



## Explaining racial/ethnic and socioeconomic differences in COVID protective behavior

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### ABSTRACT

COVID-19 has had a disproportionate impact on Black, Hispanic, and lower socioeconomic status communities. Using data from the Community, Health and Politics Study (CHAPS 2021), collected in the midst of the pandemic, we examine differences in COVID-19 health promotion behavior (i.e., avoiding large gatherings, mask wearing, and vaccination status) across racial, ethnic, and socioeconomic status subgroups of the population. Moreover, we examine the degree to which observed differences are robust to controls for other health-related disparities, such as access to health insurance, underlying health conditions, personal exposure to COVID-19 (i.e., own diagnoses, knowing persons who have died from COVID-19), and perceived COVID-19 threat. Findings are consistent with arguments proposed by fundamental cause theory and disease stage theory as they indicate fewer differences on the basis of socioeconomic status or race and ethnicity for masking and social distancing, which may be thought of as less effective measures. In contrast, disparities were prominent in vaccination outcomes. Specifically, racial and ethnic minorities, those with lower levels of education, and those with lower incomes had lower odds of vaccination, after controlling for covariates. Private insurance and older age were also associated with higher odds of vaccination. Higher perceived threat of COVID-19 increased the likelihood of all protective behaviors. Our findings suggest that the need for ongoing efforts to increase vaccination uptake in socially disadvantaged communities.

### 1. Introduction

COVID-19 has disrupted the health, well-being, and everyday lives of people around the world. The pandemic has resulted in the loss of millions of lives worldwide, leading to decreases in life expectancy that have exceeded recent gains (Aburto et al., 2021; Andrasfay & Goldman, 2021; Gutin & Hummer, 2021).

Although all groups have been affected, COVID-19 has taken a disproportionate toll on persons of lower socio-economic status, as well as Black and Hispanic communities in the United States (Andrasfay and Goldman, 2021; Garcia, Homan, García, & Brown, 2021; Green, Hernandez, and MacPhail, 2021; Owen, Carmona, & Pomeroy, 2020; Williams & Cooper, 2020; Yancy, 2020). These groups are more likely to be exposed to the virus in their communities and workplaces, as they are more likely to work in hands-on service industries, and less likely to be able to work remotely (Baker, 2020; Hawkins, 2020).

Fundamental causes theory (Clouston & Link, 2021; Link, & Phelan, 1995; Phelan & Link, 2015) recognizes that social conditions structure exposures to risk factors and disease, access to resources, as well as health promotion and help-seeking behaviors, resulting in durable inequalities in health and well-being by socioeconomic status, race and

ethnicity, and other social conditions. A counter-intuitive pattern that the fundamental cause theory explains is that although life expectancy has generally been increasing, health disparities between groups have also increased and are greatest for preventable diseases (Phelan, Link, Diez-Roux, Kawachi, & Levin, 2004) such as COVID-19 (Andrasfay and Goldman, 2021). As Williams and Cooper (2020, p. 2478) note, “COVID-19 is a magnifying glass that has highlighted the larger pandemic of racial/ethnic disparities in health.”

Given the disproportional exposure to COVID-19 across population subgroups, it is imperative to understand the degree to which behaviors associated with preventing and ameliorating the consequences of COVID-19 also vary across these groups. Vaccinations are the most effective means of avoiding contraction of COVID-19 and of lessening its health consequences (Kaplan & Milstein, 2021). In addition to vaccinations, mask wearing and social distancing are among the most commonly recommended methods for minimizing one’s risk of contracting COVID-19, and controlling spread of the disease at the population level (Li, Liu, Li, Qian, & Dai, 2020). A few studies have documented differences in COVID-19 preventive behavior by socioeconomic status and race and ethnicity, however, results have been mixed. For example, Hearne and Niño (2021) find Blacks, Hispanic, and Asian

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groups to be more likely to wear masks, other research reports Black and Hispanic respondents to be less likely to wear masks, particularly in high poverty neighborhoods (Cohen et al., 2021). Results are more consistent with respect to vaccination status and intentions, with studies finding vaccine hesitancy higher among Black and Hispanic respondents (Latkin, Dayton, Yi, Colon, & Kong, 2021; Rane et al., 2021). Much work remains in this area to document differences in health promoting behavior across subgroups and to understand potential sources of these disparities.

Using data from the Community Health and Politics Study (CHAPS), collected in the midst of the pandemic, the present study examines differences in COVID-19 health promotion behavior (i.e., avoiding large gatherings, mask wearing, and vaccination status) across racial, ethnic, and socioeconomic status subgroups of the population. Moreover, it examines the degree to which differences observed are robust to controls for group differences in exposure to risks such as COVID-19 experiences (own diagnoses, knowing persons who have died), and underlying health conditions, access to health insurance, and perceptions of COVID-19 threat.

## 2. Background

### 2.1. Fundamental cause theory and COVID-19

Fundamental cause theory (FCT) seeks to explain the persistence of morbidity and mortality gradients by socioeconomic status (SES) and race and ethnicity (Link, & Phelan, 1995; Clouston & Link, 2021). FCT contends that health disparities by socioeconomic status and race and ethnicity persist across places and times, despite changing disease patterns and risk and protective factors, because persons of higher status have greater resources (e.g., time, money, human and social capital) that allow them to access health care and emerging best practices to combat current health threats. FCT also posits that social disparities will be more pronounced for preventable diseases for which resources can be marshalled, than for those that are less preventable (Clouston & Link, 2021).

In an extension of FCT, Clouston, Rubin, Phelan, and Link (2016) describe how inequalities associated with a particular disease change across stages of disease progression. As a new disease emerges, an initial stage termed “natural mortality” is distinguished by a low level of inequality, because not enough is known about protective factors for advantaged individuals or communities to act upon. As knowledge about the disease grows and preventive practices are identified, so too do inequalities, in a stage termed “producing inequalities.” As preventive practices and treatments becomes more widespread and inexpensive, and less advantaged groups begin to gain greater access, a “reducing inequalities” stage is expected. Finally, a “reduced mortality and disease elimination” stage occurs as treatments become more effective and universally available, or the disease is eliminated.

FCT is well suited to examining why COVID-19 has so severely illuminated health disparities by SES and race and ethnicity. For example, Clouston, Natale, and Link (2021) recently applied FCT and the disease stage theory to explain SES disparities in the spread of the virus. Consistent with disease stage theory hypotheses, they found that in early stages counties with larger proportions of high socioeconomic status populations had a higher incidence of infection. As more effective public health measures were developed, county SES became inversely associated with spread of COVID-19. However, their county-level data was unable to show that SES or race and ethnic variations in social distancing, mask-wearing, or other practices explained the patterns observed. The study was also conducted prior to the emergence of the vaccine, which the authors speculate would lead to a heightening of socioeconomic disparities (Clouston et al., 2021). In the present study we are able to examine these patterns in a timeframe during which the vaccine was increasingly available.

#### 2.1.1. Differential exposure to risks and access to resources

In addition to explaining differential behavioral responses to health risks, FCT and the broader social determinants of health perspective recognize that social factors, such as where one lives and works, strongly structure disparities in exposure to risks and disease (Cockerman, Hamby and Oates, 2017; Link, & Phelan, 1995). In the case of COVID-19, those working in health care and other protective or service occupations involving face-to-face interactions are more at risk of being exposed to the virus than are those able to work remotely (Baker, Peckham, & Seixas, 2020). Living in higher-density and disadvantaged neighborhoods has also been found to be positively associated with COVID-19 infections (Maroko, Nash, & Pavilonis, 2020; Whittle & Diaz-Artiles, 2020). Thus, it is not surprising that persons of lower socioeconomic status and from racial and ethnic minority groups, who are more likely to work and reside in these occupations and communities, are more at risk of exposure to the virus (Green, Hernandez, MacPhail, 2021).

Disadvantaged groups are also more vulnerable to consequences of COVID-19 due to underlying health conditions (Lin & Liu, 2021; Papegeorge et al., 2021). Several comorbidities, e.g. heart disease, obesity, that increase the risk of hospitalization or death due to COVID-19 are higher in social and economically disadvantaged populations. One study observed that Black patients (in comparison to White patients) had higher rates of obesity, diabetes, hypertension, and chronic kidney disease (Price-Haywood, Burton, Fort, & Seoane, 2020). Accordingly, disproportionately high rates of hospitalization or deaths in Black communities have been posited to result from high rates of comorbid conditions (Suleyman et al., 2020).

Research suggests that these objective differences in risk also have consequences for people’s subjective perceptions of risk and subsequent behavioral responses. For example, using data from the Health and Retirement Survey Covid Study, Lin and Liu (2021) find that non-Hispanic Black and Hispanic older adults are more likely to be concerned about COVID-19 than their white counterparts. Differences in knowing someone with COVID-19 and underlying conditions explained part, but not all, of these group differences. In a study of vaccination uptake during the H1N1 influenza outbreak, perceived risk of infection was positively associated with being vaccinated (Bish, Yardley, Nicoll, & Michie, 2011).

In addition to previously mentioned differences in resources such as employment status, and where one works and lives, FCT posits that group differences in health-related resources are critical to understanding health disparities. Long-standing racial-ethnic and socioeconomic disparities in access, utilization, and quality of care have been identified as important mechanisms through which disparities in health are produced and maintained (Smedley, Stith, & Nelson, 2003; Williams & Collins, 1995). Having access to health insurance has been found to be a strong predictor of access to primary care, and the treatment and management of both acute and chronic conditions (Hoffman & Paradise, 2008).

#### 2.1.2. Protective behavior: hand washing, mask wearing and social distancing

At early stages of COVID-19, the most widely used means of protection were hand washing, social distancing, and mask wearing. The perceived importance of hand washing diminished over time, as did frequent disinfecting of surfaces or groceries. COVID-19 vaccines, which became widely available about a year into the pandemic, represent a level of self-protection and effectiveness that is on a different order of magnitude. In the review of literature to follow, we thus discuss hand washing, mask wearing and social distancing separately from vaccine status.

In a study at the outset of the pandemic (April 2020), Papegeorge and colleagues found persons of higher income to be more likely to change their protective behavior, which included social distancing, mask wearing, and hand-washing. This relationship was partially explained

by a greater ability of higher income respondents to tele-commute (Papageorge et al., 2020). This study also found that black respondents were more likely to engage in handwashing or mask wearing than were their white counterparts. Differences by race were not observed for social distancing, which the authors attribute to being a more difficult protective behavior to employ.

Using data from the COVID Impact Study, fielded in the late Spring of 2020, [Hearne and Niño \(2021\)](#) similarly found that black, Hispanic, and Asian respondents were more likely to wear masks than whites, controlling for socioeconomic status and other factors. Using systematic observations parks and commercial streets in Philadelphia, Cohen and colleagues found black and Asian respondents to be more likely to correctly wear masks than their white counterparts. Females were also more likely to wear masks correctly than males ([Cohen et al., 2021](#)).

Social distancing practices, such as sheltering in place or staying 6 ft apart when in public areas, are another effective means of reducing the likelihood of infection ([Sen-Crowe, McKenney, & Elkbuli, 2020](#)). As Clouster, Natale, and Link (2020) point out, however, social distancing is more difficult for those from lower SES backgrounds, who are more likely to work in service or other essential industries, live in dense housing, or in multi-generational households. Using data from the Chicago COVID-19 Comorbidities Survey, which focused on persons at higher risk of COVID-19 complications due to underlying health conditions, black respondents were found to be less likely to socially distance than were their white counterparts ([O'Connor et al., 2020](#)). [Pedersen and Favero \(2020\)](#) similarly found black respondents to be less likely to socially distance, and Asians somewhat more likely than white respondents. In Cohen and colleagues' systematic observation study, Hispanic respondents were the least likely to socially distance.

#### 2.1.3. Protective behavior: vaccination uptake

Vaccination represents the most effective means of protection from COVID-19, yet fewer studies have been published to date on social group differences in vaccine uptake. Using data from the nationally-representative Amerispeak panel (in May of 2020) higher income respondents were more likely to report intending to be vaccinated. Black and Hispanic respondents, in contrast, were less likely to intend to be vaccinated ([Latkin et al., 2021](#)). Rane and colleagues similarly observed higher vaccination hesitancy and resistance among black and Hispanic respondents in the first few waves of the prospective Communities, Households, and SARS-CoV-2 (CHASING) Epidemiology COVID Cohort study ([Rane et al., 2021](#)).

Rane and colleagues used a more recent wave of the CHASING study (February 2021) to examine COVID-19 vaccination uptake among persons 65 or older and/or healthcare workers who were eligible at the time of the survey to receive the vaccination. Among both of these subgroups, income was positively associated with vaccination uptake, but vaccine uptake differences across racial and ethnic groups were not statistically significant ([Rane et al., 2021](#)). Important questions, thus remain about vaccination uptake within the context of more widespread availability.

#### 2.1.4. Other important social factors

Although the focus of this analysis is on socioeconomic status and racial and ethnic differences, other social factors have been found to be associated with COVID-19 protective behaviors. Many studies have observed gender differences. For example, women have been found to be less likely to report vaccine intention ([Latkin et al., 2021](#)) or to social distance than men ([Pedersen & Favero, 2020](#)). However, other research has found white men to be the least likely to wear masks ([Hearne & Niño, 2021](#)). Employment status has also been found to be associated with COVID-19 protective behaviors ([Khubchandani, Jagdish, and Kandiah, 2020](#)).

Given the significant consequences of COVID-19 for older people, it is not surprising that age has been found to be associated with protective behaviors. For example, Latkin and colleagues found older respondents to be more likely than younger respondents to report intending to be

vaccinated ([Latkin et al., 2021](#)). Cohen and colleagues similarly found older respondents (60+) to be more likely to properly adhere to mask wearing ([Cohen et al., 2021](#)).

Finally, given the highly politicized nature of response to COVID-19, it is not surprising that studies have found political party to strongly influence protective behavior with Republicans and Independents to be less likely to wear masks ([Naeim et al., 2021](#)) and Democrats being more likely to perceive greater risks from COVID, to wear face coverings or masks, and to avoid large gatherings than Republicans ([de Bruin, Saw, & Goldman, 2020](#)).

## 2.2. Summary of present study: research questions and hypotheses

Extant research, largely conducted using samples in the earlier stages of COVID-19 prior to general availability of vaccines, have revealed differences in COVID-19 protective behavior by socioeconomic status and race and ethnicity that are largely consistent with FCT theory. Motivated by FCT and disease stage theories, and using a nationally-representative sample surveyed after COVID-19 vaccinations had become available in May of 2021, we seek to address two main research questions. First, how do socioeconomic and racial and ethnic groups vary in COVID-19 protective behavior, including social distancing, mask wearing, and vaccination status? Secondly, are socioeconomic and racial/ethnic differences in COVID-19 protective behavior observed robust to controls for other health-related social disparities, such as access to health care, underlying health conditions, employment status, perceived threat of COVID-19, and exposure to COVID-19?

Disease stage theory suggests that SES and racial and ethnic differences will be strongest when effective protective strategies such as a vaccine have emerged. Thus, we anticipate that SES and racial and ethnic disparities will be more apparent for vaccination status than for other protective health behaviors.

## 3. Data

For this investigation, we use data from the 2021 Crime, Health, and Politics Survey (CHAPS). The CHAPS is based on a national probability sample of 1771 community-dwelling adults aged 18 and over living in the United States. Respondents were sampled from the National Opinion Research Center's (NORC) AmeriSpeak® panel, which is representative of households from all 50 states and the District of Columbia (<https://amerispeak.norc.org/Documents/Research/AmeriSpeak%20Technical%20Overview%202019%2002%2018.pdf>). The AmeriSpeak® panel has been used in previous research to study Covid-19 protective behavior ([Latkin et al., 2021](#)). The Sampled respondents were invited to complete the online survey in English between May 10, 2021 and June 1, 2021. The data collection process yielded a survey completion rate of 30.7% and a weighted cumulative response rate of 4.4%. The multistage probability sample resulted in a margin of error of  $\pm 3.23\%$  and an average design effect of 1.92. The median self-administered web-based survey lasted approximately 25 min. All respondents were offered the cash equivalent of \$8.00 for completing the survey. The survey was reviewed and approved by the institutional review board at NORC and one other university review board. Informed consent was obtained from all participants. The primary purpose of the CHAPS is to document the social causes and social consequences of various indicators of health and well-being in the United States during the coronavirus (COVID-19) pandemic. The omnibus survey includes measures of psychosocial characteristics, religious beliefs and experiences, political views and behaviors, neighborhood conditions, experiences with crime and police, stressful life events, health behavior and health lifestyles, mental health, physical health, sexual and reproductive health, and sociodemographic characteristics.

### 3.1. Measures

#### 3.1.1. Pandemic health behaviors

We measure pandemic behaviors via responses to questions on social distancing, mask-wearing, and vaccination status. Respondents were asked to indicate how often during the COVID-19 pandemic they: “attended indoor gatherings with more than 10 people” (1 = never, 0 = all other responses); or “have worn a face mask or other face covering in public places” (1 = always, 0 = all other responses). Respondents’ COVID-19 vaccination status was measured with the following responses: yes; no, but planning to; no, and undecided about getting a vaccine; or no, and not planning to. Responses were recoded as a dichotomous variable (1 = yes, 0 = all other responses). Sensitivity analyses which separately consider responses to the “no, but planning to” category are reported below.

#### 3.1.2. Focal independent variables

Respondent race and ethnicity is a categorical variable with the following categories: non-Hispanic White, non-Hispanic Black, Hispanic, and Non-Hispanic Other race. These groups are hereafter referred to as White, Black, Hispanic, and Other races (White is reference category). Socioeconomic status is reflected via respondent education level (1 = high school or less, 0 = more than high school) and income (1 = less than \$30,000, 2 = \$30–59,999, 3 = \$60–99,999, and 4 = \$100,000 or more; reference = less than \$30,000).

#### 3.1.3. COVID risk factors/health measures. COVID-19 exposure

We include a variety of measures to partially control for social groups differences in exposure to risk factors and disease, access to resources, and health-related attitudes and behaviors that FCT posits are critical to understanding health disparities. Respondents were asked to indicate the extent to which they have come into contact with COVID-19 via the following two questions: 1) “Have you ever been diagnosed with coronavirus (COVID-19 or SARS-CoV-2) by a health professional?” (0 = no, 1 = yes); 2) “Have you ever known anyone who has been diagnosed with coronavirus (COVID-19 or SARS-CoV-2) by a health professional?” (0 = no, 1 = yes). Access to health insurance is captured via type of insurance, with categories of: private insurance (reference); Medicaid, Medicare, or VA insurance; other insurance; and, no insurance. We further include a measure of underlying conditions that puts individuals at greater risk of COVID-19 infection. This measure was created based on conditions identified by the Centers for Disease Control as having a significant association with risk of severe COVID-19 illness (Cockerham, Hamby, & Oates, 2017). Any yes response to: diabetes, heart disease, COPD, chronic kidney disease, immunocompromised state, cancer, and current or former smoking was recoded (1 = one or more listed conditions, 0 = no listed conditions).

#### 3.1.4. Perceived COVID threat

We measure perceived COVID-19 threat as the mean response to four items: 1) “The coronavirus pandemic is a major threat to public health in the United States,” 2) “The coronavirus pandemic is a major threat to your personal health,” 3) “The coronavirus pandemic is a major threat to the economy in the United States,” and 4) “The coronavirus pandemic is a major threat to your personal financial situation.” Response values ranged from strongly agree (5) to strongly disagree (1). This scale has very good internal consistency, with a Cronbach’s alpha coefficient of 0.81. *Sociodemographic Controls.* Background variables include age (continuous); sex (dichotomous variable with 0 = female and 1 = male); political party (1 = Democrat, 2 = independent, 3 = Republican; Democrat = reference); and employment status (1 = employed, 0 = all other responses).

### 3.2. Analysis

Listwise deletion of missing data ( $n = 39$ ) resulted in an analytic

sample of 1,732, or 98% of the total sample. Logistic regression analyses were used to examine the likelihood of engaging in protective pandemic behaviors (avoidance of indoor gatherings, mask-wearing, and vaccination status) on the basis of race and ethnicity and socioeconomic status. In fully adjusted models, we controlled for COVID-19 exposure, access to health care, underlying conditions, perceived threat of COVID-19, political party, age, sex, and employment. Analyses were performed using STATA 15.1 (Statacorp, 2020).

## 4. Results

Summary statistics are provided in Table 1. We present weighted means and standard errors for continuous measures and percentages for categorical outcomes. With regard to COVID-19 protective behavior, it was observed that approximately one-third of all respondents (33.1%) reported never attending indoor gatherings, whereas the majority always wore a mask in public (65.7%). Bivariate analyses revealed significant differences in social distancing and masking across education categories, with the highest education categories reporting more social distancing. A majority of respondents reported they were vaccinated (65%). Significant differences were detected on the basis of race and ethnicity (whites had the highest rates of vaccination), education, and income (vaccination rates increased with higher education and income). These bivariate patterns are largely consistent with our expectations. We turn next to whether these differences in COVID-19 protective behavior across population subgroups are robust to controls in multivariate models.

Results of multivariate logistic regressions are presented as odds ratios in Table 2. Model 1 includes our focal variables of interest regarding socioeconomic status and race and ethnicity; Model 2 incorporates all controls.

#### 4.1. Social distancing

The first model (Table 2, Model 1) assesses race and ethnic and socioeconomic status group differences in social distancing (or never participating in gatherings with more than 10 people), without controls for other health related disparities and other covariates. It indicates few differences across groups, with the exception of those with incomes between \$30,000 and \$59,999, who have a lower odds ( $e^b = 0.73$ ,  $p \leq .05$ ) of distancing than those with incomes below \$30,000. In the fully adjusted model (Table 2, Model 2) social distancing is not significantly associated with level of education or income. This is largely consistent with expectations of fewer social group differences for social distancing. However, Black respondents have a lower odds of social distancing ( $e^b = 0.62$ ,  $p \leq .01$ ), all else being equal.

Many of the health and COVID-19 related covariates are significantly associated with social distancing. For example, greater perceived threat of COVID-19 is associated with an increased odds of social distancing ( $e^b = 1.79$ ,  $p \leq .001$ ). Formally, a one-unit increase on the perceived threat scale is associated with a 79% higher odds of social distancing, controlling for other variables. Similarly, increasing age and having Medicaid/Medicare/VA insurance (compared to private insurance) are associated with a higher odds of social distancing. On the other hand, having a COVID-19 diagnosis ( $e^b = 0.66$ ,  $p \leq .05$ ) and knowing someone with COVID-19 ( $e^b = 0.66$ ,  $p \leq .01$ ) are associated with a lower odds of social distancing. Although not the focus of the paper, republican affiliation ( $e^b = 0.30$ ,  $p = .000$ ) is negatively associated with social distancing.

#### 4.2. Mask-wearing

Turning next to mask-wearing, and Model 1 which only includes race, ethnicity and socioeconomic measures, only Black respondents are observed to have a higher odds of mask-wearing ( $e^b = 1.88$ ,  $p \leq .001$ ) compared to their white counterparts. In Model 2, that controls for



**Table 1**  
Weighted characteristics of study sample.

	N	Indoor Gatherings, 10+ (%)			Mask-Wearing in Public (%)			Vaccination (%)		
		Never	≥ Rarely	p	Always	≤ Very Often	p	Yes	No	p
	1732	33.08	66.92		65.69	34.31		64.77	35.23	
Race/Ethnicity				0.496			0.008			0.007
NH White	1173	33.52	66.48		63.65	36.35		66.40	33.60	
NH Black	180	36.97	63.03		70.22	29.78		59.04	40.96	
Hispanic	285	27.22	72.78		64.74	35.26		57.47	42.53	
NH Other	94	36.33	63.67		76.85	23.15		75.29	24.71	
Education				0.061			0.001			0.000
Less than High School	57	18.01	81.99		47.37	52.63		51.30	48.70	
High School	299	32.73	67.27		63.40	36.60		53.46	46.54	
Some College	753	33.35	66.65		67.59	32.41		61.31	38.69	
Bachelor's	372	35.76	64.24		67.22	32.78		75.19	24.81	
Professional	251	38.84	61.16		75.68	24.32		86.67	13.33	
Income				0.106			0.936			0.000
Less than \$30,000	386	34.26	65.74		59.88	40.12		49.66	50.34	
\$30–59,999	494	29.80	70.20		68.41	31.59		59.52	40.48	
\$60–99,999	472	30.56	69.44		64.32	35.68		68.41	31.59	
\$100,000+	380	38.79	61.21		70.07	29.93		83.59	16.41	
COVID-19 Diagnosis (self)				0.000			0.000			0.016
Yes	177	34.51	65.49		49.00	51.00		67.60	32.40	
No	1555	20.66	79.34		67.61	32.39		64.45	35.55	
COVID-19 Diagnosis (other)				0.013			0.001			0.000
Yes	1330	36.77	63.23		68.55	31.45		67.71	32.29	
No	402	31.73	68.27		57.90	42.10		56.74	43.26	
Type of Insurance				0.000			0.001			0.000
Private	818	27.81	72.19		64.15	35.85		71.01	28.99	
Medicaid/Medicare/VA	650	41.87	58.13		70.51	29.49		63.74	36.26	
Other	155	27.66	72.34		59.35	40.65		55.13	44.87	
None	109	30.58	69.42		58.71	41.29		35.95	64.05	
Underlying Conditions Present				0.003			0.389			0.672
Yes	852	31.25	68.75		65.34	34.66		62.87	37.13	
No	880	34.90	65.10		66.05	33.95		66.68	33.32	
COVID-19 Threat (Mean, SE) (Range: 1–5)	3.66, 0.03	4.02, 0.04	3.48, 0.03	0.000	3.91, 0.03	3.17, 0.05	0.000	3.83, 0.03	3.35, 0.05	0.000
Party				0.000			0.000			0.000
Democrat	824	44.90	55.10		82.18	17.82		80.45	19.55	
Independent	229	34.57	65.43		63.67	36.33		49.06	50.94	
Republican	679	18.13	81.87		46.52	53.48		52.20	47.80	
Sex				0.025			0.000			0.856
Male	826	30.15	69.85		61.34	38.66		66.24	33.76	
Female	906	35.76	64.24		69.67	30.33		63.43	36.57	
Age (Mean, SE) (18–94)	47.98, 0.62	53.1, 1.0	45.5, 0.75	0.000	50.89, 0.73	42.41, 0.99	0.000	51.51, 0.81	41.48, 0.85	0.000
Employment				0.000			0.000			0.000
Working	1076	27.99	72.01		62.13	37.87		63.16	36.84	
Not Working	656	40.28	59.72		70.73	29.27		67.05	32.95	

Note: p-values are reported based on two-tailed chi-square tests (categorical variables) and independent samples t-tests (continuous variables).

Source: Crime, Health, and Politics Survey, 2021.

health and COVID-19 related measures, there are no remaining differences in mask-wearing across these social groups. This overall pattern is again consistent with expectations of fewer differences by socioeconomic status or race and ethnicity for mask wearing. As with social distancing, having a COVID-19 diagnosis is associated with a lower odds of mask-wearing. In contrast, knowing someone with COVID-19, increased threat perception, and age are all significantly associated with a higher odds of mask-wearing. Being male is associated with higher odds mask-wearing. Again, identifying as a Republican is associated with a lower odds of mask-wearing compared to Democrats, as is identifying as independent.

### 4.3. Vaccination status

Lastly, we turn to models of vaccination status, for which larger differences by socioeconomic status and race and ethnicity are expected. In unadjusted Model 1, differences by both education and income are observed. For example, those with a high school education or less have a lower odds ( $e^b = 0.62, p \leq .001$ ) of being vaccinated than are those with more than a high school education. In the case of income, respondents with incomes between \$60,000 and \$99,999, as well as above \$100,000 have a higher odds of being vaccinated than do those with income less

than \$30,000. When controlling for health and other COVID-19 related measures, both socioeconomic status and race and ethnicity are associated with vaccination status. For instance, Black and Other race respondents are observed to have a lower odds of vaccination than their White counterparts. Formally, Black and Other race individuals have 72 and 43 percent lower odds of vaccination, respectively, than do White respondents, all else equal.

Of the health and COVID-19 related covariates, knowing someone with COVID-19, greater perceived threat of COVID-19, and older age were all associated with a higher odds of vaccination. Compared to those with private insurance, individuals with government insurance or those who were uninsured have reduced odds of vaccination. Interestingly, having an underlying health condition is associated with a lower odds of vaccination ( $e^b = 0.68, p \leq .01$ ), and one's own COVID-19 diagnosis is not significantly associated with vaccination status. Identifying as independent or Republican is also associated with a lower odds of being vaccinated.

### 4.4. Supplemental analyses

Given strong associations between poorer COVID-19 outcomes and age, we stratified our analyses by age (ages 18–45 versus 46 and older).

**Table 2**  
Adjusted odds ratios of pandemic health behaviors.

	Never Attends Indoor Gatherings OR (95% CI)		Mask-Wearing OR (95% CI)		Vaccinated OR (95% CI)	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
	Race/Ethnicity					
NH Black	1.10 (0.79, 1.53)	0.62 (0.43, 0.89)**	1.88 (1.29, 2.72) ***	0.91 (0.58, 1.44)	0.74 (0.53, 1.04)	0.28 (0.19, 0.43) ***
Hispanic	0.89 (0.67, 1.17)	0.79 (0.57, 1.09)	1.22 (0.92, 1.62)	1.29 (0.91, 1.84)	0.81 (0.61, 1.07)	0.82 (0.59, 1.15)
NH Other	1.18 (0.77, 1.82)	1.06 (0.65, 1.70)	1.33 (0.84, 2.12)	1.23 (0.71, 2.11)	0.72 (0.46, 1.12)	0.57 (0.34, 0.95)*
≤HS Education	0.86 (0.66, 1.11)	0.81 (0.61, 1.07)	0.79 (0.61, 1.01)	0.85 (0.62, 1.15)	0.62 (0.48, 0.79) ***	0.65 (0.48, 0.87)**
Income						
\$30–59,999	0.73 (0.55, 0.98)*	0.86 (0.63, 1.19)	1.13 (0.85, 1.51)	1.35 (0.94, 1.93)	1.20 (0.91, 1.58)	1.12 (0.81, 1.56)
\$60–99,999	0.78 (0.59, 1.04)	1.13 (0.80, 1.59)	1.08 (0.80, 1.45)	1.44 (0.99, 2.10)	1.51 (1.13, 2.02)**	1.45 (1.01, 2.08)*
\$100,000+	0.93 (0.68, 1.26)	1.20 (0.83, 1.73)	1.10 (0.80, 1.50)	1.08 (0.72, 1.62)	2.81 (2.01, 3.94) ***	2.26 (1.49, 3.41) ***
COVID Diagnosis (self)		0.66 (0.44, 0.99)*		0.49 (0.33, 0.72) ***		0.71 (0.49, 1.03)
COVID Diagnosis (other)		0.66 (0.50, 0.86)**		1.59 (1.19, 2.12)**		1.33 (1.00, 1.77)*
Insurance						
Medicaid/ Care/VA		1.46 (1.08, 1.97)*		1.02 (0.73, 1.42)		0.62 (0.45, 0.87)**
Other		1.26 (0.83, 1.92)		0.95 (0.62, 1.45)		0.67 (0.44, 1.03)
None		1.13 (0.69, 1.83)		0.84 (0.51, 1.39)		0.35 (0.22, 0.57) ***
Underlying Conditions		1.04 (0.82, 1.31)		0.79 (0.61, 1.02)		0.68 (0.53, 0.87)**
Perceived Threat		1.79 (1.55, 2.08) ***		2.51 (2.14, 2.95) ***		1.79 (1.54, 2.08) ***
Party						
Independent		1.02 (0.73, 1.40)		0.65 (0.44, 0.95)*		0.41 (0.28, 0.59) ***
Republican		0.30 (0.23, 0.40) ***		0.22 (0.16, 0.29) ***		0.20 (0.15, 0.27) ***
Male		0.86 (0.69, 1.07)		0.71 (0.56, 0.91)**		1.24 (0.98, 1.57)
Age		1.02 (1.01, 1.04)		1.03 (1.02, 1.04)		1.04 (1.04, 1.04)

**Table 2 (continued)**

	Never Attends Indoor Gatherings OR (95% CI)		Mask-Wearing OR (95% CI)		Vaccinated OR (95% CI)	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
	Employed					
Constant	0.65 (0.51, 0.83)	0.07 (0.03, 0.16)	1.79 (1.40, 2.31)	0.05 (0.02, 0.10)	0.90 (0.63, 1.28)	0.06 (0.03, 0.14)

\*p ≤ .05, \*\*p ≤ .01, \*\*\*p ≤ .001.

Note: Model 1 includes the focal variables of race/ethnicity, education, and income. Model 2 reflects odds ratios adjusted for all other variables.

Data Source: Crime, Health, and Politics Survey, 2021.

In fully adjusted models, it is observed that race and ethnicity, education, and income are not associated with either social distancing or mask-wearing in those younger than 45. This was also the case for older individuals with the exception of income, which is positively associated with social distancing. However, in both younger and older adults, higher incomes are associated with a higher odds of vaccination. In younger individuals, Black and Other race individuals have a lower odds of vaccination. Black older respondents also have a lower odds of vaccination, but the association with Other race was not significant. Education is also negatively associated with vaccination in those ages 45 and older. Across both age groups, perceived COVID-19 threat increases the odds of all protective health behaviors. Conversely, Republican party affiliation lowers the odds of all protective behaviors. In the older age group, males have higher odds of protective behaviors. Interestingly, males in the younger age group have lower odds of distancing and vaccination compared to females. Beyond these associations, no other appreciable changes to models were detected. Finally, motivated by the concept of intersectionality, we further examined interactions between our focal independent variables (e.g., race and ethnicity with education), and none were found to be statistically significant.

In the results presented for vaccination status, we collapsed all negative responses into a single “not vaccinated” category, not considering potential differences between those who said they are not vaccinated but plan to, and those who are undecided or never plan to be vaccinated. In particular, one might argue it makes sense to treat those who said “no, but plan to” as more like the vaccinated than the unvaccinated. In a supplemental analysis (not presented, available upon request), the “plan to” and vaccinated groups are combined versus the other not vaccinated groups. Overall, the model results were strikingly similar to those presented, with one exception of the Other race coefficient becoming non-statistically significant. We also compared how the vaccinated and “plan to” group differed. The only statistically significant difference is that the “plan to” group is more likely to have tested positive for the virus. That they report not having been vaccinated may reflect a sense of relative immunity due to previous infection. Due to the small number of cases in this group (less than 5% of sample), however, we retain our original measurement strategy in the final results.

Social distancing, mask-wearing, and vaccination status were treated as independent outcomes. It is plausible, however, that being vaccinated may change how respondents think about the importance of distancing and mask-wearing. Unfortunately, the temporal horizons of these variables (e.g., vaccination refers to current status, whereas questions regarding avoiding large gatherings and mask-wearing refer to their frequency during the pandemic) do not allow a clean consideration of this question. However, as a sensitivity analysis, models of social distancing and mask-wearing were stratified by current vaccination status. Neither race and ethnicity nor SES measures were significantly

associated with mask-wearing within either the vaccinated or unvaccinated. In the case of avoiding large gatherings, no race and ethnic or SES differences were observed among the vaccinated. However, Hispanics and respondents with a high school degree or less had a lower odds of social distancing among the unvaccinated.

Finally, in analyses not shown, we replicated our analyses with weights. Results were not substantively different from those observed in unweighted models; thus, we retained our original unweighted results.

### 5. Discussion

Motivated by Fundamental Cause Theory (FCT) and disease stage theory, and building on recent research on the correlates of protective behavior during earlier stages of the COVID-19 pandemic, we assess variability in masking, distancing and vaccination status across racial, ethnic, and socioeconomic subgroups using data from CHAPS (2021). Taken together, FCT and disease stage theory posit that at earlier stages of the disease and for less effective protective behaviors, we should see fewer sociodemographic disparities. In contrast, stronger sociodemographic disparities should be expected once more effective protective measures become available. In the case of COVID-19, we hypothesized that masking and distancing would be entered into relatively equally, but that vaccine uptake might have socioeconomic or racial and ethnic disparities as it was the first truly efficacious protective behavior.

Consistent with expectations, few differences in mask wearing or social distancing were observed across racial, ethnic and socioeconomic status groups. The sole exception was for Black respondents who were less likely to socially distance than were their White counterparts. This finding is consistent with previous research conducted at earlier stages of the pandemic (O’Conor et al., 2020; Pedersen & Favero, 2020).

Also aligning with our hypotheses is that disparities in vaccination status were consistently observed across sociodemographic groups. To aid in summarizing the results, Fig. 1 presents predicted probabilities of vaccination by education, race and ethnicity, and income. With respect to race and ethnicity, Black respondents are the least likely to report being vaccinated, followed by persons of Other races. In the case of Black respondents, this is consistent with a lower intent to be vaccinated (Latkin et al., 2020) and higher COVID-19 vaccine hesitancy. However, these studies also found Hispanic respondents to be more vaccine hesitant, and yet just as likely as White respondents to report being vaccinated in the present study. Future research might seek to examine why Hispanic respondents were no less likely to be vaccinated despite having greater reservations.

The pattern of vaccination uptake across educational and income subgroups is similarly consistent with predictions motivated by FCT and disease stage theory. In short, those with more education and higher incomes are more likely to be vaccinated. Given that the COVID-19

vaccine is essentially free and has been highly effective at preventing infection and lessening the severity of disease, one might wonder why everyone doesn’t get vaccinated. This is the power of FCT, as it predicts that higher status persons will have greater awareness of, and be better able to marshal their resources to gain access to, the most effective treatments.

Motivated by FCT, the present study included a variety of measures to try to capture the processes through which health disparities are produced and perpetuated, such as differential exposure to risk factors and underlying conditions, access to resources, and other perceptions that might motivate health promotion and help-seeking behaviors. Although many of these variables were associated with COVID-19 protective behaviors in expected ways, they did not explain group differences in vaccination status. Future research into the mechanisms explaining health disparities in COVID-19 protective behavior is thus needed. For example, although we were able to control for employment status, information about the occupations (e.g., service, healthcare, etc.) in which respondents were working would help to contextualize the behaviors examined. This is important as some groups were likely advantaged in their ability to avoid exposure (e.g., via telecommuting) and gain access to vaccinations and vaccine-related information from employers.

While perceived threat of COVID-19 was strongly associated with all three outcomes, and likely taps into group differences in motivation to employ protection, other perceptions about the efficacy of vaccinations and mask-wearing would be useful for future research. Having access to health insurance was also found to be associated with being vaccinated. Despite the fact that COVID-19 vaccines are free of cost, regardless of health insurance status, this finding is consistent with past research regarding misperceptions among those without health insurance (Sparks, Kirzinger, & Brodie, 2021). Consistent with FCT, absence of health insurance reflects lack of access to an important health promoting resource, that may also serve as a proxy for the quality of one’s employment situation.

A variety of other factors such as closer proximity to vaccination sites, access to private transportation, greater availability to vaccines through private health care providers, and more flexible careers that allow time off for vaccinations may also explain the patterns observed. Future research into barriers of access and uptake of a free and highly effective vaccine is clearly needed.

The timing of the CHAPS study was fortuitous for studying health behavior after the initial vaccine had been developed. The results presented here regarding consistent disparities for vaccination status aligns with the “producing inequalities” stage of disease stage theory, and the predictions of its proponents (Do and Frank, 2022). But the initial vaccine was clearly not the signal of a waning of COVID-19, as new variants emerged and additional booster shots became necessary. Thus, it is not clear if we are entering a “reducing inequalities” stage of the disease in which protective measures are considered highly effective and widely available. The final stage of reduced mortality and disease elimination is thus likely some ways off, and perhaps not fully attainable as COVID-19 transitions from pandemic to endemic. One limitation associated with the timing of the survey is that guidance from both the CDC and the states was shifting and some respondents would have lived in areas where masking was required, while others would not have (e.g., Texas and Florida residents). Future research is thus needed as the nature of COVID-19 continues to shift, and perhaps recedes into endemic status.

Several additional study limitations should be taken into consideration when interpreting and drawing conclusions from these results. The cross-sectional nature of the CHAPS study precludes making causal arguments about the relationships observed. The relatively small size of the sample, particularly for some subgroups, reduces the statistical power of the analysis. That we are sampling persons who had survived the COVID-19 pandemic may also bias our results, perhaps resulting in more conservative estimates of SES and race and ethnic disparities.

As noted previously, the mixed temporal horizons of the COVID-19

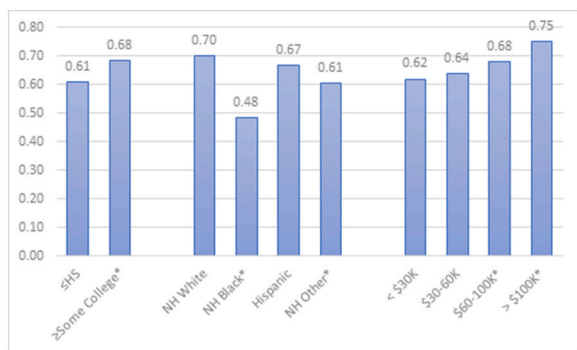


Fig. 1. Average Marginal Effects of Education, Race, and Income on Probability of Vaccination

Note: significant differences ( $p \leq .05$ ) from reference group are identified with an asterisk.

protective behaviors limited our ability to cleanly examine how one behavior might influence the others. An important question for future research is how being vaccinated changes people's use of other protective behaviors. Do those who are vaccinated feel so protected that they refrain from distancing or mask-wearing? Or do those who are vaccinated continue to employ all available protections out of concern for themselves and others? Our sensitivity analyses, in which being vaccinated was positively associated with mask-wearing is suggestive of the latter, though again temporal ordering precludes a definitive answer.

Our measure of social distancing is also somewhat limited in that it only captures whether people avoided indoor gatherings with more than 10 people. One might also like to know if they observed distancing guidelines between people at such gatherings, or whether they wore masks when attending social gatherings. We are also not able to assess how their occupations or workplaces influenced protective behavior. For example, it would be helpful to know if respondent workplaces required social distancing, provided masks to their workers, or mandated that workers are vaccinated.

In closing, consistent with FCT and disease stage theory, this study reveals evidence of significant disparities in vaccination status across racial, ethnic, and socioeconomic status subgroups, with persons from higher status groups more likely to be vaccinated. From a public health policy perspective, these findings highlight the need to better educate the public about the efficacy of vaccines, and to seek to remove perceived and objective barriers to more widespread access and utilization.

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## Author statement

Raymond R. Swisher: Conceptualization, Writing - Original Draft, Writing - Review & Editing. Ginny Garcia-Alexander: Conceptualization, Formal Analysis, Writing - Original Draft, Writing - Review & Editing. Jeralynn S. Cossman: Conceptualization, Writing - Original Draft, Writing - Review & Editing.

## Data availability statement

Raw survey data not available due to restrictions, outputs available upon request. Raw data were generated at NORC. Outputs supporting the findings of this study are available from the corresponding author on request.

## Declaration of competing interest

None of the authors have any competing interests to declare.

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