

Perceived Discrimination and Mental Distress Amid the COVID-19 Pandemic: Evidence From the Understanding America Study



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Introduction: This study examines COVID-19–associated discrimination regardless of infection status. It evaluates the contribution of various risk factors (e.g., race/ethnicity and wearing a face mask) and the relationship with mental distress among U.S. adults in March and April 2020, when the pandemic escalated across the country.

Methods: Participants consisted of a probability-based, nationally representative sample of U.S. residents aged ≥ 18 years who completed COVID-19–related surveys online in March and April ($n=3,665$). Multivariable logistic regression was used to predict the probability of a person perceiving COVID-19–associated discrimination. Linear regression was used to analyze the association between discrimination and mental distress. Analyses were conducted in May 2020.

Results: Perception of COVID-19–associated discrimination increased from March (4%) to April (10%). Non-Hispanic Black (absolute risk from 0.09 to 0.15 across months) and Asians (absolute risk from 0.11 to 0.17) were more likely to perceive discrimination than other racial/ethnic groups (absolute risk from 0.03 to 0.11). Individuals who wore face masks (absolute risk from 0.11 to 0.14) also perceived more discrimination than those who did not (absolute risk from 0.04 to 0.11). Perceiving discrimination was subsequently associated with increased mental distress (from 0.77 to 1.01 points on the 4-item Patient Health Questionnaire score).

Conclusions: Perception of COVID-19–associated discrimination was relatively low but increased with time. Perceived discrimination was associated with race/ethnicity and wearing face masks and may contribute to greater mental distress during early stages of the pandemic. The long-term implications of this novel form of discrimination should be monitored.

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INTRODUCTION

The coronavirus disease 2019 (COVID-19) pandemic threatens global health and national economies. Both the UN and the Centers for Disease Control and Prevention have called for increased attention to prevent stigma associated with COVID-19,^{1,2} which could undermine disease control efforts, worsen mental health outcomes, and exacerbate disparities.^{3–6} This study examines perceived discrimination among U.S. residents and its relationship with mental distress.

Disease-associated stigma toward people, regardless of infection status, has been seen in previous outbreaks of

novel viruses.^{7–10} For example, Mexican and Latinx individuals were stigmatized during the 2009 H1N1 pandemic owing to the virus' link to hog farms where migrants worked.¹¹ Family members of patients during

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the 2014 Ebola epidemic also faced stigmatization.¹² Such stigmatization could be attributable to implicit cognition associating disease avoidance with these individuals.^{13,14}

Discrimination toward people who share social or behavioral characteristics with COVID-19 patients but may not carry the novel virus, termed COVID-19–associated discrimination (CAD), was first seen in heightened anti-Chinese rhetoric online^{15,16} and a rapid accumulation of reports on in-person racist acts against Asians.¹⁷ Social media analyses showed a nearly 10-fold increase in the use of offensive language,^{18,19} which could be linkable to in-person hate incidents.²⁰

Soon after, CAD expanded to a broader subset of Americans regardless of race/ethnicity. For instance, people wearing face masks were perceived as more likely to carry the virus,^{21,22} although mask wearing was recommended for healthy individuals.²³ Essential workers in healthcare and service industries were considered high risk,^{24,25} when others were instructed to stay home.²⁶ CAD was also seen in other countries.²⁷

This study uses national survey data to examine CAD among U.S. residents when the pandemic escalated across the country. It explores the contribution of risk factors including (1) social and behavioral identifiers that might tie individuals to COVID-19 (e.g., race/ethnicity and mask wearing) and (2) in-person and social media encounters during which discriminatory acts might occur. Additionally, the study examines the association between perceived CAD and mental distress.

METHODS

Study Sample

The survey cohort came from the Understanding America Study (UAS), a nationally representative panel maintained by the Center for Economic and Social Research at the University of Southern California. The panel consists of a random sample of residents aged ≥ 18 years across the U.S., recruited using address-based sampling since 2014. Respondents were invited by mail and provided a tablet and broadband Internet if they did not have Internet access. They then answered survey questions on a computer, tablet, or smartphone. The design of the UAS is documented extensively elsewhere,²⁸ and studies²⁹ show that the UAS is comparable to other national panels including the Current Population Survey³⁰ and Health and Retirement Study.³¹

Participants were surveyed on perceptions and responses to the COVID-19 pandemic,³² with a first survey fielded between March 10 and March 31, 2020 (March survey) and a second from April 1 to April 28 (April survey). Among the 8,502 invited to the March survey, 6,884 (81%) completed it. The April survey was part of a tracking series³³ requiring a separate consent. Although all panelists were invited on March 29, only 5,891 consented by April 1, with 5,450 (93%) completing the April survey. Individuals who completed both surveys were included for analysis.

Because prior discrimination experience could be a potential confounder in this study, participants without such information were excluded from the analysis. Roughly 1 year before COVID-19 surveys, respondents were asked about discrimination experience in day-to-day life. Panelists at the time (6,708) were invited to this survey, with 5,569 (83%) completing it. The analytic sample was then restricted to the 3,665 respondents who completed all 3 surveys. The parent study protocol was approved by the IRB of University of Southern California.

Measures

This study assessed CAD using a 4-item scale adapted from the Everyday Discrimination Scale Short Version,³⁴ abbreviated from a well-studied 9-item scale.^{35–37} Respondents answered *yes*, *no*, or *unsure* to the question of whether they had the following experiences *due to people thinking they might have the coronavirus: treated with less courtesy and respect than others; receiving poorer service at restaurants or stores; people act as if they were afraid of them; threatened or harassed*. Perceived CAD was identified if one reported *yes* to any of the experiences. Sensitivity analysis showed similar results when *unsure* was coded as *no* or missing.

Mental distress was assessed using the Patient Health Questionnaire (PHQ-4) validated in the general population.^{38,39} Respondents answered how often in the past 14 days they felt bothered by the following: *feeling anxious; not being able to stop or control worrying; feeling depressed; having little interest in doing things*. Response options included: *not at all* (0), *several days* (1), *more than half the days* (2), and *nearly every day* (3). Although the first 2 items assessed anxiety and the latter 2 assessed depression, the sum score measured overall mental distress.

The study also included social and behavioral risk factors of CAD. Both COVID-19 surveys asked respondents whether they had worn a face mask or covering in the past 7 days. Social media exposure was only assessed in March, as number of minutes a respondent spent on social media in a day on average, which was then categorized as: *none* (0), *1–30 minutes* (1), *31–60 minutes* (2), *61–120 minutes* (3), and *more than 120 minutes* (4). Assuming that respondents' social media usage was similar across months, responses were carried over to analyze the April data.

Working status was assessed in April as number of days in the past week a respondent worked at a job and days worked from home. The ratio between the 2 was then derived as: *not working* (0), *working outside* (1), *working partially from home* (2), and *working completely from home* (3). The April survey also asked about in-person interaction in the past 7 days (e.g., going to the grocery store or pharmacy or visiting others).

Discrimination experience before the pandemic was assessed between December 2018 and February 2019 by asking respondents if they had been treated unfairly or harassed because of their parents' education or possessions. Prior mental distress was evaluated using the 8-item Center for Epidemiologic Studies–Depression Scale^{40,41} on a rolling basis—for this sample, 53% in 2018 and 39% in 2019. As prior data are often strong predictors of later observation on a similar construct, controlling for these prior measures was useful to parse out the impact of the pandemic.

Additional covariates were used in this study. The COVID-19 surveys asked about respondents' symptoms experienced in the past 7 days (e.g., cough and fever). Although COVID-19 cannot be diagnosed based on symptoms alone, a combination of self-

reported shortness of breath and fever, the 2 cardinal symptoms of the disease,⁴² was considered indicative of a respondent potentially having COVID-19. Sociodemographic data were collected periodically in the UAS—for this sample, between December 2019 and March 2020.

Two contextual measures were constructed from publicly available data, quantifying the progression of and policy response to the pandemic in the state in which the respondent resided on the date they responded. Disease prevalence was constructed by dividing the total number of confirmed cases documented by the New York Times⁴³ over a 1-year estimate of the state population based on the 2018 American Community Survey.⁴⁴ The number of days under states' Shelter-in-Place (SIP) orders was calculated using the effective dates archived by the New York Times.²⁶

Statistical Analysis

Analyses were performed using Stata, version 16 in May 2020 and restricted to respondents who completed both COVID-19 surveys and a prior survey on perceived discrimination ($n=3,665$). Differences in sample characteristics by whether one perceived CAD were tested using Pearson chi-square test for categorical variables and independent sample *t*-test for continuous variables.

Two distinct modeling strategies were used. The cross-sectional approach analyzed each month's data separately because people's exposure to CAD could take different forms before (March) and during (April) the implementation of SIP orders requiring most people to stay home. The longitudinal approach then compared across months by predicting the April dependent variable while controlling for its March counterpart.

Multivariable logistic regression was used to predict the probability of a person perceiving CAD as a function of risk factors (e.g., race/ethnicity and wearing face masks) and prior discrimination experience, with AOR quantifying association and predicted probability assessing absolute risk. Multivariable linear regression was then used to model mental distress (PHQ-4 score), using CAD as a predictor rather than an outcome as in the logistic regression, while controlling for prior mental distress. All models adjusted for COVID-19 prevalence in each state, number of days under the SIP order, self-reported symptoms, and demographic characteristics. SEs were clustered at the state level using the Eicker–Huber–White estimator,⁴⁵ accounting for nonindependence of respondents who resided in the same state. Less than 5% of data were missing for each variable and list-wise deletion was used in analyses.

RESULTS

The study sample consisted of 3,665 U.S. adults aged ≥ 18 years. [Appendix Table 1](#), available online, shows that three quarters (75%) were non-Hispanic White; more than half (55%) were female; three quarters (73%) were aged 18–64 years; and less than half (41%) reported having a bachelor's degree or higher. More than half (59%) had a household income $< \$75,000$.

Compared with the excluded sample who completed COVID-19 surveys but not the prior discrimination survey, the analytic sample was more likely to be non-Hispanic White; male; older; and with higher income.

Because the UAS oversampled Los Angeles County residents in the past year,⁴⁶ 46% of the excluded sample came from Los Angeles, driving the differences. [Appendix Table 2](#), available online, shows a similar composition of included and excluded non–Los Angeles samples.

The overall percentage perceiving CAD doubled, from 4% in March to 10% in April. [Table 1](#) contrasts data by perceived CAD. In both months, relative to respondents who did not experience CAD, those who did were more likely to be racial/ethnic minorities, immigrants, and younger, and to have disease-related symptoms, face mask usage, and prior discrimination experience. Additionally, those who perceived CAD in April tended to have a lower household income and reside in states with higher COVID-19 prevalence. Mental distress, during and before the pandemic, was higher for those perceiving CAD than for those who did not.

Cross-sectional analyses ([Table 2](#)) show the AOR of perceiving CAD in March. In addition to race/ethnicity, risk factors, including prior discrimination experience, immigrant status, mask wearing, and social media usage, entered the model one at a time to illustrate their incremental contribution and potential mediation of the racial/ethnic effects. Compared with non-Hispanic Whites, more non-Hispanic Blacks perceived CAD (AOR=2.69, $p<0.001$ in Model 4). Asians also had a higher likelihood, but the magnitude reduced when immigration status and face mask usage entered the model (AOR=5.79, $p<0.001$ in Model 1; AOR=3.71, $p<0.001$ in Model 2; AOR=3.04, $p<0.001$ in Model 3), suggesting their potential to mediate the association between being Asian and perceiving CAD. Those who experienced discrimination before also experienced more CAD than those who did not (AOR=1.74, $p<0.01$), as did respondents who wore face masks in March relative to those who did not (AOR=3.51, $p<0.001$).

[Table 3](#) presents the AOR of perceiving CAD in April including risk factors presented in the March analysis (Model 4), whereas [Appendix Table 3](#), available online, includes the summary for Models 0–3. Because the April survey collected data on respondents' working status and social activities, these measures were added to Models 5 and 6. Compared with non-Hispanic Whites, non-Hispanic Blacks (AOR=1.80, $p<0.001$ in Model 6) and Asians (AOR=2.02, $p<0.05$) were more likely to experience CAD, but the racial/ethnic gaps were smaller than those observed in March. Prior discrimination experience remained a strong predictor of CAD (AOR=2.18, $p<0.001$).

In April, respondents who were second- (AOR=1.86, $p<0.01$) and third- (AOR=1.65, $p<0.001$) generation immigrants experienced more CAD relative to

Table 1. Comparison of Respondents Perceiving and Not Perceiving COVID-19–Associated Discrimination (n=3,665)

Characteristics	March survey			April survey		
	No perceived discrimination (n=3,460)	Perceived discrimination (n=157)		No perceived discrimination (n=3,285)	Perceived discrimination (n=371)	
Race, n (%)						
White	2,627 (76)	86 (55)	***	2,499 (76)	234 (63)	***
Black	229 (7)	23 (15)		226 (7)	36 (10)	
Hispanic	317 (9)	16 (10)		289 (9)	54 (15)	
Asian	96 (3)	21 (13)		92 (3)	26 (7)	
Other race/ethnicity	185 (5)	11 (7)		176 (5)	21 (6)	
Age, years, n (%)						
18–34	411 (12)	33 (21)	***	382 (12)	63 (17)	***
35–44	1,253 (36)	74 (47)		1,177 (36)	166 (45)	
55–64	825 (24)	32 (20)		782 (24)	85 (23)	
≥65	971 (28)	18 (11)		944 (29)	57 (15)	
Education, n (%)						
High school or less	739 (21)	36 (23)		703 (21)	93 (25)	
Some college	1,301 (38)	58 (37)		1,236 (38)	135 (36)	
Bachelor or higher	1,420 (41)	63 (40)		1,346 (41)	143 (39)	
Household income, n (%)						
<\$25,000	607 (18)	33 (21)		571 (17)	92 (25)	**
\$25,000–\$49,999	722 (21)	36 (23)		692 (21)	76 (21)	
\$50,000–\$74,999	694 (20)	32 (20)		643 (20)	72 (19)	
>\$75,000	1,430 (41)	56 (36)		1,374 (42)	130 (35)	
Sex, n (%)						
Female	1,914 (55)	89 (57)		1,832 (56)	194 (52)	
Fever/chills and shortness of breath, n (%)						
Yes	36 (1)	<10 (<6)	**	18 (1)	<10 (<3)	*
Prior perceived discrimination, n (%)						
Yes	954 (28)	66 (42)	***	854 (26)	169 (46)	***
Immigrant status, n (%)						
Nonimmigrant	2,053 (61)	85 (54)	***	1,976 (62)	190 (52)	***
First-generation immigrant	252 (7)	25 (16)		249 (8)	31 (8)	
Second-generation immigrant	356 (11)	27 (17)		319 (10)	66 (18)	
Third-generation immigrant	714 (21)	20 (13)		661 (21)	78 (21)	

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Table 1. Comparison of Respondents Perceiving and Not Perceiving COVID-19—Associated Discrimination (n=3,665) (continued)

Characteristics	March survey			April survey		
	No perceived discrimination (n=3,460)	Perceived discrimination (n=157)		No perceived discrimination (n=3,285)	Perceived discrimination (n=371)	
Wear a face mask, n (%)						
Yes	229 (7)	41 (26)	***	1,584 (48)	215 (58)	***
Time spent on social media in a day on average, n (%)						
None	727 (21)	21 (14)		701 (22)	60 (16)	
1–30 minutes	1,192 (35)	52 (34)		1,126 (35)	130 (35)	
31–60 minutes	722 (21)	41 (27)		688 (21)	83 (22)	
61–120 minutes	535 (16)	23 (15)		494 (15)	63 (17)	
>120 minutes	259 (8)	17 (11)		242 (7)	34 (9)	
Mental distress (PHQ-4), mean (IQR)	1.70 (0–2)	3.05 (0–5)	***	2.33 (0–4)	3.60 (1–5)	***
Prior mental distress (CES-D 8), mean (IQR)	1.50 (0–2)	2.39 (0–4)	***	1.48 (0–2)	2.23 (0–4)	***
Number of COVID-19 cases per 100,000 population in the state, mean (IQR)	8.21 (0–4)	12.16 (1–6)		921.76 (286–787)	875.38 (298–872)	
Number of days under state SIP order, mean (IQR)	0.16 (0–0)	0.27 (0–0)		13.13 (7–19)	14.33 (9–20)	**
Work from home, n (%)						
Do not work				1,705 (53)	158 (45)	**
Work but no day WFH				655 (20)	97 (28)	
Some days WFH				156 (5)	20 (6)	
All days WFH				681 (21)	75 (21)	
Social activities, n (%)						
Go out to a bar, club, or other places where people gather				30 (1)	<10 (<3)	
Go to grocery store or pharmacy				2,535 (77)	302 (81)	
Go to a friend, neighbor, or relatives' residence (that's not your own)				691 (21)	84 (23)	
Have visitor such as friends, neighbors, or relatives at your residence				694 (21)	96 (26)	*
Attend a gathering with more than 10 people such as a reunion, wedding, or funeral				49 (1)	10 (3)	
Go outside to walk, hike, or exercise				2,455 (75)	275 (74)	

Note: Boldface indicates statistical significance (*p<0.05; **p<0.01; ***p<0.001) using chi-square test for categorical variables and independent sample t-test for continuous variables. CES-D 8, 8-item Center for Epidemiologic Studies–Depression Scale; PHQ-4, 4-item Patient Health Questionnaire; SIP, Shelter-in-Place; WFH, working from home.

Table 2. AORs of Perceiving COVID-19–Associated Discrimination in March (n=3,665)

Variable	Model 0	Model 1	Model 2	Model 3	Model 4
Race ^a					
Black	2.83 (1.82, 4.39)***	2.87 (1.86, 4.42)***	2.84 (1.81, 4.44)^b	2.51 (1.59, 3.95)***	2.69 (1.69, 4.28)***
Hispanic	1.08 (0.57, 2.03)	1.02 (0.53, 1.96)	0.71 (0.27, 1.84)	0.68 (0.28, 1.68)	0.70 (0.28, 1.75)
Asian	5.62 (3.38, 9.32)***	5.79 (3.41, 9.85)***	3.71 (2.54, 5.44)^b	3.04 (2.03, 4.55)***	3.23 (2.12, 4.92)***
Other race/ethnicity	1.56 (0.79, 3.09)	1.58 (0.79, 3.14)	1.46 (0.78, 2.73)	1.39 (0.74, 2.62)	1.50 (0.80, 2.83)
Prior perceived discrimination					
Yes	—	1.76 (1.23, 2.51)**	1.74 (1.21, 2.52)^c	1.70 (1.17, 2.48)**	1.74 (1.17, 2.57)**
Immigrant status ^b					
First-generation immigrant	—	—	1.76 (0.97, 3.21)	1.64 (1.02, 2.64)*	1.64 (1.00, 2.70)
Second-generation immigrant	—	—	1.76 (0.99, 3.10)	1.75 (0.99, 3.09)	1.76 (1.00, 3.17)
Third-generation immigrant	—	—	0.97 (0.60, 1.59)	0.97 (0.59, 1.60)	1.03 (0.63, 1.69)
Wear a face mask					
Yes	—	—	—	3.63 (2.56, 5.15)***	3.51 (2.46, 5.02)***
Time spent on social media in a day on average ^c					
1–30 minutes	—	—	—	—	1.28 (0.79, 2.07)
31–60 minutes	—	—	—	—	1.67 (0.98, 2.85)
61–120 minutes	—	—	—	—	1.09 (0.70, 1.69)
>120 minutes	—	—	—	—	1.75 (0.91, 3.34)

Note: Boldface indicates statistical significance (* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$) using multivariable logistic regression. Values in parentheses are 95% CI. All models adjusted for age, education, sex, household income, self-reported symptom, COVID-19 prevalence in the state a respondent resided, and the number of days under the state's Shelter-in-Place order on the day of the response, with Eicker–Huber–White robust SEs clustered at the state level.

^aNon-Hispanic White as reference category.

^bNonimmigrant as reference category.

^cSpent no time on social media in a day on average as reference category.

Table 3. AORs of Perceiving COVID-19–Associated Discrimination in April (n=3,665)

Variable	Model 4	Model 5	Model 6	Longitudinal analysis ^a
Race^b				
Black	1.70 (1.22, 2.36)**	1.80 (1.30, 2.48)***	1.80 (1.30, 2.51)***	1.53 (1.05, 2.23)*
Hispanic	1.07 (0.71, 1.60)	0.98 (0.67, 1.44)	0.97 (0.66, 1.43)	1.09 (0.71, 1.67)
Asian	2.34 (1.19, 4.61)*	2.07 (1.08, 3.94)*	2.02 (1.07, 3.80)*	1.35 (0.77, 2.38)
Other race/ethnicity	1.11 (0.60, 2.05)	1.20 (0.65, 2.22)	1.20 (0.66, 2.19)	1.14 (0.57, 2.26)
Prior perceived discrimination				
Yes	2.19 (1.74, 2.76)***	2.15 (1.67, 2.75)***	2.18 (1.69, 2.80)***	2.14 (1.60, 2.87)***
Immigrant status^c				
First-generation immigrant	0.91 (0.47, 1.78)	0.98 (0.51, 1.88)	0.95 (0.48, 1.87)	0.90 (0.42, 1.96)
Second-generation immigrant	1.73 (1.20, 2.48)**	1.85 (1.24, 2.77)**	1.86 (1.27, 2.73)**	1.80 (1.26, 2.58)**
Third-generation immigrant	1.59 (1.21, 2.10)**	1.64 (1.24, 2.18)**	1.65 (1.24, 2.19)**	1.67 (1.26, 2.23)***
Wear a face mask				
Yes	1.35 (1.04, 1.75)*	1.34 (1.02, 1.75)*	1.30 (0.99, 1.71)	1.21 (0.90, 1.63)
Time spent on social media in a day on average^d				
1–30 minutes	1.30 (0.99, 1.70)	1.33 (1.03, 1.73)*	1.30 (1.00, 1.69)	1.27 (0.96, 1.70)
31–60 minutes	1.31 (0.90, 1.89)	1.33 (0.89, 2.00)	1.31 (0.86, 1.99)	1.22 (0.75, 2.00)
61–120 minutes	1.27 (0.93, 1.74)	1.33 (0.97, 1.81)	1.27 (0.93, 1.75)	1.28 (0.92, 1.79)
>120 minutes	1.47 (1.03, 2.10)*	1.59 (1.09, 2.32)*	1.58 (1.09, 2.29)*	1.50 (1.02, 2.21)*
Work from home by wearing a face mask^e				
Work but no day WFH and no mask	—	1.29 (0.76, 2.20) 0.35	1.26 (0.75, 2.11)	1.32 (0.74, 2.33)
Some days WFH and no mask	—	1.61 (0.84, 3.09) 0.15	1.55 (0.79, 3.00)	1.51 (0.74, 3.07)
All days WFH and no mask	—	1.12 (0.85, 1.48) 0.42	1.11 (0.83, 1.48)	1.16 (0.83, 1.61)
Work but no day WFH and wear mask	—	1.52 (1.13, 2.05) 0.01	1.58 (1.17, 2.14)**	1.73 (1.25, 2.41)**
Some days WFH and wear mask	—	1.10 (0.58, 2.12) 0.76	1.12 (0.59, 2.11)	1.08 (0.57, 2.07)
All days WFH and wear mask	—	1.20 (0.88, 1.63) 0.26	1.23 (0.89, 1.69)	1.25 (0.87, 1.78)
Social activities				
Go out to a bar, club, or other places where people gather	—	—	1.17 (0.47, 2.89)	0.88 (0.25, 3.05)
Go to grocery store or pharmacy	—	—	1.10 (0.82, 1.47)	1.10 (0.80, 1.50)
Go to a friend, neighbor, or relatives' residence (that's not your own)	—	—	0.94 (0.73, 1.22)	0.94 (0.73, 1.23)
Have visitor such as friends, neighbors, or relatives at your residence	—	—	1.32 (1.08, 1.60)**	1.29 (1.04, 1.61)*

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Table 3. AORs of Perceiving COVID-19–Associated Discrimination in April ($n=3,665$) (continued)

Variable	Model 4	Model 5	Model 6	Longitudinal analysis ^a
Attend a gathering with more than 10 people such as a reunion, wedding, or funeral	—	—	1.79 (0.89, 3.60)	2.09 (1.06, 4.11)*
Go outside to walk, hike, or exercise	—	—	1.18 (0.89, 1.57)	1.22 (0.86, 1.73)

Note: Boldface indicates statistical significance (* $p<0.05$; ** $p<0.01$; *** $p<0.001$) using multivariable logistic regression. Values in parentheses are 95% CI. All models adjusted for age, education, sex, household income, self-reported symptom, COVID-19 prevalence in the state a respondent resided, and the number of days under the state's Shelter-in-Place order on the day of the response, with Eicker–Huber–White robust SEs clustered at the state level.

^aAlso controlled for March perception in COVID-19 associated discrimination in the longitudinal analysis.

^bNon-Hispanic White as reference category.

^cNonimmigrant as reference category.

^dSpent no time on social media in a day on average as reference category.

^eDid not work as reference category.

WFH, working from home.

nonimmigrants. Frequent social media users, who spent >2 hours in a day on average, were also at a higher risk than those who did not use social media (AOR=1.58, $p<0.05$). To understand the association with use of face masks, reports of mask wearing were interacted with respondents' working status, given that most states implemented SIP orders in April requiring everyone except essential workers to stay home. Compared with people who did not work, only those who worked outside and wore face masks perceived more CAD (AOR=1.58, $p<0.01$). No difference was found for those who worked outside but did not wear face masks (AOR=1.26, $p>0.05$) nor those who worked partially or fully from home regardless of face mask usage. Engagement in social activities in which in-person discrimination might occur (e.g., going to the grocery store or pharmacy) was not associated with more discrimination except for those with visitors at their own residence (AOR=1.32, $p<0.01$).

Figure 1 illustrates the predicted absolute risk by race/ethnicity, adjusted for risk factors and covariates in the cross-sectional analyses. In both months, non-Hispanic Blacks (absolute risk [AR]=0.09, 95% CI=0.059, 0.122 for March, Model 4; AR=0.151, 95% CI=0.115, 0.187 for April, Model 6) and Asians (AR=0.105, 95% CI=0.070, 0.140 for March, Model 4; AR=0.165, 95% CI=0.086, 0.244 for April, Model 6) had higher risk than other racial/ethnic groups (AR ranged from 0.027 to 0.054 in March and 0.090 to 0.108 in April). From March to April, the risk increased for all racial/ethnic groups including non-Hispanic Whites, although it was less evident for Asians. Mask wearing also increased the likelihood of perceiving CAD, persistent in both March (AR=0.112, 95% CI=0.082, 0.142 for wearing; AR=0.037, 95% CI=0.031, 0.042 for not wearing) and April (AR=0.144, 95% CI=0.110, 0.178 for wearing and working completely outside home; otherwise, ARs ranged from 0.079 to 0.111).

Longitudinal analysis (Table 3, last column) associated the increase in perceiving CAD over time with several aforementioned risk factors, including being non-Hispanic Black; a second- or third-generation immigrant; and a frequent social media user (i.e., spending >2 hours in a day on average), as well as having prior discrimination experiences and a combination of working outside and using a face mask. Different from the cross-sectional analysis (Table 3, Model 6), attending a gathering with >10 people in April significantly predicted the increased CAD perception over time. Relative to non-Hispanic Whites, Asians did not experience more CAD in April after accounting for their experience in March (AOR=1.35, $p>0.05$).

In addition to assessing factors associated with perceived CAD, subsequent analyses examined the relationship between CAD and mental health factors to determine potential impact (Appendix Table 4, available online). Cross-sectional analysis revealed that perceived CAD predicted a higher PHQ-4 score in March ($b=0.77$, $p<0.001$) and April ($b=1.01$, $p<0.001$) after adjusting for the prior score on 8-item Center for Epidemiologic Studies–Depression Scale and person- and state-level covariates (e.g., demographics and COVID-19 prevalence). The longitudinal approach associated perceived CAD with the PHQ-4 score in April after controlling for PHQ-4 score in March ($b=0.50$, $p<0.001$) and the same set of covariates.

DISCUSSION

Anecdotal discriminatory acts amid the COVID-19 pandemic have been widely documented in media reports. To the authors' knowledge, this study provides the first systematic assessment on how perceived CAD is associated with potential risk factors (e.g., race/ethnicity and social media usage) and mental distress. Given the

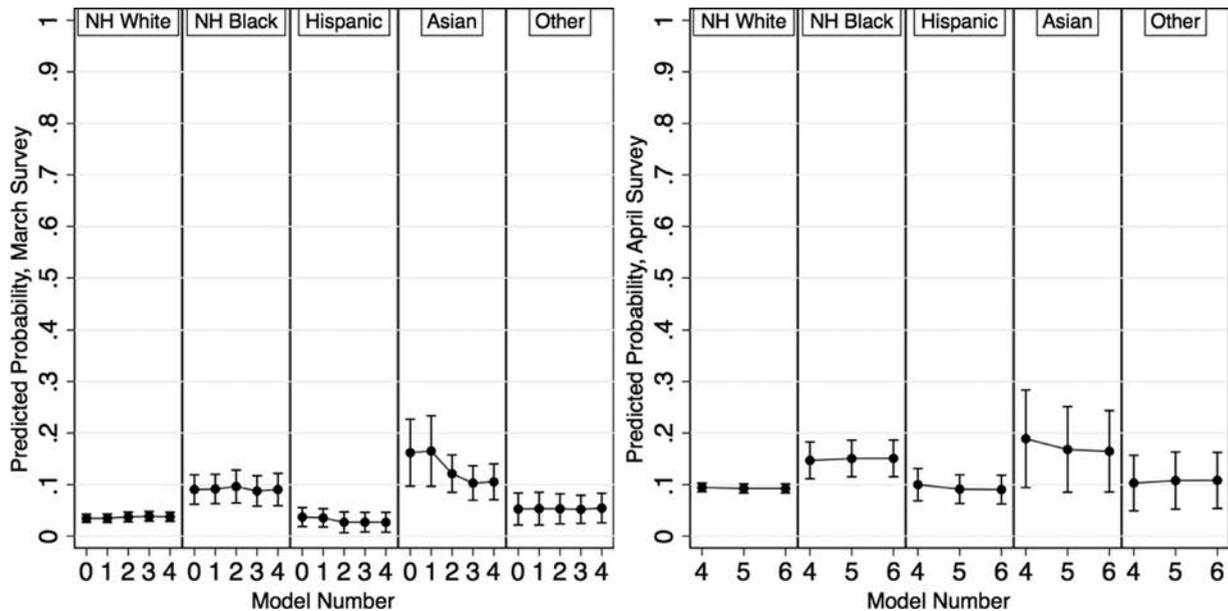


Figure 1. Predicted probability for racial/ethnic groups experiencing COVID-19–associated discrimination ($n=3,665$). All models adjusted for age, education, sex, household income, self-reported symptom, COVID-19 prevalence in the state a respondent resided, and the number of days under the state’s Shelter-in-Place order on the day of the response, with Eicker–Huber–White robust SEs clustered at the state level. NH, non-Hispanic.

representativeness of this sample, the authors believe that these results are generalizable to U.S. residents.

The findings suggest that perceptions of CAD are increasing although the overall prevalence remains relatively low. Although all racial/ethnic groups have experienced CAD, disparities are observed. Elevated risk among Asians in March confirms the media reports on hate crimes,⁴⁷ and it was in part mediated by their immigration status and use of face masks. Although their risk also appeared higher than non-Hispanic Whites in April, it was mostly carried over from March. Non-Hispanic Blacks are another group who persistently experience more CAD, and their risk increased from March to April. This could reflect the longstanding stereotypes associating non-Hispanic Blacks with the spread of infectious diseases,^{48,49} whereas the increased risk in April could be attributable to media coverage on their disproportionately higher mortality rate because of COVID-19.^{50–52} Smaller racial/ethnic gaps in April than March could be due to the increase in CAD among non-Hispanic Whites.

Besides race/ethnicity, wearing face masks is another risk factor consistently associated with CAD. This confirms media reports on the stigmatization of mask wearing during the pandemic,^{21,22} reflecting longstanding bias in the West⁵³ and contradicting public messaging across different disease control phases.^{54,55} In addition to mask-related cultural factors studied in previous outbreaks,⁵⁶ perceived CAD because of mask wearing could be

attributable to the spotlight effect, in which individuals overestimate others’ attention directed toward them when their appearances are different from people around.^{57,58} As many states transit to lifting SIP orders and reopen businesses and public activities, CAD associated with mask wearing, a highly recommended disease control metric,⁵⁹ calls for public awareness. This may ease as more authorities start to mandate face coverings in public⁶⁰ and wearing face masks becomes commonplace.

The results also point to CAD’s potential association with other risk factors such as heavy social media usage (i.e., spending >2 hours on a day on average), being an immigrant, and engagement in some social activities. However, such relationships seem less robust and need further confirmation.

As for potential health outcomes of CAD, this study showcases substantial evidence linking CAD to increased mental distress, consistent with literature associating general discrimination with poorer mental health, especially among racial/ethnic minorities.^{61,62} The relationship is particularly pertinent during this pandemic as it compounds mental health distress^{63,64} attributable to concerns of disease spread, austere social restrictions, and financial stress.

Limitations

Findings from this study should be interpreted in light of several limitations. First, the analysis was based on observational data. The reported correlational relationships

need further confirmation in stronger designs such as a field experiment. Additionally, CAD was operationalized as people's self-reported perception instead of direct observation. Other data types detailing occasions or types of discrimination might provide an in-depth view. Moreover, risk factors examined here are limited. For example, coughing in public was not covered in the data although anecdotal evidence associates it with disease avoidance. Finally, mental health was assessed by perceived mental distress instead of mental illness as in other studies.⁶¹

CONCLUSIONS

The impact of the COVID-19 pandemic on public health, including mental health, will continue to reverberate for years to come. This study's initial findings of perceived CAD and its association with poorer mental health underscore the existing racial/ethnic inequalities experienced by many non-Hispanic Blacks and Asians. The findings also suggested discrimination toward those who wear face masks, signaling the need to raise public awareness, especially as economies reopen and wearing a face mask is highly recommended to prevent transmission.

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YL and BKF conceived the study and analyzed and interpreted the data; all authors contributed to drafting and revising the article. The contents of the article have not been presented or published elsewhere.

SUPPLEMENTAL MATERIAL

Supplemental materials associated with this article can be found in the online version at <https://doi.org/10.1016/j.amepre.2020.06.007>.

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