1.12)	
<b>Household income</b>							0.04
<\$15000	10 (22%)	6 (18%)	14 (25%)	11 (17%)	11 (12%)	1.00 (ref)	
\$15000 to \$49999	22 (49%)	18 (53%)	21 (37%)	25 (39%)	31 (35%)	1.00 (0.56–1.79)	
\$50000+	13 (29%)	10 (29%)	22 (39%)	28 (44%)	47 (53%)	0.57 (0.31–1.03)	
<b>Any chronic disease</b>							0.22
No	13 (30%)	10 (29%)	7 (13%)	12 (19%)	17 (20%)	1.00 (ref)	
Yes	31 (70%)	24 (71%)	49 (88%)	52 (81%)	70 (80%)	0.73 (0.44–1.21)	
<b>Diabetes</b>							0.06
No	28 (62%)	22 (67%)	32 (56%)	40 (63%)	65 (74%)	1.00 (ref)	
Yes	17 (38%)	11 (33%)	25 (44%)	24 (38%)	23 (26%)	1.60 (0.97–2.62)	
<b>Chronic lung disease</b>							0.85
No	31 (70%)	24 (73%)	40 (70%)	48 (75%)	63 (74%)	1.00 (ref)	
Yes	13 (30%)	9 (27%)	17 (30%)	16 (25%)	22 (26%)	1.05 (0.64–1.73)	
<b>Cardiovascular disease</b>							0.06
No	21 (47%)	14 (41%)	16 (28%)	18 (28%)	29 (33%)	1.00 (ref)	
Yes	24 (53%)	20 (59%)	41 (72%)	46 (72%)	60 (67%)	0.61 (0.37–1.01)	
<b>Kidney disease</b>							0.93
No	43 (96%)	31 (94%)	53 (95%)	60 (97%)	84 (94%)	1.00 (ref)	
Yes	2 (4%)	2 (6%)	3 (5%)	2 (3%)	5 (6%)	0.96 (0.35–2.60)	
<b>Cancer under active treatment</b>							0.77
No	41 (91%)	29 (85%)	54 (95%)	63 (98%)	80 (90%)	1.00 (ref)	
Yes	4 (9%)	5 (15%)	3 (5%)	1 (2%)	9 (10%)	1.13 (0.50–2.55)	
<b>Other chronic disease</b>							0.2
No	37 (82%)	26 (76%)	41 (73%)	53 (83%)	77 (89%)	1.00 (ref)	
Yes	8 (18%)	8 (24%)	15 (27%)	11 (17%)	10 (11%)	1.45 (0.82–2.58)	
<b>Body mass index (kg/m<sup>2</sup>)</b>	30.1 (8.8)	29.6 (6.8)	30.5 (6.7)	28.7 (8.1)	27.3 (5.7)	1.03 (1.00–1.07)	0.04
<b>Self-reported health status</b>							0.31
Excellent	8 (18%)	3 (9%)	8 (14%)	5 (8%)	11 (12%)	1.00 (ref)	
Very good	14 (31%)	14 (41%)	20 (35%)	30 (47%)	42 (47%)	0.75 (0.38–1.47)	
Good	14 (31%)	11 (32%)	18 (32%)	16 (25%)	25 (28%)	0.89 (0.44–1.80)	
Fair	6 (13%)	6 (18%)	9 (16%)	13 (20%)	10 (11%)	0.87 (0.39–1.91)	
Poor	3 (7%)	0	2 (4%)	0	1 (1%)	3.70 (0.76–17.99)	
<b>Smoking status</b>							0.75
nonsmoker	40 (89%)	31 (91%)	52 (93%)	63 (98%)	81 (91%)	1.00 (ref)	
Current smoker	5 (11%)	3 (9%)	4 (7%)	1 (2%)	8 (9%)	0.88 (0.39–1.98)	
<b>Employment status</b>							0.43
Not currently employed	27 (60%)	25 (74%)	40 (70%)	44 (69%)	67 (75%)	1.00 (ref)	
Currently employed	18 (40%)	9 (26%)	17 (30%)	20 (31%)	22 (25%)	1.22 (0.75–1.97)	
<b>Time spent working within 6 ft of others (hours/day)</b>							0.69
0	7 (39%)	1 (11%)	7 (41%)	8 (40%)	9 (41%)	1.00 (ref)	
0.1 to <1	2 (11%)	0	2 (12%)	1 (5%)	4 (18%)	0.70 (0.18–2.63)	
1 to <3	3 (17%)	4 (44%)	5 (29%)	3 (15%)	3 (14%)	1.60 (0.57–4.48)	
≥3	6 (33%)	4 (44%)	3 (18%)	8 (40%)	6 (27%)	1.13 (0.45–2.82)	
<b>Household composition</b>							0.42
Lives alone	9 (20%)	11 (32%)	19 (34%)	19 (31%)	25 (28%)	1.00 (ref)	
Lives with other adult(s) and no children	31 (70%)	21 (62%)	30 (54%)	37 (60%)	59 (67%)	1.37 (0.84–2.24)	
Lives with child(ren)	4 (9%)	2 (6%)	7 (13%)	6 (10%)	4 (5%)	1.39 (0.61–3.19)	
<b>Spirituality/religiosity</b>							0.03
Very	22 (54%)	18 (55%)	30 (56%)	25 (42%)	31 (37%)	1.00 (ref)	
Fairly	15 (37%)	10 (30%)	17 (31%)	24 (41%)	27 (33%)	0.79 (0.49–1.28)	
Slightly/Not at all	4 (10%)	5 (15%)	7 (13%)	10 (17%)	25 (30%)	0.44 (0.24–0.82)	
<b>Health insurance status</b>							0.4
Any Medicare/Medicaid	28 (62%)	21 (62%)	39 (68%)	43 (67%)	62 (70%)	1.00 (ref)	
Any private/no Medicare or Medicaid	13 (29%)	8 (24%)	15 (26%)	18 (28%)	22 (25%)	0.94 (0.55–1.62)	
Only military/other	3 (7%)	2 (6%)	3 (5%)	3 (5%)	4 (4%)	1.12 (0.43–2.94)	
No health insurance	1 (2%)	3 (9%)	0	0	1 (1%)	3.98 (0.75–21.02)	
<b>Self-rated reading ability<sup>c</sup></b>	1.5 (0.9)	1.5 (0.8)	1.6 (0.8)	1.4 (0.7)	1.3 (0.7)	1.29 (0.99–1.69)	0.06
<b>Confidence in filling out medical forms<sup>d</sup></b>	1.6 (1.0)	1.4 (0.7)	1.5 (0.8)	1.5 (0.8)	1.4 (0.7)	1.25 (0.96–1.62)	0.1
<b>Need help reading materials from doctors</b>							0.34
No	43 (96%)	30 (91%)	53 (93%)	56 (90%)	87 (98%)	1.00 (ref)	
Yes	2 (4%)	3 (9%)	4 (7%)	6 (10%)	2 (2%)	1.53 (0.64–3.66)	

(Continued)

Appendix Table 3E. (Continued).

CHARACTERISTICS <sup>a</sup>	All other racial/ethnic groups					OR (95% CI) <sup>b</sup>	p-Value
	Very unlikely n = 45	Somewhat unlikely n = 34	Neither likely nor unlikely n = 57	Somewhat likely n = 64	Very likely n = 89		
<b>Experience of discrimination in healthcare due to race or socioeconomic status</b>							0.24
No experience	35 (78%)	28 (82%)	46 (81%)	52 (81%)	78 (88%)	1.00 (ref)	
Experienced discrimination	10 (22%)	6 (18%)	8 (14%)	11 (17%)	8 (9%)	1.39 (0.77–2.52)	
Unknown	0	0	3 (5%)	1 (2%)	3 (3%)	0.43 (0.11–1.74)	
<b>COVID-19 preventive behaviors</b>							
Personal protective behaviors score <sup>e</sup>	24.0 (6.7)	26.2 (3.6)	25.4 (4.6)	25.9 (3.1)	24.8 (4.9)	0.96 (0.92–1.01)	0.13
Community protective behaviors score <sup>f</sup>	17.1 (5.7)	19.3 (2.6)	17.8 (5.7)	19.1 (2.8)	19.1 (3.5)	0.93 (0.88–0.98)	0.003
<b>Perceived likelihood of getting COVID-19<sup>g</sup></b>	2.3 (1.1)	2.3 (1.0)	2.3 (1.0)	2.3 (1.0)	2.4 (0.9)	0.94 (0.76–1.17)	0.59
<b>Perceived likelihood of surviving COVID-19<sup>g</sup></b>	3.7 (1.4)	3.7 (1.1)	3.4 (1.2)	3.5 (1.3)	3.5 (1.2)	1.03 (0.87–1.22)	0.75
<b>COVID-19 testing</b>							0.29
Never tested	20 (44%)	16 (47%)	37 (65%)	37 (58%)	53 (60%)	1.00 (ref)	
Tested negative	23 (51%)	16 (47%)	18 (32%)	24 (38%)	35 (39%)	1.35 (0.88–2.08)	
Ever tested positive	2 (4%)	2 (6%)	2 (4%)	3 (5%)	1 (1%)	1.74 (0.55–5.49)	
<b>Household member tested positive for COVID-19</b>							0.71
No	34 (94%)	23 (100%)	37 (97%)	43 (96%)	62 (97%)	1.00 (ref)	
Yes	2 (6%)	0	1 (3%)	2 (4%)	2 (3%)	0.77 (0.20–2.99)	
<b>Had an influenza vaccination in 2019–2021</b>							<0.0001
Yes	26 (59%)	23 (68%)	42 (74%)	52 (81%)	85 (96%)	1.00 (ref)	
No	18 (41%)	11 (32%)	15 (26%)	12 (19%)	4 (4%)	3.77 (2.21–6.41)	
<b>Childhood vaccines are safe</b>							<0.0001
Yes	35 (78%)	30 (88%)	52 (91%)	61 (95%)	88 (99%)	1.00 (ref)	
No	10 (22%)	4 (12%)	5 (9%)	3 (5%)	1 (1%)	4.98 (2.23–11.09)	
<b>Confidence in COVID-19 vaccine effectiveness<sup>h</sup></b>	2.1 (1.2)	2.3 (1.3)	2.7 (1.2)	3.3 (0.9)	3.7 (1.2)	0.46 (0.38–0.55)	<0.0001
<b>Confidence in COVID-19 vaccine safety<sup>h</sup></b>	2.0 (1.2)	2.3 (1.2)	2.8 (1.1)	3.4 (1.0)	3.8 (1.1)	0.43 (0.36–0.52)	<0.0001
<b>COMMUNITY CHARACTERISTICS</b>							
<b>Urban/rural status</b>							0.18
Urban/suburban resident	33 (73%)	31 (91%)	49 (86%)	55 (86%)	78 (88%)	1.00 (ref)	
Rural resident	12 (27%)	3 (9%)	8 (14%)	9 (14%)	11 (12%)	1.48 (0.83–2.64)	
<b>State influenza vaccination ranking</b>	60.4 (3.2)	61.6 (3.3)	61.0 (3.3)	60.5 (4.0)	61.5 (3.6)	0.98 (0.92–1.04)	0.48
<b>Area Deprivation Index ranking 2018 (per 1 unit increase)</b>	67.7 (23.2)	59.9 (22.8)	59.2 (23.0)	57.7 (20.6)	54.2 (27.5)	1.01 (1.00–1.02)	0.02
<b>COVID-19 community burden</b>	23.9 (17.4)	19.8 (9.1)	20.4 (14.0)	22.1 (13.5)	24.3 (17.8)	0.99 (0.98–1.01)	0.26
<b>Unacast social distancing grade</b>	0.91 (0.15)	0.97 (0.09)	0.94 (0.13)	0.94 (0.13)	0.96 (0.09)	0.34 (0.06–1.89)	0.22
<b>Pandemic Vulnerability Index</b>	0.55 (0.04)	0.54 (0.03)	0.54 (0.04)	0.53 (0.04)	0.54 (0.05)	60.37 (0.39–>999)	0.11

<sup>a</sup>Presented as n (%) for categorical variables and mean (standard deviation) for continuous variables.

<sup>b</sup>Odds ratios and p-values were derived from proportional odds models additionally adjusted for age, sex. The six specific chronic diseases were additionally adjusted for each other.

<sup>c</sup>Scored as 1 – Excellent, 2 – Very good, 3 – Good, 4 – Okay, 5 – Poor.

<sup>d</sup>Scored as 1 – Extremely, 2 – Quite a bit, 3 – Somewhat, 4 – A little bit, 5 – Not at all.

<sup>e</sup>Sum of days per week for each of washing hands or using sanitizer frequently, cleaning surfaces touched, wearing face masks, and keeping 6 feet away from others. Range from 0 to 28

<sup>f</sup>Sum of days per week for each of avoiding large gatherings, avoiding restaurants or bars, and following government guidelines. Range from 0 to 21

<sup>g</sup>Scored as 1- Very unlikely, 2- Somewhat unlikely, 3 – Neither unlikely nor likely, 4 – Somewhat likely, 5 – Very likely.

<sup>h</sup>Scored as 1 – Very unconfident, 2 – Somewhat unconfident, 3 – Neither unconfident nor confident, 4 – Somewhat confident, 5 – Very confident.



Appendix Table 3F. Simple associations between individual and community characteristics and intent to receive COVID-19 vaccination – age &lt;65.

CHARACTERISTICS <sup>a</sup>	Age <65					OR (95% CI) <sup>b</sup>	p-Value
	Very unlikely n = 442	Somewhat unlikely n = 260	Neither likely nor unlikely n = 327	Somewhat likely n = 383	Very likely n = 439		
<b>INDIVIDUAL CHARACTERISTICS</b>							
<b>Age (per 1 year)</b>	59.6 (3.1)	59.8 (3.2)	59.8 (2.9)	60.1 (3.1)	60.1 (2.9)	0.97 (0.94–0.99)	0.02
<b>Gender</b>							0.0002
Female	350 (79%)	193 (74%)	262 (80%)	274 (72%)	288 (66%)	1.00 (ref)	
Male	92 (21%)	67 (26%)	65 (20%)	109 (28%)	151 (34%)	0.70 (0.58–0.85)	
<b>Race/ethnicity</b>							<0.0001
Black	232 (52%)	165 (63%)	178 (54%)	192 (50%)	113 (26%)	1.00 (ref)	
White	188 (43%)	76 (29%)	121 (37%)	167 (44%)	300 (68%)	0.48 (0.41–0.57)	
Other/unknown	22 (5%)	19 (7%)	28 (9%)	24 (6%)	26 (6%)	0.70 (0.50–0.98)	
<b>Educational attainment</b>							<0.0001
Less than high school	24 (6%)	16 (6%)	23 (7%)	18 (5%)	25 (6%)	0.77 (0.54–1.10)	
High school or some college	275 (64%)	159 (62%)	193 (60%)	206 (55%)	190 (44%)	1.00 (ref)	
College or above	133 (31%)	80 (31%)	106 (33%)	152 (40%)	213 (50%)	0.64 (0.54–0.76)	
<b>Household income</b>							0.0002
<\$15000	128 (29%)	75 (29%)	102 (31%)	97 (25%)	87 (20%)	1.00 (ref)	
\$15000 to \$49999	176 (40%)	100 (38%)	130 (40%)	137 (36%)	127 (29%)	0.99 (0.80–1.21)	
\$50000+	138 (31%)	85 (33%)	95 (29%)	148 (39%)	225 (51%)	0.69 (0.56–0.85)	
<b>Any chronic disease</b>							0.49
No	88 (20%)	44 (17%)	55 (17%)	79 (21%)	109 (25%)	1.00 (ref)	
Yes	349 (80%)	215 (83%)	269 (83%)	304 (79%)	329 (75%)	1.08 (0.88–1.32)	
<b>Diabetes</b>							0.74
No	248 (57%)	145 (56%)	189 (58%)	230 (60%)	293 (67%)	1.00 (ref)	
Yes	189 (43%)	114 (44%)	137 (42%)	151 (40%)	144 (33%)	1.03 (0.86–1.25)	
<b>Chronic lung disease</b>							0.07
No	291 (67%)	181 (72%)	208 (65%)	280 (75%)	314 (73%)	1.00 (ref)	
Yes	141 (33%)	72 (28%)	111 (35%)	95 (25%)	114 (27%)	1.19 (0.99–1.45)	
<b>Cardiovascular disease</b>							0.98
No	160 (37%)	83 (32%)	96 (30%)	136 (36%)	180 (41%)	1.00 (ref)	
Yes	278 (63%)	177 (68%)	229 (70%)	247 (64%)	258 (59%)	1.00 (0.83–1.22)	
<b>Kidney disease</b>							0.78
No	411 (97%)	241 (95%)	301 (94%)	361 (96%)	420 (97%)	1.00 (ref)	
Yes	14 (3%)	13 (5%)	20 (6%)	17 (5%)	12 (3%)	1.06 (0.70–1.63)	
<b>Cancer under active treatment</b>							0.91
No	423 (96%)	247 (95%)	315 (96%)	370 (97%)	422 (96%)	1.00 (ref)	
Yes	18 (4%)	13 (5%)	12 (4%)	12 (3%)	17 (4%)	1.03 (0.65–1.61)	
<b>Other chronic disease</b>							0.86
No	329 (77%)	193 (75%)	231 (72%)	283 (75%)	354 (81%)	1.00 (ref)	
Yes	96 (23%)	65 (25%)	90 (28%)	92 (25%)	82 (19%)	1.02 (0.83–1.25)	
<b>Body mass index (kg/m<sup>2</sup>)</b>	32.5 (8.6)	32.6 (8.4)	33.3 (8.1)	31.0 (8.8)	29.9 (7.6)	1.02 (1.01–1.03)	0.0004
<b>Self-reported health status</b>							0.72
Excellent	49 (11%)	22 (8%)	29 (9%)	24 (6%)	59 (13%)	1.00 (ref)	
Very good	141 (32%)	77 (30%)	79 (24%)	131 (34%)	166 (38%)	0.87 (0.65–1.17)	
Good	170 (38%)	110 (42%)	139 (43%)	143 (37%)	143 (33%)	0.99 (0.74–1.33)	
Fair	68 (15%)	48 (18%)	64 (20%)	78 (20%)	54 (12%)	0.99 (0.71–1.37)	
Poor	14 (3%)	3 (1%)	16 (5%)	6 (2%)	17 (4%)	0.90 (0.52–1.53)	
<b>Smoking status</b>							0.65
nonsmoker	368 (83%)	215 (83%)	270 (83%)	313 (82%)	376 (86%)	1.00 (ref)	
Current smoker	74 (17%)	45 (17%)	55 (17%)	70 (18%)	63 (14%)	1.05 (0.85–1.31)	
<b>Employment status</b>							0.2
Not currently employed	237 (54%)	130 (50%)	182 (56%)	202 (53%)	205 (47%)	1.00 (ref)	
Currently employed	204 (46%)	130 (50%)	145 (44%)	180 (47%)	233 (53%)	0.90 (0.76–1.06)	
<b>Time spent working within 6 ft of others (hours/day)</b>							0.03
0	53 (26%)	38 (29%)	44 (30%)	45 (25%)	91 (39%)	1.00 (ref)	
0.1 to <1	31 (15%)	21 (16%)	39 (27%)	40 (22%)	50 (21%)	1.05 (0.75–1.47)	
1 to <3	21 (10%)	23 (18%)	12 (8%)	14 (8%)	28 (12%)	1.48 (0.98–2.24)	
≥3	99 (49%)	47 (36%)	50 (34%)	80 (45%)	64 (27%)	1.45 (1.09–1.93)	
<b>Household composition</b>							0.18
Lives alone	133 (30%)	66 (26%)	103 (32%)	108 (29%)	108 (25%)	1.00 (ref)	
Lives with other adult(s) and no children	231 (53%)	148 (58%)	171 (53%)	226 (60%)	281 (65%)	0.92 (0.76–1.11)	
Lives with child(ren)	73 (17%)	42 (16%)	48 (15%)	42 (11%)	46 (11%)	1.15 (0.88–1.51)	
<b>Spirituality/religiosity</b>							0.0001
Very	257 (60%)	145 (57%)	171 (53%)	177 (47%)	188 (43%)	1.00 (ref)	
Fairly	132 (31%)	86 (34%)	109 (34%)	151 (40%)	169 (39%)	0.73 (0.61–0.87)	
Slightly/Not at all	41 (10%)	25 (10%)	44 (14%)	52 (14%)	79 (18%)	0.64 (0.50–0.83)	
<b>Health insurance status</b>							0.002
Any Medicare/Medicaid	148 (34%)	94 (36%)	126 (39%)	128 (34%)	122 (28%)	1.00 (ref)	
Any private/no Medicare or Medicaid	188 (43%)	103 (40%)	140 (43%)	185 (48%)	254 (58%)	0.81 (0.67–0.97)	
Only military/other	65 (15%)	39 (15%)	36 (11%)	42 (11%)	44 (10%)	1.16 (0.88–1.52)	
No health insurance	39 (9%)	24 (9%)	24 (7%)	27 (7%)	19 (4%)	1.35 (0.97–1.89)	

(Continued)

Appendix Table 3F. (Continued).

CHARACTERISTICS <sup>a</sup>	Age <65					OR (95% CI) <sup>b</sup>	p-Value
	Very unlikely n = 442	Somewhat unlikely n = 260	Neither likely nor unlikely n = 327	Somewhat likely n = 383	Very likely n = 439		
<b>Self-rated reading ability<sup>c</sup></b>	1.5 (0.8)	1.5 (0.8)	1.6 (0.9)	1.5 (0.8)	1.3 (0.8)	1.09 (0.99–1.21)	0.1
<b>Confidence in filling out medical forms<sup>d</sup></b>	1.4 (0.8)	1.5 (0.8)	1.5 (0.8)	1.4 (0.7)	1.4 (0.8)	1.01 (0.91–1.13)	0.81
<b>Need help reading materials from doctors</b>							0.87
No	401 (95%)	228 (91%)	300 (94%)	353 (95%)	399 (95%)	1.00 (ref)	
Yes	22 (5%)	23 (9%)	19 (6%)	20 (5%)	23 (5%)	1.03 (0.73–1.46)	
<b>Experience of discrimination in healthcare due to race or socioeconomic status</b>							0.07
No experience	315 (71%)	179 (69%)	227 (69%)	289 (75%)	364 (83%)	1.00 (ref)	
Experienced discrimination	89 (20%)	61 (23%)	72 (22%)	71 (19%)	52 (12%)	1.24 (1.00–1.53)	
Unknown	38 (9%)	20 (8%)	28 (9%)	23 (6%)	23 (5%)	1.27 (0.92–1.76)	
<b>COVID-19 preventive behaviors</b>							
Personal protective behaviors score <sup>e</sup>	24.9 (6.0)	25.9 (4.7)	26.1 (3.8)	25.8 (3.8)	25.5 (4.0)	0.96 (0.94–0.98)	<0.0001
Community protective behaviors score <sup>f</sup>	17.3 (6.1)	18.3 (4.7)	18.6 (4.5)	18.4 (4.6)	18.5 (3.9)	0.95 (0.93–0.96)	<0.0001
<b>Perceived likelihood of getting COVID-19<sup>g</sup></b>	2.2 (1.2)	2.5 (1.1)	2.5 (1.1)	2.7 (1.0)	2.6 (1.1)	0.80 (0.74–0.86)	<0.0001
<b>Perceived likelihood of surviving COVID-19<sup>g</sup></b>	4.0 (1.3)	3.8 (1.3)	3.7 (1.2)	3.8 (1.2)	4.0 (1.2)	1.00 (0.93–1.07)	0.95
<b>COVID-19 testing</b>							0.07
Never tested	265 (60%)	131 (50%)	175 (54%)	205 (54%)	242 (55%)	1.00 (ref)	
Tested negative	161 (36%)	106 (41%)	141 (43%)	160 (42%)	177 (40%)	0.82 (0.69–0.97)	
Ever tested positive	16 (4%)	23 (9%)	9 (3%)	17 (4%)	19 (4%)	0.85 (0.57–1.27)	
<b>Household member tested positive for COVID-19</b>							0.9
No	295 (95%)	178 (93%)	213 (96%)	262 (96%)	315 (95%)	1.00 (ref)	
Yes	14 (5%)	13 (7%)	10 (4%)	11 (4%)	15 (5%)	0.97 (0.62–1.53)	
<b>Had an influenza vaccination in 2019–2021</b>							<0.0001
Yes	213 (49%)	180 (70%)	213 (66%)	299 (78%)	390 (89%)	1.00 (ref)	
No	224 (51%)	79 (31%)	112 (34%)	82 (22%)	47 (11%)	3.33 (2.76–4.01)	
<b>Childhood vaccines are safe</b>							<0.0001
Yes	350 (80%)	236 (91%)	298 (92%)	373 (98%)	431 (98%)	1.00 (ref)	
No	90 (20%)	23 (9%)	26 (8%)	9 (2%)	7 (2%)	5.40 (3.90–7.48)	
<b>Confidence in COVID-19 vaccine effectiveness<sup>h</sup></b>	2.0 (1.2)	2.1 (1.0)	2.6 (1.0)	3.2 (1.1)	3.9 (1.1)	0.40 (0.37–0.43)	<0.0001
<b>Confidence in COVID-19 vaccine safety<sup>h</sup></b>	2.0 (1.2)	2.2 (1.1)	2.6 (1.0)	3.2 (1.1)	3.9 (1.1)	0.40 (0.37–0.43)	<0.0001
<b>COMMUNITY CHARACTERISTICS</b>							
<b>Urban/rural status</b>							0.002
Urban/suburban resident	336 (76%)	203 (78%)	251 (77%)	312 (81%)	365 (83%)	1.00 (ref)	
Rural resident	105 (24%)	57 (22%)	76 (23%)	71 (19%)	74 (17%)	1.38 (1.13–1.68)	
<b>State influenza vaccination ranking</b>	60.2 (3.7)	60.2 (3.7)	60.3 (4.0)	60.0 (3.8)	60.7 (3.8)	1.00 (0.98–1.02)	0.92
<b>Area Deprivation Index ranking 2018 (per 1 unit increase)</b>	69.8 (22.8)	69.2 (23.3)	69.2 (23.6)	64.8 (23.9)	60.0 (25.6)	1.01 (1.00–1.01)	<0.0001
<b>COVID-19 community burden</b>	23.1 (14.7)	23.1 (14.9)	22.8 (14.3)	24.6 (15.3)	22.6 (14.0)	1.00 (1.00–1.01)	0.93
<b>Unacast social distancing grade</b>	0.92 (0.15)	0.92 (0.16)	0.92 (0.15)	0.93 (0.13)	0.94 (0.13)	0.56 (0.32–0.99)	0.05
<b>Pandemic Vulnerability Index</b>	0.55 (0.04)	0.55 (0.04)	0.55 (0.05)	0.55 (0.04)	0.54 (0.05)	0.80 (0.11–5.69)	0.82

<sup>a</sup>Presented as n (%) for categorical variables and mean (standard deviation) for continuous variables.

<sup>b</sup>Odds ratios and p-values were derived from proportional odds models additionally adjusted for age, sex, race. The six specific chronic diseases were additionally adjusted for each other.

<sup>c</sup>Scored as 1 – Excellent, 2 – Very good, 3 – Good, 4 – Okay, 5 – Poor.

<sup>d</sup>Scored as 1 – Extremely, 2 – Quite a bit, 3 – Somewhat, 4 – A little bit, 5 – Not at all.

<sup>e</sup>Sum of days per week for each of washing hands or using sanitizer frequently, cleaning surfaces touched, wearing face masks, and keeping 6 feet away from others. Range from 0 to 28

<sup>f</sup>Sum of days per week for each of avoiding large gatherings, avoiding restaurants or bars, and following government guidelines. Range from 0 to 21

<sup>g</sup>Scored as 1- Very unlikely, 2- Somewhat unlikely, 3 – Neither unlikely nor likely, 4 – Somewhat likely, 5 – Very likely.

<sup>h</sup>Scored as 1 – Very unconfident, 2 – Somewhat unconfident, 3 – Neither unconfident nor confident, 4 – Somewhat confident, 5 – Very confident.

Appendix Table 3G. Simple associations between individual and community characteristics and intent to receive COVID-19 vaccination – age ≥65.

CHARACTERISTICS <sup>a</sup>	Age ≥65					OR (95% CI) <sup>b</sup>	p-Value
	Very unlikely n = 426	Somewhat unlikely n = 249	Neither likely nor unlikely n = 374	Somewhat likely n = 601	Very likely n = 985		
<b>INDIVIDUAL CHARACTERISTICS</b>							
<b>Age (per 1 year)</b>	71.1 (5.3)	71.5 (5.2)	71.1 (5.3)	72.0 (5.5)	72.7 (5.3)	0.99 (0.97–1.00)	0.03
<b>Gender</b>							<0.0001
Female	312 (73%)	175 (70%)	280 (75%)	365 (61%)	455 (46%)	1.00 (ref)	
Male	114 (27%)	74 (30%)	94 (25%)	236 (39%)	530 (54%)	0.48 (0.41–0.55)	
<b>Race/ethnicity</b>							<0.0001
Black	193 (45%)	128 (51%)	180 (48%)	200 (33%)	134 (14%)	1.00 (ref)	
White	210 (49%)	106 (43%)	165 (44%)	361 (60%)	788 (80%)	0.33 (0.28–0.39)	
Other/unknown	23 (5%)	15 (6%)	29 (8%)	40 (7%)	63 (6%)	0.49 (0.36–0.66)	
<b>Educational attainment</b>							<0.0001
Less than high school	19 (5%)	6 (2%)	20 (5%)	18 (3%)	17 (2%)	1.12 (0.74–1.68)	
High school or some college	216 (52%)	137 (55%)	211 (58%)	256 (44%)	316 (33%)	1.00 (ref)	
College or above	178 (43%)	104 (42%)	135 (37%)	314 (53%)	639 (66%)	0.63 (0.54–0.73)	
<b>Household income</b>							<0.0001
<\$15000	76 (18%)	46 (18%)	82 (22%)	69 (11%)	65 (7%)	1.00 (ref)	
\$15000 to \$49999	208 (49%)	119 (48%)	161 (43%)	244 (41%)	306 (31%)	0.84 (0.67–1.05)	
\$50000+	142 (33%)	84 (34%)	130 (35%)	288 (48%)	612 (62%)	0.52 (0.41–0.65)	
<b>Any chronic disease</b>							0.45
No	70 (17%)	43 (17%)	43 (12%)	96 (16%)	198 (20%)	1.00 (ref)	
Yes	352 (83%)	205 (83%)	324 (88%)	499 (84%)	770 (80%)	1.08 (0.89–1.30)	
<b>Diabetes</b>							0.4
No	249 (59%)	149 (61%)	200 (54%)	377 (63%)	683 (70%)	1.00 (ref)	
Yes	173 (41%)	95 (39%)	172 (46%)	219 (37%)	292 (30%)	1.07 (0.91–1.27)	
<b>Chronic lung disease</b>							0.65
No	299 (73%)	176 (73%)	279 (77%)	427 (74%)	754 (78%)	1.00 (ref)	
Yes	112 (27%)	66 (27%)	84 (23%)	152 (26%)	208 (22%)	1.04 (0.88–1.24)	
<b>Cardiovascular disease</b>							0.29
No	118 (28%)	66 (27%)	86 (23%)	170 (28%)	336 (34%)	1.00 (ref)	
Yes	308 (72%)	183 (73%)	286 (77%)	430 (72%)	644 (66%)	1.10 (0.93–1.30)	
<b>Kidney disease</b>							0.01
No	393 (95%)	228 (95%)	338 (92%)	547 (93%)	899 (93%)	1.00 (ref)	
Yes	20 (5%)	11 (5%)	29 (8%)	40 (7%)	69 (7%)	0.69 (0.51–0.93)	
<b>Cancer under active treatment</b>							0.09
No	406 (96%)	231 (93%)	354 (95%)	562 (94%)	909 (93%)	1.00 (ref)	
Yes	19 (4%)	17 (7%)	18 (5%)	38 (6%)	72 (7%)	0.76 (0.56–1.04)	
<b>Other chronic disease</b>							0.27
No	344 (82%)	182 (75%)	282 (77%)	479 (81%)	821 (86%)	1.00 (ref)	
Yes	74 (18%)	61 (25%)	82 (23%)	111 (19%)	137 (14%)	1.12 (0.92–1.35)	
<b>Body mass index (kg/m<sup>2</sup>)</b>	29.9 (7.4)	29.7 (6.9)	30.0 (7.6)	29.1 (7.3)	27.8 (6.2)	1.01 (1.00–1.02)	0.05
<b>Self-reported health status</b>							0.47
Excellent	49 (12%)	17 (7%)	31 (8%)	47 (8%)	145 (15%)	1.00 (ref)	
Very good	168 (39%)	92 (37%)	115 (31%)	231 (38%)	413 (42%)	1.25 (0.98–1.60)	
Good	145 (34%)	92 (37%)	165 (44%)	214 (36%)	308 (31%)	1.21 (0.94–1.55)	
Fair	56 (13%)	44 (18%)	61 (16%)	100 (17%)	104 (11%)	1.27 (0.95–1.69)	
Poor	8 (2%)	4 (2%)	2 (1%)	9 (2%)	14 (1%)	1.27 (0.68–2.37)	
<b>Smoking status</b>							0.19
nonsmoker	396 (93%)	231 (93%)	342 (91%)	558 (93%)	938 (95%)	1.00 (ref)	
Current smoker	30 (7%)	18 (7%)	32 (9%)	43 (7%)	47 (5%)	1.21 (0.91–1.61)	
<b>Employment status</b>							0.43
Not currently employed	330 (77%)	205 (82%)	309 (83%)	475 (79%)	808 (82%)	1.00 (ref)	
Currently employed	96 (23%)	44 (18%)	65 (17%)	126 (21%)	176 (18%)	1.08 (0.90–1.29)	
<b>Time spent working within 6 ft of others (hours/day)</b>							0.76
0	37 (9%)	13 (5%)	28 (8%)	48 (8%)	70 (7%)	1.00 (ref)	
0.1 to <1	25 (6%)	7 (3%)	17 (5%)	32 (5%)	48 (5%)	1.03 (0.68–1.54)	
1 to <3	8 (2%)	9 (4%)	5 (1%)	19 (3%)	14 (1%)	1.33 (0.77–2.29)	
≥3	26 (6%)	15 (6%)	15 (4%)	27 (4%)	44 (4%)	1.10 (0.73–1.65)	
<b>Household composition</b>							0.23
Lives alone	161 (38%)	80 (33%)	135 (37%)	189 (32%)	255 (26%)	1.00 (ref)	
Lives with other adult(s) and no children	225 (53%)	147 (60%)	206 (56%)	357 (61%)	677 (69%)	0.91 (0.78–1.07)	
Lives with child(ren)	35 (8%)	19 (8%)	27 (7%)	39 (7%)	43 (4%)	1.14 (0.84–1.55)	
<b>Spirituality/religiosity</b>							<0.0001
Very	269 (64%)	149 (60%)	215 (59%)	298 (50%)	410 (42%)	1.00 (ref)	
Fairly	122 (29%)	70 (28%)	120 (33%)	207 (35%)	346 (36%)	0.77 (0.66–0.91)	
Slightly/Not at all	27 (6%)	29 (12%)	30 (8%)	86 (15%)	218 (22%)	0.50 (0.40–0.63)	
<b>Health insurance status</b>							0.002
Any Medicare/Medicaid	382 (90%)	223 (90%)	339 (91%)	537 (89%)	877 (89%)	1.00 (ref)	
Any private/no Medicare or Medicaid	23 (5%)	15 (6%)	24 (6%)	48 (8%)	83 (8%)	0.69 (0.52–0.91)	
Only military/other	17 (4%)	7 (3%)	9 (2%)	15 (3%)	22 (2%)	1.40 (0.91–2.16)	
No health insurance	3 (1%)	3 (1%)	2 (1%)	1 (0.2%)	0	3.96 (1.17–13.48)	

(Continued)

Appendix Table 3G. (Continued).

CHARACTERISTICS <sup>a</sup>	Age ≥65					OR (95% CI) <sup>b</sup>	p-Value
	Very unlikely n = 426	Somewhat unlikely n = 249	Neither likely nor unlikely n = 374	Somewhat likely n = 601	Very likely n = 985		
<b>Self-rated reading ability<sup>c</sup></b>	1.5 (0.8)	1.5 (0.8)	1.5 (0.8)	1.4 (0.7)	1.3 (0.6)	1.27 (1.15–1.41)	<0.0001
<b>Confidence in filling out medical forms<sup>d</sup></b>	1.4 (0.8)	1.5 (0.7)	1.5 (0.8)	1.4 (0.7)	1.3 (0.5)	1.29 (1.17–1.43)	<0.0001
<b>Need help reading materials from doctors</b>							0.08
No	406 (96%)	232 (95%)	342 (93%)	569 (97%)	959 (98%)	1.00 (ref)	
Yes	15 (4%)	13 (5%)	24 (7%)	16 (3%)	19 (2%)	1.41 (0.96–2.08)	
<b>Experience of discrimination in healthcare due to race or socioeconomic status</b>							0.05
No experience	340 (80%)	207 (83%)	294 (79%)	511 (85%)	915 (93%)	1.00 (ref)	
Experienced discrimination	65 (15%)	33 (13%)	54 (14%)	58 (10%)	43 (4%)	1.36 (1.07–1.74)	
Unknown	21 (5%)	9 (4%)	26 (7%)	32 (5%)	27 (3%)	1.07 (0.76–1.50)	
<b>COVID-19 preventive behaviors</b>							
Personal protective behaviors score <sup>e</sup>	24.6 (6.2)	25.3 (4.3)	25.6 (4.9)	25.3 (4.4)	24.9 (4.2)	0.97 (0.95–0.98)	<0.0001
Community protective behaviors score <sup>f</sup>	17.3 (6.1)	18.5 (4.8)	18.3 (4.7)	18.7 (4.2)	18.6 (4.2)	0.95 (0.93–0.96)	<0.0001
<b>Perceived likelihood of getting COVID-19<sup>g</sup></b>	2.0 (1.1)	2.2 (1.0)	2.3 (1.0)	2.4 (1.0)	2.3 (1.0)	0.86 (0.80–0.93)	<0.0001
<b>Perceived likelihood of surviving COVID-19<sup>g</sup></b>	3.8 (1.3)	3.5 (1.3)	3.6 (1.3)	3.6 (1.2)	3.6 (1.3)	1.01 (0.95–1.07)	0.78
<b>COVID-19 testing</b>							0.55
Never tested	268 (63%)	150 (60%)	225 (60%)	360 (60%)	634 (65%)	1.00 (ref)	
Tested negative	149 (35%)	92 (37%)	135 (36%)	228 (38%)	325 (33%)	0.92 (0.79–1.07)	
Ever tested positive	7 (2%)	6 (2%)	12 (3%)	11 (2%)	20 (2%)	0.93 (0.57–1.51)	
<b>Household member tested positive for COVID-19</b>							0.87
No	257 (98%)	157 (96%)	229 (97%)	391 (96%)	707 (97%)	1.00 (ref)	
Yes	6 (2%)	7 (4%)	7 (3%)	16 (4%)	20 (3%)	1.04 (0.64–1.70)	
<b>Had an influenza vaccination in 2019–2021</b>							<0.0001
Yes	243 (58%)	181 (73%)	277 (75%)	542 (90%)	940 (96%)	1.00 (ref)	
No	178 (42%)	68 (27%)	94 (25%)	58 (10%)	44 (4%)	5.30 (4.35–6.45)	
<b>Childhood vaccines are safe</b>							<0.0001
Yes	364 (87%)	229 (93%)	347 (94%)	584 (98%)	972 (99%)	1.00 (ref)	
No	53 (13%)	18 (7%)	21 (6%)	10 (2%)	7 (1%)	5.22 (3.61–7.54)	
<b>Confidence in COVID-19 effectiveness<sup>h</sup></b>	2.1 (1.3)	2.2 (1.0)	2.7 (1.0)	3.3 (1.0)	4.0 (1.2)	0.42 (0.40–0.45)	<0.0001
<b>Confidence in COVID-19 safety<sup>h</sup></b>	2.1 (1.4)	2.3 (1.1)	2.7 (1.0)	3.4 (1.0)	4.0 (1.1)	0.42 (0.40–0.45)	<0.0001
<b>COMMUNITY CHARACTERISTICS</b>							
<b>Urban/rural status</b>							0.02
Urban/suburban resident	325 (76%)	200 (80%)	305 (82%)	457 (76%)	803 (82%)	1.00 (ref)	
Rural resident	101 (24%)	49 (20%)	69 (18%)	144 (24%)	182 (18%)	1.22 (1.03–1.45)	
<b>State influenza vaccination ranking</b>	60.4 (3.8)	60.8 (3.8)	60.5 (4.0)	60.5 (4.0)	61.2 (4.0)	1.00 (0.98–1.01)	0.69
<b>Area Deprivation Index ranking 2018 (per 1 unit increase)</b>	67.6 (23.8)	66.0 (23.9)	65.6 (24.3)	61.3 (25.3)	52.6 (26.2)	1.01 (1.01–1.01)	<0.0001
<b>COVID-19 community burden</b>	21.9 (13.9)	21.1 (12.5)	22.4 (15.2)	23.5 (14.9)	22.7 (15.3)	1.00 (0.99–1.00)	0.31
<b>Unacast social distancing grade</b>	0.92 (0.15)	0.91 (0.16)	0.93 (0.15)	0.92 (0.15)	0.94 (0.14)	0.50 (0.31–0.81)	0.004
<b>Pandemic Vulnerability Index</b>	0.55 (0.04)	0.55 (0.04)	0.55 (0.04)	0.54 (0.04)	0.54 (0.05)	4.23 (0.85–21.16)	0.08

<sup>a</sup>Presented as n (%) for categorical variables and mean (standard deviation) for continuous variables.

<sup>b</sup>Odds ratios and p-values were derived from proportional odds models additionally adjusted for age, sex, race. The six specific chronic diseases were additionally adjusted for each other.

<sup>c</sup>Scored as 1 – Excellent, 2 – Very good, 3 – Good, 4 – Okay, 5 – Poor.

<sup>d</sup>Scored as 1 – Extremely, 2 – Quite a bit, 3 – Somewhat, 4 – A little bit, 5 – Not at all.

<sup>e</sup>Sum of days per week for each of washing hands or using sanitizer frequently, cleaning surfaces touched, wearing face masks, and keeping 6 feet away from others. Range from 0 to 28

<sup>f</sup>Sum of days per week for each of avoiding large gatherings, avoiding restaurants or bars, and following government guidelines. Range from 0 to 21

<sup>g</sup>Scored as 1 – Very unlikely, 2 – Somewhat unlikely, 3 – Neither unlikely nor likely, 4 – Somewhat likely, 5 – Very likely.

<sup>h</sup>Scored as 1 – Very unconfident, 2 – Somewhat unconfident, 3 – Neither unconfident nor confident, 4 – Somewhat confident, 5 – Very confident.

Appendix Table 3H. Simple associations between individual and community characteristics and intent to receive COVID-19 vaccination – rural residents.

CHARACTERISTICS <sup>a</sup>	Rural residents					OR (95% CI) <sup>b</sup>	p-Value
	Very unlikely	Somewhat unlikely	Neither likely nor unlikely	Somewhat likely	Very likely		
	n = 206	n = 106	n = 145	n = 215	n = 256		
<b>INDIVIDUAL CHARACTERISTICS</b>							
<b>Age (per 1 year)</b>	65.0 (7.1)	65.1 (7.2)	65.3 (7.4)	67.7 (6.8)	68.9 (7.5)	0.96 (0.94–0.97)	<0.0001
<b>Gender</b>							0.001
Female	151 (73%)	75 (71%)	100 (69%)	146 (68%)	132 (52%)	1.00 (ref)	
Male	55 (27%)	31 (29%)	45 (31%)	69 (32%)	124 (48%)	0.66 (0.51–0.85)	
<b>Race/ethnicity</b>							0.0008
Black	75 (36%)	54 (51%)	69 (48%)	89 (41%)	46 (18%)	1.00 (ref)	
White	119 (58%)	49 (46%)	68 (47%)	117 (54%)	199 (78%)	0.62 (0.49–0.80)	
Other/unknown	12 (6%)	3 (3%)	8 (6%)	9 (4%)	11 (4%)	0.87 (0.49–1.53)	
<b>Educational attainment</b>							<0.0001
Less than high school	10 (5%)	7 (7%)	10 (7%)	12 (6%)	11 (4%)	0.76 (0.45–1.28)	
High school or some college	124 (62%)	59 (56%)	92 (66%)	109 (51%)	94 (37%)	1.00 (ref)	
College or above	65 (33%)	39 (37%)	38 (27%)	92 (43%)	146 (58%)	0.53 (0.41–0.68)	
<b>Household income</b>							0.01
<\$15000	42 (20%)	18 (17%)	39 (27%)	42 (20%)	24 (9%)	1.00 (ref)	
\$15000 to \$49999	94 (46%)	47 (44%)	62 (43%)	89 (42%)	88 (34%)	0.91 (0.66–1.27)	
\$50000+	70 (34%)	41 (39%)	43 (30%)	83 (39%)	144 (56%)	0.64 (0.46–0.90)	
<b>Any chronic disease</b>							0.63
No	33 (16%)	17 (16%)	18 (13%)	32 (15%)	53 (21%)	1.00 (ref)	
Yes	172 (84%)	89 (84%)	125 (87%)	182 (85%)	202 (79%)	1.08 (0.79–1.49)	
<b>Diabetes</b>							0.56
No	114 (56%)	59 (56%)	86 (60%)	118 (55%)	166 (66%)	1.00 (ref)	
Yes	89 (44%)	47 (44%)	58 (40%)	95 (45%)	86 (34%)	1.09 (0.83–1.43)	
<b>Chronic lung disease</b>							0.25
No	141 (72%)	70 (71%)	105 (74%)	156 (75%)	193 (77%)	1.00 (ref)	
Yes	56 (28%)	28 (29%)	36 (26%)	53 (25%)	57 (23%)	1.18 (0.89–1.57)	
<b>Cardiovascular disease</b>							0.41
No	56 (28%)	28 (26%)	39 (27%)	58 (27%)	86 (34%)	1.00 (ref)	
Yes	147 (72%)	78 (74%)	105 (73%)	157 (73%)	170 (66%)	1.13 (0.85–1.50)	
<b>Kidney disease</b>							0.03
No	196 (98%)	98 (97%)	136 (96%)	198 (93%)	230 (93%)	1.00 (ref)	
Yes	5 (2%)	3 (3%)	6 (4%)	14 (7%)	17 (7%)	0.52 (0.30–0.92)	
<b>Cancer under active treatment</b>							0.2
No	195 (95%)	98 (92%)	138 (95%)	200 (93%)	236 (92%)	1.00 (ref)	
Yes	11 (5%)	8 (8%)	7 (5%)	15 (7%)	20 (8%)	0.72 (0.43–1.20)	
<b>Other chronic disease</b>							0.47
No	167 (83%)	73 (71%)	109 (76%)	158 (75%)	204 (81%)	1.00 (ref)	
Yes	34 (17%)	30 (29%)	34 (24%)	53 (25%)	48 (19%)	0.89 (0.66–1.21)	
<b>Body mass index (kg/m<sup>2</sup>)</b>	31.1 (8.4)	31.1 (7.7)	31.6 (8.2)	30.1 (8.6)	28.7 (6.3)	1.01 (0.99–1.03)	0.23
<b>Self-reported health status</b>							0.97
Excellent	20 (10%)	7 (7%)	8 (6%)	9 (4%)	29 (11%)	1.00 (ref)	
Very good	72 (35%)	37 (35%)	38 (26%)	76 (35%)	102 (40%)	0.99 (0.63–1.57)	
Good	77 (37%)	37 (35%)	67 (46%)	78 (36%)	83 (32%)	1.06 (0.67–1.68)	
Fair	30 (15%)	23 (22%)	26 (18%)	48 (22%)	35 (14%)	1.00 (0.60–1.65)	
Poor	7 (3%)	2 (2%)	6 (4%)	4 (2%)	7 (3%)	1.23 (0.55–2.74)	
<b>Smoking status</b>							0.97
nonsmoker	181 (88%)	101 (95%)	129 (90%)	192 (89%)	234 (91%)	1.00 (ref)	
Current smoker	25 (12%)	5 (5%)	15 (10%)	23 (11%)	22 (9%)	1.01 (0.68–1.49)	
<b>Employment status</b>							0.54
Not currently employed	127 (62%)	73 (69%)	101 (70%)	155 (72%)	189 (74%)	1.00 (ref)	
Currently employed	79 (38%)	33 (31%)	44 (30%)	59 (28%)	67 (26%)	1.09 (0.83–1.43)	
<b>Time spent working within 6 ft of others (hours/day)</b>							0.32
0	21 (27%)	7 (21%)	9 (20%)	11 (19%)	22 (33%)	1.00 (ref)	
0.1 to <1	13 (16%)	4 (12%)	12 (27%)	17 (29%)	18 (27%)	0.79 (0.43–1.46)	
1 to <3	11 (14%)	7 (21%)	1 (2%)	8 (14%)	7 (10%)	1.55 (0.74–3.23)	
≥3	34 (43%)	15 (45%)	22 (50%)	23 (39%)	20 (30%)	1.14 (0.67–1.95)	
<b>Household composition</b>							0.29
Lives alone	57 (28%)	25 (24%)	41 (28%)	71 (34%)	59 (23%)	1.00 (ref)	
Lives with other adult(s) and no children	120 (59%)	70 (67%)	86 (59%)	126 (60%)	180 (71%)	1.00 (0.76–1.32)	
Lives with child(ren)	26 (13%)	10 (10%)	18 (12%)	13 (6%)	14 (6%)	1.40 (0.89–2.21)	
<b>Spirituality/religiosity</b>							<0.0001
Very	128 (63%)	65 (63%)	72 (52%)	111 (52%)	107 (42%)	1.00 (ref)	
Fairly	64 (32%)	26 (25%)	50 (36%)	82 (39%)	94 (37%)	0.67 (0.52–0.86)	
Slightly/Not at all	11 (5%)	13 (13%)	16 (12%)	19 (9%)	53 (21%)	0.41 (0.28–0.61)	
<b>Health insurance status</b>							0.61
Any Medicare/Medicaid	123 (60%)	60 (57%)	101 (70%)	163 (76%)	185 (72%)	1.00 (ref)	
Any private/no Medicare or Medicaid	64 (31%)	34 (32%)	29 (20%)	38 (18%)	52 (20%)	1.17 (0.85–1.60)	
Only military/other	13 (6%)	8 (8%)	12 (8%)	10 (5%)	16 (6%)	0.88 (0.53–1.44)	
No health insurance	6 (3%)	4 (4%)	3 (2%)	4 (2%)	3 (1%)	1.32 (0.58–3.01)	

(Continued)

Appendix Table 3H. (Continued).

CHARACTERISTICS <sup>a</sup>	Rural residents					OR (95% CI) <sup>b</sup>	p-Value
	Very unlikely n = 206	Somewhat unlikely n = 106	Neither likely nor unlikely n = 145	Somewhat likely n = 215	Very likely n = 256		
<b>Self-rated reading ability<sup>c</sup></b>	1.5 (0.8)	1.6 (0.8)	1.7 (0.9)	1.5 (0.8)	1.3 (0.6)	1.20 (1.03–1.39)	0.02
<b>Confidence in filling out medical forms<sup>d</sup></b>	1.4 (0.8)	1.6 (0.8)	1.6 (0.8)	1.4 (0.7)	1.3 (0.6)	1.27 (1.09–1.49)	0.002
<b>Need help reading materials from doctors</b>							0.17
No	195 (97%)	91 (88%)	130 (92%)	198 (94%)	246 (98%)	1.00 (ref)	
Yes	7 (3%)	12 (12%)	12 (8%)	12 (6%)	6 (2%)	1.44 (0.86–2.40)	
<b>Experience of discrimination in healthcare due to race or socioeconomic status</b>							0.31
No experience	165 (80%)	76 (72%)	121 (83%)	176 (82%)	233 (91%)	1.00 (ref)	
Experienced discrimination	31 (15%)	21 (20%)	14 (10%)	31 (14%)	18 (7%)	1.17 (0.81–1.68)	
Unknown	10 (5%)	9 (8%)	10 (7%)	8 (4%)	5 (2%)	1.49 (0.85–2.63)	
<b>COVID-19 preventive behaviors</b>							
Personal protective behaviors score <sup>e</sup>	24.3 (6.3)	25.6 (4.8)	25.6 (4.3)	25.6 (4.2)	24.9 (4.5)	0.96 (0.94–0.99)	0.001
Community protective behaviors score <sup>f</sup>	16.8 (6.5)	18.5 (4.4)	18.3 (5.4)	18.6 (4.5)	18.2 (4.5)	0.95 (0.93–0.97)	<0.0001
<b>Perceived likelihood of getting COVID-19<sup>g</sup></b>	2.3 (1.2)	2.6 (1.0)	2.4 (1.0)	2.6 (1.0)	2.5 (0.9)	0.85 (0.76–0.96)	0.009
<b>Perceived likelihood of surviving COVID-19<sup>g</sup></b>	4.0 (1.3)	3.6 (1.3)	3.6 (1.3)	3.7 (1.2)	3.5 (1.3)	1.11 (1.01–1.23)	0.03
<b>COVID-19 testing</b>							0.48
Never tested	125 (61%)	66 (62%)	87 (60%)	122 (57%)	166 (65%)	1.00 (ref)	
Tested negative	75 (36%)	32 (30%)	51 (35%)	81 (38%)	77 (30%)	1.01 (0.79–1.29)	
Ever tested positive	6 (3%)	8 (8%)	6 (4%)	11 (5%)	12 (5%)	0.71 (0.41–1.25)	
<b>Household member tested positive for COVID-19</b>							0.9
No	141 (95%)	75 (94%)	101 (97%)	133 (94%)	186 (95%)	1.00 (ref)	
Yes	7 (5%)	5 (6%)	3 (3%)	9 (6%)	9 (5%)	0.96 (0.51–1.80)	
<b>Had an influenza vaccination in 2019–2021</b>							<0.0001
Yes	112 (55%)	83 (78%)	93 (64%)	186 (87%)	236 (92%)	1.00 (ref)	
No	93 (45%)	23 (22%)	52 (36%)	28 (13%)	20 (8%)	3.96 (2.96–5.29)	
<b>Childhood vaccines are safe</b>							<0.0001
Yes	176 (86%)	96 (91%)	132 (92%)	210 (98%)	254 (99%)	1.00 (ref)	
No	29 (14%)	10 (9%)	11 (8%)	4 (2%)	2 (1%)	4.47 (2.65–7.55)	
<b>Confidence in COVID-19 vaccine effectiveness<sup>h</sup></b>	1.9 (1.1)	2.2 (1.1)	2.7 (1.0)	3.3 (1.0)	3.9 (1.2)	0.39 (0.35–0.43)	<0.0001
<b>Confidence in COVID-19 vaccine safety<sup>h</sup></b>	1.9 (1.2)	2.2 (1.1)	2.6 (1.0)	3.4 (1.1)	4.0 (1.1)	0.37 (0.33–0.41)	<0.0001
<b>COMMUNITY CHARACTERISTICS</b>							
<b>State influenza vaccination ranking</b>	59.4 (3.9)	59.9 (4.3)	59.3 (4.5)	59.0 (4.0)	60.6 (4.3)	1.00 (0.97–1.03)	0.78
<b>Area Deprivation Index ranking 2018 (per 1 unit increase)</b>	80.6 (16.9)	83.1 (13.6)	82.2 (15.8)	79.8 (16.3)	72.4 (18.9)	1.01 (1.01–1.02)	0.0002
<b>COVID-19 community burden</b>	25.1 (17.0)	25.1 (17.4)	25.3 (19.2)	27.1 (17.2)	23.2 (15.2)	1.00 (1.00–1.01)	0.34
<b>Unacast social distancing grade</b>	0.74 (0.18)	0.71 (0.18)	0.74 (0.18)	0.75 (0.17)	0.77 (0.18)	0.60 (0.31–1.15)	0.12
<b>Pandemic Vulnerability Index</b>	0.55 (0.05)	0.55 (0.05)	0.55 (0.05)	0.55 (0.05)	0.54 (0.05)	0.43 (0.04–5.07)	0.50

<sup>a</sup>Presented as n (%) for categorical variables and mean (standard deviation) for continuous variables.

<sup>b</sup>Odds ratios and p-values were derived from proportional odds models additionally adjusted for age, sex, race. The six specific chronic diseases were additionally adjusted for each other.

<sup>c</sup>Scored as 1 – Excellent, 2 – Very good, 3 – Good, 4 – Okay, 5 – Poor.

<sup>d</sup>Scored as 1 – Extremely, 2 – Quite a bit, 3 – Somewhat, 4 – A little bit, 5 – Not at all.

<sup>e</sup>Sum of days per week for each of washing hands or using sanitizer frequently, cleaning surfaces touched, wearing face masks, and keeping 6 feet away from others. Range from 0 to 28

<sup>f</sup>Sum of days per week for each of avoiding large gatherings, avoiding restaurants or bars, and following government guidelines. Range from 0 to 21

<sup>g</sup>Scored as 1- Very unlikely, 2- Somewhat unlikely, 3 – Neither unlikely nor likely, 4 – Somewhat likely, 5 – Very likely.

<sup>h</sup>Scored as 1 – Very unconfident, 2 – Somewhat unconfident, 3 – Neither unconfident nor confident, 4 – Somewhat confident, 5 – Very confident.

Appendix Table 3I. Simple associations between individual and community characteristics and intent to receive COVID-19 vaccination – urban residents.

CHARACTERISTICS <sup>a</sup>	Urban Residents					OR (95% CI) <sup>b</sup>	p-value
	Very unlikely	Somewhat unlikely	Neither likely nor unlikely	Somewhat likely	Very likely		
	n = 661	n = 403	n = 556	n = 769	n = 1168		
<b>INDIVIDUAL CHARACTERISTICS</b>							
<b>Age (per 1 year)</b>	65.2 (7.2)	65.6 (7.3)	66.0 (7.0)	67.2 (7.6)	68.8 (7.5)	0.98 (0.97–0.98)	<0.0001
<b>Gender</b>							<0.0001
Female	511 (77%)	293 (73%)	442 (80%)	493 (64%)	611 (52%)	1.00 (ref)	
Male	150 (23%)	110 (27%)	114 (20%)	276 (36%)	557 (48%)	0.52 (0.46–0.60)	
<b>Race/ethnicity</b>							<0.0001
Black	350 (53%)	239 (59%)	289 (52%)	303 (39%)	201 (17%)	1.00 (ref)	
White	278 (42%)	133 (33%)	218 (39%)	411 (53%)	889 (76%)	0.34 (0.30–0.39)	
Other/unknown	33 (5%)	31 (8%)	49 (9%)	55 (7%)	78 (7%)	0.54 (0.42–0.69)	
<b>Educational attainment</b>							<0.0001
Less than high school	33 (5%)	15 (4%)	33 (6%)	24 (3%)	31 (3%)	0.97 (0.71–1.33)	
High school or some college	367 (57%)	237 (60%)	312 (57%)	353 (47%)	412 (36%)	1.00 (ref)	
College or above	245 (38%)	145 (37%)	203 (37%)	374 (50%)	706 (61%)	0.66 (0.58–0.75)	
<b>Household income</b>							<0.0001
<\$15000	162 (25%)	103 (26%)	145 (26%)	124 (16%)	128 (11%)	1.00 (ref)	
\$15000 to \$49999	290 (44%)	172 (43%)	229 (41%)	292 (38%)	345 (30%)	0.93 (0.78–1.10)	
\$50000+	209 (32%)	128 (32%)	182 (33%)	353 (46%)	693 (59%)	0.59 (0.49–0.70)	
<b>Any chronic disease</b>							0.4
No	125 (19%)	70 (17%)	80 (15%)	143 (19%)	254 (22%)	1.00 (ref)	
Yes	528 (81%)	331 (83%)	468 (85%)	621 (81%)	897 (78%)	1.07 (0.92–1.25)	
<b>Diabetes</b>							0.52
No	382 (58%)	235 (59%)	303 (55%)	489 (64%)	810 (70%)	1.00 (ref)	
Yes	273 (42%)	162 (41%)	251 (45%)	275 (36%)	350 (30%)	1.05 (0.91–1.21)	
<b>Chronic lung disease</b>							0.25
No	449 (70%)	287 (72%)	382 (71%)	551 (74%)	875 (77%)	1.00 (ref)	
Yes	196 (30%)	110 (28%)	159 (29%)	194 (26%)	265 (23%)	1.09 (0.94–1.26)	
<b>Cardiovascular disease</b>							0.55
No	221 (33%)	121 (30%)	143 (26%)	248 (32%)	430 (37%)	1.00 (ref)	
Yes	439 (67%)	282 (70%)	410 (74%)	520 (68%)	732 (63%)	1.04 (0.91–1.21)	
<b>Kidney disease</b>							0.57
No	607 (95%)	371 (95%)	503 (92%)	710 (94%)	1089 (94%)	1.00 (ref)	
Yes	29 (5%)	21 (5%)	43 (8%)	43 (6%)	64 (6%)	0.92 (0.70–1.21)	
<b>Cancer under active treatment</b>							0.38
No	633 (96%)	380 (95%)	531 (96%)	732 (95%)	1095 (94%)	1.00 (ref)	
Yes	26 (4%)	22 (5%)	23 (4%)	35 (5%)	69 (6%)	0.88 (0.66–1.17)	
<b>Other chronic disease</b>							0.09
No	505 (79%)	302 (76%)	404 (75%)	604 (80%)	971 (85%)	1.00 (ref)	
Yes	136 (21%)	96 (24%)	138 (25%)	150 (20%)	171 (15%)	1.14 (0.98–1.34)	
<b>Body mass index (kg/m<sup>2</sup>)</b>	31.2 (8.1)	31.2 (7.9)	31.5 (8.0)	29.8 (7.7)	28.4 (6.8)	1.02 (1.01–1.02)	0.0003
<b>Self-reported health status</b>							0.74
Excellent	78 (12%)	32 (8%)	52 (9%)	62 (8%)	175 (15%)	1.00 (ref)	
Very good	236 (36%)	132 (33%)	156 (28%)	286 (37%)	477 (41%)	1.08 (0.88–1.33)	
Good	238 (36%)	165 (41%)	237 (43%)	279 (36%)	368 (32%)	1.10 (0.89–1.35)	
Fair	94 (14%)	69 (17%)	99 (18%)	130 (17%)	123 (11%)	1.18 (0.93–1.50)	
Poor	15 (2%)	5 (1%)	12 (2%)	11 (1%)	24 (2%)	1.01 (0.63–1.61)	
<b>Smoking status</b>							0.17
nonsmoker	582 (88%)	345 (86%)	483 (87%)	679 (88%)	1080 (92%)	1.00 (ref)	
Current smoker	79 (12%)	58 (14%)	72 (13%)	90 (12%)	88 (8%)	1.15 (0.94–1.39)	
<b>Employment status</b>							0.67
Not currently employed	440 (67%)	262 (65%)	390 (70%)	522 (68%)	824 (71%)	1.00 (ref)	
Currently employed	220 (33%)	141 (35%)	166 (30%)	247 (32%)	342 (29%)	0.97 (0.85–1.11)	
<b>Time spent working within 6 ft of others (hours/day)</b>							0.22
0	69 (31%)	44 (31%)	63 (38%)	82 (33%)	139 (41%)	1.00 (ref)	
0.1 to <1	43 (20%)	24 (17%)	44 (27%)	55 (22%)	80 (23%)	1.08 (0.81–1.44)	
1 to <3	18 (8%)	25 (18%)	16 (10%)	25 (10%)	35 (10%)	1.39 (0.96–2.02)	
≥3	90 (41%)	47 (34%)	43 (26%)	84 (34%)	88 (26%)	1.24 (0.96–1.61)	
<b>Household composition</b>							0.05
Lives alone	237 (36%)	121 (30%)	197 (36%)	226 (30%)	304 (26%)	1.00 (ref)	
Lives with other adult(s) and no children	335 (51%)	225 (57%)	291 (53%)	457 (61%)	778 (67%)	0.87 (0.76–1.00)	
Lives with child(ren)	82 (13%)	51 (13%)	57 (10%)	98 (9%)	75 (6%)	1.07 (0.86–1.34)	
<b>Spirituality/religiosity</b>							<0.0001
Very	398 (62%)	229 (57%)	314 (57%)	364 (48%)	491 (42%)	1.00 (ref)	
Fairly	190 (30%)	130 (33%)	179 (32%)	276 (36%)	421 (36%)	0.78 (0.68–0.89)	
Slightly/Not at all	56 (9%)	41 (10%)	58 (11%)	119 (16%)	244 (21%)	0.60 (0.50–0.73)	
<b>Health insurance status</b>							<0.0001
Any Medicare/Medicaid	407 (62%)	257 (64%)	364 (66%)	502 (65%)	814 (70%)	1.00 (ref)	
Any private/no Medicare or Medicaid	147 (22%)	84 (21%)	135 (24%)	195 (25%)	285 (24%)	0.79 (0.67–0.93)	
Only military/other	68 (10%)	38 (9%)	33 (6%)	47 (6%)	50 (4%)	1.34 (1.05–1.72)	
No health insurance	36 (5%)	23 (6%)	23 (4%)	24 (3%)	16 (1%)	1.62 (1.15–2.27)	

(Continued)

Appendix Table 3I. (Continued).

CHARACTERISTICS <sup>a</sup>	Urban Residents					OR (95% CI) <sup>b</sup>	p-value
	Very unlikely n = 661	Somewhat unlikely n = 403	Neither likely nor unlikely n = 556	Somewhat likely n = 769	Very likely n = 1168		
<b>Self-rated reading ability<sup>c</sup></b>	1.5 (0.8)	1.5 (0.8)	1.5 (0.8)	1.4 (0.7)	1.3 (0.6)	1.17 (1.08–1.27)	0.0001
<b>Confidence in filling out medical forms<sup>d</sup></b>	1.4 (0.8)	1.4 (0.7)	1.4 (0.8)	1.3 (0.7)	1.3 (0.6)	1.13 (1.04–1.23)	0.005
<b>Need help reading materials from doctors</b>							0.53
No	611 (95%)	369 (94%)	512 (94%)	724 (97%)	1112 (97%)	1.00 (ref)	
Yes	30 (5%)	24 (6%)	31 (6%)	24 (3%)	36 (3%)	1.10 (0.82–1.49)	
<b>Experience of discrimination in healthcare due to race or socioeconomic status</b>							0.008
No experience	489 (74%)	310 (77%)	400 (72%)	624 (81%)	1046 (90%)	1.00 (ref)	
Experienced discrimination	123 (19%)	73 (18%)	112 (20%)	98 (13%)	77 (7%)	1.33 (1.11–1.59)	
Unknown	49 (7%)	20 (5%)	44 (8%)	47 (6%)	45 (4%)	1.12 (0.87–1.46)	
<b>COVID-19 preventive behaviors</b>							
Personal protective behaviors score <sup>e</sup>	24.9 (6.0)	25.6 (4.5)	25.9 (4.5)	25.5 (4.2)	25.1 (4.1)	0.96 (0.95–0.98)	<0.0001
Community protective behaviors score <sup>f</sup>	17.5 (5.9)	18.4 (4.9)	18.5 (4.4)	18.6 (4.3)	18.7 (4.0)	0.95 (0.93–0.96)	<0.0001
<b>Perceived likelihood of getting COVID-19<sup>g</sup></b>	2.1 (1.1)	2.3 (1.0)	2.4 (1.1)	2.5 (1.0)	2.4 (1.1)	0.82 (0.78–0.87)	<0.0001
<b>Perceived likelihood of surviving COVID-19<sup>g</sup></b>	3.9 (1.3)	3.6 (1.3)	3.6 (1.2)	3.7 (1.2)	3.7 (1.3)	0.98 (0.93–1.03)	0.43
<b>COVID-19 testing</b>							0.04
Never tested	407 (62%)	215 (53%)	313 (57%)	443 (58%)	710 (61%)	1.00 (ref)	
Tested negative	235 (36%)	166 (41%)	225 (41%)	307 (40%)	425 (37%)	0.85 (0.75–0.97)	
Ever tested positive	17 (3%)	21 (5%)	15 (3%)	17 (2%)	27 (2%)	0.94 (0.65–1.36)	
<b>Household member tested positive for COVID-19</b>							0.85
No	410 (97%)	260 (95%)	341 (96%)	520 (97%)	836 (97%)	1.00 (ref)	
Yes	13 (3%)	15 (5%)	14 (4%)	18 (3%)	26 (3%)	0.96 (0.65–1.43)	
<b>Had an influenza vaccination in 2019–2021</b>							<0.0001
Yes	344 (53%)	278 (69%)	397 (72%)	655 (85%)	1094 (94%)	1.00 (ref)	
No	308 (47%)	124 (31%)	154 (28%)	112 (15%)	71 (6%)	4.19 (3.59–4.88)	
<b>Childhood vaccines are safe</b>							<0.0001
Yes	537 (82%)	369 (92%)	513 (93%)	747 (98%)	1149 (99%)	1.00 (ref)	
No	114 (18%)	31 (8%)	36 (7%)	15 (2%)	12 (1%)	5.75 (4.36–7.58)	
<b>Confidence in COVID-19 vaccine effectiveness<sup>h</sup></b>	2.1 (1.3)	2.2 (1.0)	2.7 (1.0)	3.3 (1.1)	3.9 (1.1)	0.42 (0.40–0.44)	<0.0001
<b>Confidence in COVID-19 vaccine safety<sup>h</sup></b>	2.1 (1.3)	2.2 (1.1)	2.7 (1.0)	3.3 (1.1)	4.0 (1.1)	0.43 (0.41–0.45)	<0.0001
<b>COMMUNITY CHARACTERISTICS</b>							
<b>State influenza vaccination ranking</b>	60.6 (3.6)	60.7 (3.6)	60.6 (3.8)	60.7 (3.8)	61.1 (3.8)	1.00 (0.98–1.02)	0.97
<b>Area Deprivation Index ranking 2018 (per 1 unit increase)</b>	65.0 (23.8)	63.6 (24.0)	63.4 (24.3)	57.9 (24.7)	51.0 (26.0)	1.01 (1.01–1.01)	<0.0001
<b>COVID-19 community burden</b>	21.7 (13.2)	21.3 (12.6)	21.9 (13.3)	23.1 (14.3)	22.5 (14.8)	1.00 (0.99–1.00)	0.07
<b>Unicast social distancing grade</b>	0.98 (0.08)	0.97 (0.09)	0.97 (0.10)	0.97 (0.08)	0.97 (0.09)	0.76 (0.39–1.50)	0.43
<b>Pandemic Vulnerability Index</b>	0.55 (0.04)	0.55 (0.04)	0.55 (0.04)	0.55 (0.04)	0.54 (0.05)	4.77 (1.12–20.34)	0.03

<sup>a</sup>Presented as n (%) for categorical variables and mean (standard deviation) for continuous variables.

<sup>b</sup>Odds ratios and p-values were derived from proportional odds models additionally adjusted for age, sex, race. The six specific chronic diseases were additionally adjusted for each other.

<sup>c</sup>Scored as 1 – Excellent, 2 – Very good, 3 – Good, 4 – Okay, 5 – Poor.

<sup>d</sup>Scored as 1 – Extremely, 2 – Quite a bit, 3 – Somewhat, 4 – A little bit, 5 – Not at all.

<sup>e</sup>Sum of days per week for each of washing hands or using sanitizer frequently, cleaning surfaces touched, wearing face masks, and keeping 6 feet away from others. Range from 0 to 28

<sup>f</sup>Sum of days per week for each of avoiding large gatherings, avoiding restaurants or bars, and following government guidelines. Range from 0 to 21

<sup>g</sup>Scored as 1- Very unlikely, 2- Somewhat unlikely, 3 – Neither unlikely nor likely, 4 – Somewhat likely, 5 – Very likely.

<sup>h</sup>Scored as 1 – Very unconfident, 2 – Somewhat unconfident, 3 – Neither unconfident nor confident, 4 – Somewhat confident, 5 – Very confident.



**Appendix Table 4A** Simple Associations Between COVID-19 Vaccination Intent and Reasons for Getting or Not Getting a COVID-19 Vaccine – Overall.

Reason	n (%)	OR (95% CI)	p-Value
<b>Reasons for getting a COVID-19 vaccine among those with uncertain/high intent<sup>a</sup></b>			
I want to protect myself			<0.0001
Yes	2948 (96%)	4.44 (2.78–7.08)	
No	113 (4%)	1.00 (Ref)	
I want to protect my family			<0.0001
Yes	2884 (94%)	2.19 (1.56–3.06)	
No	178 (6%)	1.00 (Ref)	
I want to protect my community			<0.0001
Yes	2728 (90%)	2.74 (2.12–3.54)	
No	310 (10%)	1.00 (Ref)	
I have a chronic health condition, such as asthma or diabetes, so it is important that I have it			0.16
Yes	1196 (40%)	1.12 (0.95–1.32)	
No	1817 (60%)	1.00 (Ref)	
It would be the best way to avoid getting seriously ill from COVID-19			<0.0001
Yes	2739 (90%)	4.21 (3.20–5.54)	
No	307 (10%)	1.00 (Ref)	
It would allow me to feel safe around other people			<0.0001
Yes	2545 (84%)	2.63 (2.13–3.24)	
No	496 (16%)	1.00 (Ref)	
Life won't go back to normal until most people are vaccinated			<0.0001
Yes	2449 (81%)	3.38 (2.75–4.14)	
No	568 (19%)	1.00 (Ref)	
Recommendation of medical professionals			<0.0001
Yes	2685 (88%)	1.62 (1.28–2.06)	
No	366 (12%)	1.00 (Ref)	
Recommendation of political leaders			<0.0001
Yes	386 (13%)	2.37 (1.83–3.07)	
No	2601 (87%)	1.00 (Ref)	
Recommendation of religious leaders			0.002
Yes	374 (13%)	1.48 (1.16–1.89)	
No	2609 (87%)	1.00 (Ref)	
Recommendation of friends or family			<0.0001
Yes	1297 (43%)	1.37 (1.17–1.60)	
No	1699 (57%)	1.00 (Ref)	
I believe the vaccine is safe			<0.0001
Yes	2375 (80%)	3.74 (3.03–4.63)	
No	607 (20%)	1.00 (Ref)	
<b>Reasons would not get a COVID-19 vaccine among those with uncertain/low intent<sup>b</sup></b>			
I am allergic to vaccines			0.32
Yes	131 (7%)	0.83 (0.57–1.20)	
No	1720 (93%)	1.00 (Ref)	
I don't like needles			0.23
Yes	345 (19%)	0.86 (0.67–1.10)	
No	1512 (81%)	1.00 (Ref)	
I'm not concerned about getting seriously ill from COVID-19			0.09
Yes	579 (31%)	1.20 (0.97–1.48)	
No	1290 (69%)	1.00 (Ref)	
I won't have time to get vaccinated			0.91
Yes	105 (6%)	1.03 (0.67–1.57)	
No	1743 (94%)	1.00 (Ref)	
I would be concerned about getting infected with COVID-19 from the vaccine			0.08
Yes	964 (50%)	0.84 (0.69–1.02)	
No	958 (50%)	1.00 (Ref)	
I would be concerned about side effects from the vaccine			0.0007
Yes	1569 (80%)	0.67 (0.53–0.84)	
No	403 (20%)	1.00 (Ref)	
I don't think vaccines work very well			0.17
Yes	448 (24%)	1.18 (0.93–1.49)	
No	1408 (76%)	1.00 (Ref)	
The COVID-19 outbreak is not as serious as some people say it is			0.36
Yes	367 (20%)	1.13 (0.87–1.45)	
No	1497 (80%)	1.00 (Ref)	
I would be concerned about the cost of the vaccine			<0.0001
Yes	582 (31%)	0.56 (0.45–0.68)	
No	1286 (69%)	1.00 (Ref)	
I think the COVID-19 vaccine will not work			0.92
Yes	657 (35%)	0.99 (0.81–1.21)	
No	1200 (65%)	1.00 (Ref)	
Other reason			0.004
Yes	436 (29%)	1.42 (1.12–1.79)	
No	1073 (71%)	1.00 (Ref)	

<sup>a</sup>Derived from proportional odds model to individually assess each reason to get vaccinated and its association with higher likelihood of vaccination among those who answered neither likely nor unlikely, somewhat likely, or very likely for vaccination. Models were adjusted for all of the covariates included in the final model in Table 2.

<sup>b</sup>Derived from proportional odds model to individually assess each reason would not get vaccinated and its association with lower likelihood of vaccination among those who answered neither likely nor unlikely, somewhat unlikely, or very unlikely for vaccination. Models were adjusted for all of the covariates included in models in the final model in Table 2.


**Appendix Table 4B** Simple associations between COVID-19 vaccination intent and reasons for getting or not getting a COVID-19 vaccine among racial/gender groups.

Reason	Black women			White women			Black men			White men			All other racial/ ethnic groups		
	n (%)	OR (95% CI)	n (%)	n (%)	OR (95% CI)	n (%)	n (%)	OR (95% CI)	n (%)	n (%)	OR (95% CI)	n (%)	n (%)	OR (95% CI)	
<b>Reasons for getting a COVID-19 vaccine among those with uncertain/high intent*</b>															
I want to protect myself															
Yes	677 (95%)	2.35 (1.00–5.53)	1024 (97%)	5.09 (2.19–11.83)	252 (94%)	2.41 (0.61–9.61)	802 (98%)	5.77 (1.92–17.32)	193 (94%)	13.81 (2.52–75.72)	13 (6%)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	0.003
No	35 (5%)	1.00 (Ref)	34 (3%)	1.00 (Ref)	15 (6%)	1.00 (Ref)	16 (2%)	1.00 (Ref)	13 (6%)	1.00 (Ref)	0.002	0.002	0.002	0.002	0.003
<i>p</i> -value	0.05		0.0002		0.21		0.21		0.002						
I want to protect my family															
Yes	662 (94%)	2.55 (1.24–5.28)	996 (94%)	2.55 (1.46–4.43)	250 (93%)	0.57 (0.19–1.72)	787 (96%)	2.03 (0.89–4.60)	189 (90%)	2.86 (0.97–8.47)	21 (10%)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	0.06
No	45 (6%)	1.00 (Ref)	62 (6%)	1.00 (Ref)	19 (7%)	1.00 (Ref)	31 (4%)	1.00 (Ref)	21 (10%)	1.00 (Ref)	0.09	0.09	0.09	0.06	0.06
<i>p</i> -value	0.01		0.001		0.31		0.31		0.09						
I want to protect my community															
Yes	610 (87%)	2.03 (1.23–3.37)	954 (91%)	2.95 (1.91–4.58)	235 (88%)	3.56 (1.45–8.70)	747 (92%)	2.61 (1.52–4.45)	182 (88%)	4.48 (1.59–12.63)	24 (12%)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	0.005
No	90 (13%)	1.00 (Ref)	99 (9%)	1.00 (Ref)	31 (12%)	1.00 (Ref)	66 (8%)	1.00 (Ref)	24 (12%)	1.00 (Ref)	0.0005	0.0005	0.0005	0.005	0.005
<i>p</i> -value	0.006		<0.0001		0.006		0.006		0.0005						
I have a chronic health condition, such as asthma or diabetes, so it is important that I have it															
Yes	368 (53%)	1.18 (0.86–1.63)	384 (37%)	1.10 (0.83–1.44)	102 (38%)	1.73 (1.01–2.95)	263 (33%)	0.99 (0.69–1.42)	79 (39%)	0.65 (0.32–1.31)	125 (61%)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	0.22
No	323 (47%)	1.00 (Ref)	665 (63%)	1.00 (Ref)	164 (62%)	1.00 (Ref)	540 (67%)	1.00 (Ref)	125 (61%)	1.00 (Ref)	0.95	0.95	0.95	0.22	0.22
<i>p</i> -value	0.3		0.52		0.05		0.05		0.95						
It would be the best way to avoid getting seriously ill from COVID-19															
Yes	602 (86%)	3.22 (1.90–5.46)	958 (91%)	3.87 (2.46–6.08)	233 (87%)	4.51 (1.78–11.43)	755 (93%)	5.89 (3.29–10.55)	191 (91%)	10.37 (2.78–38.70)	18 (9%)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	0.0005
No	97 (14%)	1.00 (Ref)	99 (9%)	1.00 (Ref)	34 (13%)	1.00 (Ref)	59 (7%)	1.00 (Ref)	18 (9%)	1.00 (Ref)	<0.0001	<0.0001	<0.0001	0.0005	0.0005
<i>p</i> -value	<0.0001		<0.0001		<0.0001		<0.0001		<0.0001						
It would allow me to feel safe around other people															
Yes	567 (81%)	2.81 (1.79–4.41)	873 (83%)	2.53 (1.80–3.56)	222 (83%)	2.83 (1.33–6.02)	714 (88%)	2.65 (1.69–4.16)	169 (82%)	2.47 (1.05–5.86)	37 (18%)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	0.04
No	134 (19%)	1.00 (Ref)	179 (17%)	1.00 (Ref)	46 (17%)	1.00 (Ref)	100 (12%)	1.00 (Ref)	37 (18%)	1.00 (Ref)	<0.0001	<0.0001	<0.0001	0.04	0.04
<i>p</i> -value	<0.0001		<0.0001		<0.0001		<0.0001		<0.0001						
Life won't go back to normal until most people are vaccinated															
Yes	515 (75%)	3.64 (2.44–5.43)	862 (82%)	3.13 (2.24–4.37)	212 (80%)	3.02 (1.45–6.26)	701 (87%)	3.00 (1.91–4.69)	159 (78%)	11.65 (4.34–31.29)	45 (22%)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	<0.0001
No	171 (25%)	1.00 (Ref)	190 (18%)	1.00 (Ref)	53 (20%)	1.00 (Ref)	109 (13%)	1.00 (Ref)	45 (22%)	1.00 (Ref)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
<i>p</i> -value	<0.0001		<0.0001		<0.0001		<0.0001		<0.0001						
Recommendation of medical professionals															
Yes	590 (84%)	1.92 (1.20–3.07)	937 (88%)	1.38 (0.93–2.04)	228 (86%)	4.72 (1.90–11.72)	752 (92%)	1.70 (0.97–2.97)	178 (86%)	0.81 (0.31–2.12)	28 (14%)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	0.67
No	113 (16%)	1.00 (Ref)	124 (12%)	1.00 (Ref)	38 (14%)	1.00 (Ref)	63 (8%)	1.00 (Ref)	28 (14%)	1.00 (Ref)	0.06	0.06	0.06	0.67	0.67
<i>p</i> -value	0.007		0.11		0.0008		0.0008		0.06						
Recommendation of political leaders															
Yes	100 (15%)	3.01 (1.88–4.82)	108 (10%)	2.57 (1.57–4.20)	43 (16%)	1.69 (0.80–3.56)	113 (14%)	1.66 (0.98–2.83)	22 (11%)	5.60 (1.43–21.87)	181 (89%)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	0.01
No	576 (85%)	1.00 (Ref)	934 (90%)	1.00 (Ref)	222 (84%)	1.00 (Ref)	688 (86%)	1.00 (Ref)	181 (89%)	1.00 (Ref)	0.06	0.06	0.06	0.01	0.01
<i>p</i> -value	<0.0001		0.0002		0.17		0.17		0.06						
Recommendation of religious leaders															
Yes	142 (21%)	1.98 (1.32–2.96)	80 (8%)	1.21 (0.74–1.98)	58 (22%)	1.44 (0.77–2.72)	79 (10%)	1.01 (0.58–1.73)	15 (7%)	1.44 (0.38–5.39)	186 (93%)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	0.59
No	536 (79%)	1.00 (Ref)	962 (92%)	1.00 (Ref)	206 (78%)	1.00 (Ref)	719 (90%)	1.00 (Ref)	186 (93%)	1.00 (Ref)	0.98	0.98	0.98	0.59	0.59
<i>p</i> -value	0.0009		0.46		0.26		0.26		0.98						
Recommendation of friends or family															
Yes	316 (46%)	2.32 (1.68–3.20)	395 (38%)	1.39 (1.06–1.82)	136 (51%)	1.33 (0.79–2.25)	363 (45%)	0.93 (0.67–1.29)	87 (43%)	0.80 (0.38–1.68)	117 (57%)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	0.56
No	364 (54%)	1.00 (Ref)	650 (62%)	1.00 (Ref)	129 (49%)	1.00 (Ref)	439 (55%)	1.00 (Ref)	117 (57%)	1.00 (Ref)	0.66	0.66	0.66	0.56	0.56
<i>p</i> -value	<0.0001		0.02		0.28		0.28		0.66						
I believe the vaccine is safe															
Yes	449 (66%)	3.69 (2.51–5.42)	828 (80%)	4.15 (2.95–5.84)	208 (79%)	2.83 (1.35–5.94)	730 (91%)	3.87 (2.22–6.75)	160 (79%)	5.95 (2.39–14.79)	43 (21%)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	0.0001
No	235 (34%)	1.00 (Ref)	205 (20%)	1.00 (Ref)	55 (21%)	1.00 (Ref)	69 (9%)	1.00 (Ref)	43 (21%)	1.00 (Ref)	<0.0001	<0.0001	<0.0001	0.0001	0.0001
<i>p</i> -value	<0.0001		<0.0001		<0.0001		<0.0001		<0.0001						

(Continued)

Appendix Table 4B (Continued).

Reason	Black women		White women		Black men		White men		All other racial/ ethnic groups	
	n (%)	OR (95% CI)	n (%)	OR (95% CI)	n (%)	OR (95% CI)	n (%)	OR (95% CI)	n (%)	OR (95% CI)
<b>Reasons would not get a COVID-19 vaccine among those with uncertain/low intent<sup>b</sup></b>										
I am allergic to vaccines										
Yes	58 (8%)	0.80 (0.46–1.39)	42 (8%)	1.33 (0.63–2.84)	18 (9%)	0.58 (0.19–1.75)	6 (3%)	0.34 (0.04–2.85)	7 (6%)	0.18 (0.02–1.50)
No	684 (92%)	1.00 (Ref)	515 (92%)	1.00 (Ref)	186 (91%)	1.00 (Ref)	218 (97%)	1.00 (Ref)	117 (94%)	1.00 (Ref)
<i>p</i> -value		0.43		0.46		0.34		0.32		0.11
I don't like needles										
Yes	198 (27%)	0.99 (0.70–1.40)	64 (11%)	0.82 (0.46–1.46)	41 (20%)	0.72 (0.31–1.68)	20 (9%)	0.67 (0.24–1.83)	22 (17%)	0.35 (0.10–1.25)
No	546 (73%)	1.00 (Ref)	493 (89%)	1.00 (Ref)	166 (80%)	1.00 (Ref)	202 (91%)	1.00 (Ref)	105 (83%)	1.00 (Ref)
<i>p</i> -value		0.96		0.49		0.44		0.43		0.11
I'm not concerned about getting seriously ill from COVID-19										
Yes	229 (31%)	0.96 (0.69–1.33)	156 (28%)	1.69 (1.09–2.63)	57 (27%)	1.39 (0.71–2.75)	93 (41%)	1.07 (0.58–1.99)	44 (35%)	2.43 (0.81–7.26)
No	514 (69%)	1.00 (Ref)	408 (72%)	1.00 (Ref)	152 (73%)	1.00 (Ref)	135 (59%)	1.00 (Ref)	81 (65%)	1.00 (Ref)
<i>p</i> -value		0.78		0.02		0.34		0.83		0.11
I won't have time to get vaccinated										
Yes	59 (8%)	1.22 (0.70–2.12)	10 (2%)	1.39 (0.35–5.51)	16 (8%)	0.40 (0.10–1.54)	9 (4%)	2.14 (0.42–10.84)	11 (9%)	0.37 (0.03–4.30)
No	679 (92%)	1.00 (Ref)	546 (98%)	1.00 (Ref)	190 (92%)	1.00 (Ref)	213 (96%)	1.00 (Ref)	115 (91%)	1.00 (Ref)
<i>p</i> -value		0.47		0.64		0.18		0.36		0.42
I would be concerned about getting infected with COVID-19 from the vaccine										
Yes	484 (62%)	1.08 (0.80–1.46)	231 (40%)	0.70 (0.49–1.01)	98 (47%)	0.65 (0.35–1.20)	76 (33%)	0.53 (0.28–1.00)	75 (57%)	0.58 (0.23–1.50)
No	298 (38%)	1.00 (Ref)	341 (60%)	1.00 (Ref)	112 (53%)	1.00 (Ref)	151 (67%)	1.00 (Ref)	56 (43%)	1.00 (Ref)
<i>p</i> -value		0.63		0.06		0.17		0.05		0.26
I would be concerned about side effects from the vaccine										
Yes	689 (85%)	0.70 (0.46–1.06)	455 (77%)	0.72 (0.47–1.11)	156 (73%)	0.65 (0.33–1.29)	161 (69%)	0.67 (0.36–1.25)	108 (84%)	0.59 (0.17–2.09)
No	118 (15%)	1.00 (Ref)	133 (23%)	1.00 (Ref)	57 (27%)	1.00 (Ref)	74 (31%)	1.00 (Ref)	21 (16%)	1.00 (Ref)
<i>p</i> -value		0.09		0.14		0.22		0.21		0.41
I don't think vaccines work very well										
Yes	203 (27%)	1.18 (0.84–1.67)	109 (20%)	1.23 (0.74–2.04)	42 (21%)	0.87 (0.40–1.91)	63 (28%)	0.91 (0.45–1.84)	31 (24%)	3.95 (1.15–13.52)
No	537 (73%)	1.00 (Ref)	449 (80%)	1.00 (Ref)	162 (79%)	1.00 (Ref)	163 (72%)	1.00 (Ref)	97 (76%)	1.00 (Ref)
<i>p</i> -value		0.34		0.43		0.74		0.78		0.03
The COVID-19 outbreak is not as serious as some people say it is										
Yes	139 (19%)	1.15 (0.77–1.72)	114 (20%)	1.13 (0.69–1.85)	32 (15%)	0.92 (0.39–2.19)	59 (26%)	1.26 (0.63–2.53)	23 (19%)	1.95 (0.55–6.85)
No	605 (81%)	1.00 (Ref)	448 (80%)	1.00 (Ref)	176 (85%)	1.00 (Ref)	167 (74%)	1.00 (Ref)	101 (81%)	1.00 (Ref)
<i>p</i> -value		0.48		0.64		0.85		0.51		0.3
I would be concerned about the cost of the vaccine										
Yes	290 (39%)	0.68 (0.51–0.92)	140 (25%)	0.44 (0.29–0.66)	69 (33%)	0.45 (0.24–0.87)	40 (18%)	0.54 (0.26–1.14)	43 (34%)	0.33 (0.12–0.89)
No	462 (61%)	1.00 (Ref)	422 (75%)	1.00 (Ref)	137 (67%)	1.00 (Ref)	182 (82%)	1.00 (Ref)	83 (66%)	1.00 (Ref)
<i>p</i> -value		0.01		<0.0001		0.02		0.1		0.03
I think the COVID-19 vaccine will not work										
Yes	284 (38%)	1.25 (0.92–1.71)	177 (32%)	0.94 (0.63–1.41)	75 (36%)	0.90 (0.47–1.72)	69 (31%)	0.76 (0.40–1.45)	52 (42%)	0.82 (0.31–2.18)
No	461 (62%)	1.00 (Ref)	383 (68%)	1.00 (Ref)	132 (64%)	1.00 (Ref)	151 (69%)	1.00 (Ref)	73 (58%)	1.00 (Ref)
<i>p</i> -value		0.16		0.76		0.75		0.41		0.69
Other reason										
Yes	182 (30%)	1.32 (0.91–1.90)	131 (30%)	1.75 (1.10–2.77)	39 (22%)	1.55 (0.64–3.74)	53 (28%)	1.38 (0.67–2.82)	31 (32%)	1.02 (0.31–3.30)
No	424 (70%)	1.00 (Ref)	310 (70%)	1.00 (Ref)	135 (78%)	1.00 (Ref)	139 (72%)	1.00 (Ref)	65 (68%)	1.00 (Ref)
<i>p</i> -value		0.14		0.02		0.33		0.39		0.98

<sup>a</sup>Used proportional odds model to individually assess each reason and its association with higher likelihood of vaccination among those who answered neither likely nor unlikely, somewhat likely, or very likely for vaccination. Models were adjusted for all of the covariates included in models in Table 2.

<sup>b</sup>Used proportional odds model to individually assess each reason and its association with lower likelihood of vaccination among those who answered neither likely nor unlikely, somewhat unlikely, or very unlikely for vaccination. Models were adjusted for all of the covariates included in models in Table 2.

**Appendix Table 4C** Simple associations between COVID-19 vaccination intent and reasons for getting or not getting a COVID-19 vaccine among age groups.

Reason	Age (y)					
	< 65			≥ 65		
	n (%)	OR (95% CI)	p-value	n (%)	OR (95% CI)	p-value
<b>Reasons for getting a COVID-19 vaccine among those with uncertain/high intent<sup>a</sup></b>						
I want to protect myself			0.005			<0.0001
Yes	1077 (95%)	2.48 (1.31–4.69)		1871 (97%)	7.75 (3.90–15.41)	
No	55 (5%)	1.00 (Ref)		58 (3%)	1.00 (Ref)	
I want to protect my family			0.04			<0.0001
Yes	1063 (94%)	1.77 (1.03–3.04)		1821 (94%)	2.47 (1.60–3.81)	
No	67 (6%)	1.00 (Ref)		111 (6%)	1.00 (Ref)	
I want to protect my community			0.0002			<0.0001
Yes	978 (87%)	2.03 (1.39–2.95)		1750 (91%)	3.59 (2.53–5.11)	
No	147 (13%)	1.00 (Ref)		163 (9%)	1.00 (Ref)	
I have a chronic health condition, such as asthma or diabetes, so it is important that I have it			0.79			0.05
Yes	488 (44%)	0.97 (0.75–1.25)		708 (37%)	1.24 (1.00–1.53)	
No	625 (56%)	1.00 (Ref)		1192 (63%)	1.00 (Ref)	
It would be the best way to avoid getting seriously ill from COVID-19			<0.0001			<0.0001
Yes	984 (87%)	2.97 (1.99–4.42)		1755 (91%)	6.00 (4.10–8.77)	
No	142 (13%)	1.00 (Ref)		165 (9%)	1.00 (Ref)	
It would allow me to feel safe around other people			<0.0001			<0.0001
Yes	898 (80%)	2.23 (1.62–3.07)		1647 (86%)	3.03 (2.28–4.02)	
No	225 (20%)	1.00 (Ref)		271 (14%)	1.00 (Ref)	
Life won't go back to normal until most people are vaccinated			<0.0001			<0.0001
Yes	840 (76%)	2.82 (2.09–3.81)		1609 (84%)	4.10 (3.10–5.43)	
No	270 (24%)	1.00 (Ref)		298 (16%)	1.00 (Ref)	
Recommendation of medical professionals			0.05			0.0004
Yes	978 (87%)	1.45 (0.99–2.10)		1707 (89%)	1.76 (1.29–2.41)	
No	150 (13%)	1.00 (Ref)		216 (11%)	1.00 (Ref)	
Recommendation of political leaders			<0.0001			<0.0001
Yes	154 (14%)	2.29 (1.54–3.39)		232 (12%)	2.47 (1.74–3.50)	
No	954 (86%)	1.00 (Ref)		1647 (88%)	1.00 (Ref)	
Recommendation of religious leaders			0.16			0.004
Yes	136 (12%)	1.33 (0.90–1.97)		238 (13%)	1.58 (1.16–2.17)	
No	969 (88%)	1.00 (Ref)		1640 (87%)	1.00 (Ref)	
Recommendation of friends or family			0.005			0.004
Yes	479 (43%)	1.45 (1.12–1.87)		818 (43%)	1.35 (1.10–1.65)	
No	629 (57%)	1.00 (Ref)		1070 (57%)	1.00 (Ref)	
I believe the vaccine is safe			<0.0001			<0.0001
Yes	810 (73%)	2.49 (1.83–3.39)		1565 (84%)	5.74 (4.26–7.74)	
No	303 (27%)	1.00 (Ref)		304 (16%)	1.00 (Ref)	
<b>Reasons would not get a COVID-19 vaccine among those with uncertain/low intent<sup>b</sup></b>						
I am allergic to vaccines			0.76			0.25
Yes	72 (8%)	0.92 (0.55–1.55)		59 (6%)	0.72 (0.41–1.26)	
No	845 (92%)	1.00 (Ref)		875 (94%)	1.00 (Ref)	
I don't like needles			0.47			0.23
Yes	205 (22%)	0.88 (0.63–1.24)		140 (15%)	0.79 (0.54–1.16)	
No	716 (78%)	1.00 (Ref)		796 (85%)	1.00 (Ref)	
I'm not concerned about getting seriously ill from COVID-19			0.88			0.03
Yes	285 (31%)	1.02 (0.75–1.39)		294 (31%)	1.41 (1.04–1.90)	
No	645 (69%)	1.00 (Ref)		645 (69%)	1.00 (Ref)	
I won't have time to get vaccinated			0.39			0.31
Yes	60 (7%)	1.29 (0.72–2.30)		45 (5%)	0.71 (0.37–1.37)	
No	857 (93%)	1.00 (Ref)		886 (95%)	1.00 (Ref)	
I would be concerned about getting infected with COVID-19 from the vaccine			0.49			0.08
Yes	499 (52%)	0.90 (0.68–1.20)		465 (48%)	0.78 (0.60–1.03)	
No	454 (48%)	1.00 (Ref)		504 (52%)	1.00 (Ref)	
I would be concerned about side effects from the vaccine			0.06			0.006
Yes	807 (83%)	0.71 (0.50–1.01)		762 (77%)	0.64 (0.46–0.88)	
No	170 (17%)	1.00 (Ref)		233 (23%)	1.00 (Ref)	
I don't think vaccines work very well			0.71			0.2
Yes	218 (24%)	1.07 (0.76–1.50)		230 (25%)	1.23 (0.89–1.71)	
No	704 (76%)	1.00 (Ref)		704 (75%)	1.00 (Ref)	
The COVID-19 outbreak is not as serious as some people say it is			0.48			0.45
Yes	196 (21%)	1.14 (0.80–1.62)		171 (18%)	1.15 (0.80–1.66)	
No	727 (79%)	1.00 (Ref)		770 (82%)	1.00 (Ref)	
I would be concerned about the cost of the vaccine			<0.0001			0.0008
Yes	318 (34%)	0.51 (0.38–0.67)		264 (28%)	0.60 (0.45–0.81)	
No	610 (66%)	1.00 (Ref)		676 (72%)	1.00 (Ref)	
I think the COVID-19 vaccine will not work			0.56			0.59
Yes	357 (38%)	0.92 (0.69–1.22)		300 (32%)	1.08 (0.81–1.45)	
No	572 (62%)	1.00 (Ref)		628 (68%)	1.00 (Ref)	

(Continued)

Appendix Table 4C (Continued).

Reason	Age (y)					
	< 65			≥ 65		
	n (%)	OR (95% CI)	p-value	n (%)	OR (95% CI)	p-value
Other reason			0.01			0.09
Yes	229 (30%)	1.54 (1.10–2.15)		207 (28%)	1.34 (0.95–1.89)	
No	539 (70%)	1.00 (Ref)		534 (72%)	1.00 (Ref)	

<sup>a</sup>Used proportional odds model to individually assess each reason and its association with higher likelihood of vaccination among those who answered neither likely nor unlikely, somewhat likely, or very likely for vaccination. Models were adjusted for all of the covariates included in models in Table 2.

<sup>b</sup>Used proportional odds model to individually assess each reason and its association with lower likelihood of vaccination among those who answered neither likely nor unlikely, somewhat unlikely, or very unlikely for vaccination. Models were adjusted for all of the covariates included in models in Table 2.

Appendix Table 4D Simple associations between COVID-19 vaccination intent and reasons for getting or not getting a COVID-19 vaccine among rural and urban residents.

Reason	Residence Location					
	Rural residence			Urban residence		
	n (%)	OR (95% CI)	p-value	n (%)	OR (95% CI)	p-value
<b>Reasons for getting a COVID-19 vaccine among those with uncertain/high intent<sup>a</sup></b>						
I want to protect myself			0.73			<0.0001
Yes	588 (98%)	1.24 (0.38–4.08)		2360 (96%)	5.42 (3.25–9.04)	
No	15 (2%)	1.00 (Ref)		98 (4%)	1.00 (Ref)	
I want to protect my family			0.89			<0.0001
Yes	572 (95%)	1.06 (0.47–2.42)		2312 (94%)	2.53 (1.74–3.66)	
No	31 (5%)	1.00 (Ref)		147 (6%)	1.00 (Ref)	
I want to protect my community			0.001			<0.0001
Yes	542 (90%)	2.79 (1.50–5.16)		2186 (90%)	2.83 (2.13–3.77)	
No	58 (10%)	1.00 (Ref)		252 (10%)	1.00 (Ref)	
I have a chronic health condition, such as asthma or diabetes, so it is important that I have it			0.04			0.59
Yes	256 (43%)	1.47 (1.01–2.14)		940 (39%)	1.05 (0.88–1.26)	
No	341 (57%)	1.00 (Ref)		1476 (61%)	1.00 (Ref)	
It would be the best way to avoid getting seriously ill from COVID-19			0.001			<0.0001
Yes	535 (89%)	2.66 (1.48–4.80)		2204 (90%)	4.85 (3.55–6.62)	
No	67 (11%)	1.00 (Ref)		240 (10%)	1.00 (Ref)	
It would allow me to feel safe around other people			0.03			<0.0001
Yes	505 (84%)	1.71 (1.05–2.77)		2040 (84%)	2.96 (2.33–3.75)	
No	95 (16%)	1.00 (Ref)		401 (16%)	1.00 (Ref)	
Life won't go back to normal until most people are vaccinated			<0.0001			<0.0001
Yes	486 (81%)	2.65 (1.67–4.21)		1963 (81%)	3.65 (2.90–4.59)	
No	111 (19%)	1.00 (Ref)		457 (19%)	1.00 (Ref)	
Recommendation of medical professionals			0.37			0.0001
Yes	521 (87%)	1.27 (0.75–2.14)		2164 (88%)	1.71 (1.31–2.25)	
No	80 (13%)	1.00 (Ref)		286 (12%)	1.00 (Ref)	
Recommendation of political leaders			0.03			<0.0001
Yes	87 (15%)	1.86 (1.08–3.20)		299 (12%)	2.61 (1.94–3.52)	
No	505 (85%)	1.00 (Ref)		2096 (88%)	1.00 (Ref)	
Recommendation of religious leaders			0.04			0.01
Yes	81 (14%)	1.77 (1.02–3.07)		293 (12%)	1.42 (1.08–1.87)	
No	507 (86%)	1.00 (Ref)		2102 (88%)	1.00 (Ref)	
Recommendation of friends or family			0.0002			0.003
Yes	264 (45%)	2.00 (1.38–2.89)		1033 (43%)	1.30 (1.09–1.55)	
No	328 (55%)	1.00 (Ref)		1371 (57%)	1.00 (Ref)	
I believe the vaccine is safe			<0.0001			<0.0001
Yes	465 (79%)	3.56 (2.16–5.87)		1910 (80%)	3.79 (2.99–4.79)	
No	125 (21%)	1.00 (Ref)		482 (20%)	1.00 (Ref)	
<b>Reasons would not get a COVID-19 vaccine among those with uncertain/low intent<sup>b</sup></b>						
I am allergic to vaccines			0.1			0.65
Yes	31 (8%)	0.50 (0.21–1.15)		99 (7%)	0.91 (0.59–1.38)	
No	376 (92%)	1.00 (Ref)		1344 (93%)	1.00 (Ref)	
I don't like needles			0.74			0.23
Yes	73 (18%)	0.91 (0.52–1.59)		272 (19%)	0.84 (0.63–1.12)	
No	337 (82%)	1.00 (Ref)		1174 (81%)	1.00 (Ref)	
I'm not concerned about getting seriously ill from COVID-19			0.3			0.19
Yes	140 (34%)	1.28 (0.81–2.02)		438 (30%)	1.18 (0.92–1.50)	
No	270 (66%)	1.00 (Ref)		1020 (70%)	1.00 (Ref)	
I won't have time to get vaccinated			0.62			0.77
Yes	23 (6%)	0.79 (0.32–1.97)		82 (6%)	1.08 (0.66–1.75)	
No	385 (94%)	1.00 (Ref)		1357 (94%)	1.00 (Ref)	

(Continued)

Appendix Table 4D (Continued).

Reason	Residence Location					
	Rural residence			Urban residence		
	n (%)	OR (95% CI)	p-value	n (%)	OR (95% CI)	p-value
I would be concerned about getting infected with COVID-19 from the vaccine			0.64			0.11
Yes	199 (47%)	0.90 (0.58–1.39)		765 (51%)	0.83 (0.67–1.04)	
No	226 (53%)	1.00 (Ref)		731 (49%)	1.00 (Ref)	
I would be concerned about side effects from the vaccine			0.03			0.005
Yes	351 (80%)	0.53 (0.30–0.92)		1217 (79%)	0.68 (0.52–0.89)	
No	86 (20%)	1.00 (Ref)		317 (21%)	1.00 (Ref)	
I don't think vaccines work very well			0.3			0.37
Yes	108 (26%)	1.31 (0.79–2.18)		340 (24%)	1.13 (0.87–1.47)	
No	302 (74%)	1.00 (Ref)		1105 (76%)	1.00 (Ref)	
The COVID-19 outbreak is not as serious as some people say it is			0.25			0.67
Yes	91 (22%)	1.37 (0.80–2.33)		276 (19%)	1.07 (0.80–1.42)	
No	319 (78%)	1.00 (Ref)		1177 (81%)	1.00 (Ref)	
I would be concerned about the cost of the vaccine			0.007			<0.0001
Yes	120 (29%)	0.51 (0.32–0.83)		462 (32%)	0.57 (0.45–0.71)	
No	290 (71%)	1.00 (Ref)		995 (68%)	1.00 (Ref)	
I think the COVID-19 vaccine will not work			0.66			0.89
Yes	148 (36%)	0.90 (0.58–1.41)		508 (35%)	1.02 (0.81–1.28)	
No	261 (64%)	1.00 (Ref)		939 (65%)	1.00 (Ref)	
Other reason			0.04			0.03
Yes	94 (30%)	1.79 (1.04–3.08)		342 (29%)	1.35 (1.03–1.76)	
No	217 (70%)	1.00 (Ref)		855 (71%)	1.00 (Ref)	

<sup>a</sup>Used proportional odds model to individually assess each reason and its association with higher likelihood of vaccination among those who answered neither likely nor unlikely, somewhat likely, or very likely for vaccination. Models were adjusted for all of the covariates included in models in Table 2.

<sup>b</sup>Used proportional odds model to individually assess each reason and its association with lower likelihood of vaccination among those who answered neither likely nor unlikely, somewhat unlikely, or very unlikely for vaccination. Models were adjusted for all of the covariates included in models in Table 2.