

# Early perceptions of COVID-19 intensity and anti-Asian prejudice among White Americans

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## Abstract

Anecdotal reports suggested an uptick in anti-Asian prejudice corresponding with the initial outbreak of the COVID-19 pandemic. Examining responses from White U.S. citizens ( $N = 589$ ) during the first months of the pandemic, this study tested: (a) whether actual intensity (official number of cases or deaths reported) or perceived intensity (participants' estimates of the same) of the COVID-19 outbreak predicted indicators of racial outgroup prejudice, particularly those associated with cross-group interaction, (b) whether outgroup prejudice was oriented toward Asian people specifically, or toward racial outgroups more broadly (e.g., toward both Asian people and Black people), and (c) whether contact with racial outgroups moderated relations between COVID-19 intensity and racial prejudice. Results showed that perceived COVID-19 intensity was associated with prejudice indicators representing the desire for social distance from Asian people, as well as from Black people, yet it was unrelated to reports of negative affect toward either racial outgroup. These patterns support the idea that prejudice during periods of disease outbreak might functionally serve to reduce willingness for interaction with, and likelihood of infection from, racial outgroups. Contact moderated the relation between official reports of COVID-19 intensity and support for anti-China travel policies, such that greater contact with Asian people was associated with less support for exclusionary, anti-China travel policies when actual COVID-19 intensity was high. Overall, these results suggest that intensity of disease threat can exacerbate racial outgroup prejudice and reduce willingness for cross-group interaction, but that intergroup contact may sometimes provide a prejudice-attenuating effect.

## Keywords

COVID-19, intergroup contact, prejudice

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As the United States grapples with a deadly pandemic caused by SARS-CoV-2 (hereafter referred to as COVID-19) that has killed hundreds of thousands of people nationwide,<sup>1</sup> it has also been plagued by a surge in anti-Asian prejudice (Lee & Yadav, 2020). Since the start of the COVID-19

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pandemic, 30% of Americans (and 60% of Asian Americans) have reported witnessing someone blaming Asian people for the pandemic (Ellerbeck, 2020). Moreover, 58% of Asian Americans say that expressions of anti-Asian sentiment have become more common since the COVID-19 pandemic began (Ruiz et al., 2020; see also Gover et al., 2020; Tessler et al., 2020), with some estimates reporting around 1,500 instances of harassment against Asian Americans between March and April 2020 (Jeung & Nham, 2020). The present research examines the relations between the intensity of COVID-19 and anti-Asian prejudice with three primary goals: (a) to test whether actual intensity or perceived intensity of the COVID-19 outbreak predicts indicators of racial outgroup prejudice, particularly indicators of prejudice that reflect the likelihood of interaction and subsequent infection, (b) to examine whether any relations between outbreak intensity and prejudice are specific to anti-Asian prejudice, or are directed toward other racial outgroups as well (i.e., anti-Black prejudice), and (c) to examine whether contact with racial outgroup members moderates relations between COVID-19 intensity and racial outgroup prejudice.

There are theoretical reasons to expect more prejudice, and in particular more anti-Asian prejudice, during the current COVID-19 pandemic. A rich literature concerning evolutionary and functional perspectives on prejudice suggests that during periods of disease and outbreak, one's "behavioral immune system" kicks in and promotes a variety of behavior changes that aim to reduce the chances of infection (see Ackerman et al., 2018). If the function of prejudice during a period of disease outbreak is to reduce one's chance of becoming infected, then we should expect to observe that disease outbreaks are associated with psychological distancing from outgroups associated with the disease. Indicators of such psychological distancing may include reduced willingness for interaction with outgroup others or greater support for exclusionary policies that would reduce the likelihood of contact with the relevant outgroup (see Schaller & Duncan, 2007; Schaller & Park, 2011).

In the present context of COVID-19, there are at least two factors fomenting the idea that "Asian people" are the relevant outgroup targeted for exclusion. First, narratives that place the blame for COVID-19 on China, or Asian people more broadly, have been pervasive in the US since the start of the pandemic (for a review, see Noel, 2020). Anti-Asian sentiment has been expressed blatantly in public discourse (Mitchell et al., 2020), including by the former U.S. president and other leading politicians who on numerous occasions referred to COVID-19 as the "Chinese flu" or "kung flu" (Zhou, 2020). In this context, it is easy to envision how prejudice against Asian people might have deepened as the COVID-19 outbreak intensified and became more salient in people's minds.

Second, the literature examining evolutionary and functional perspectives on prejudice also supports the prediction that, at least among White Americans, periods of disease outbreak might engender anti-Asian prejudice. These perspectives propose that, during a disease outbreak, prejudice is most likely to be oriented toward outgroups perceived or stereotyped as foreign, because these outgroups are most likely to be viewed as importing new pathogens or subscribing to norms around food or hygiene that do not align with host nation norms (Kurzban & Leary, 2001; Park et al., 2003). Clearly, such trends do not negate the abundance of prejudice against Black people and other racial groups in the United States; nonetheless, White Americans have often been shown to view Asian people as more foreign than other racial groups (e.g., Devos & Banaji, 2005; Kim, 1999; Parks & Yoo, 2016; Zou & Cheryan, 2017).

Thus, during a period of disease outbreak, and especially when combined with narratives placing the blame for the COVID-19 pandemic on Chinese people (Zhou, 2020), we would expect to observe heightened anti-Asian prejudice among White people in the US. This has been borne out in recent research. For instance, social media analysis has shown that the proportion of tweets expressing negative sentiments toward Asian people increased considerably between November 2019 and March 2020, as COVID-19 began to

spread across the US, while the proportion of tweets expressing negative sentiment toward Black people remained relatively stable during this same time period (see Nguyen *et al.*, 2020).

In a related vein, the power of disease outbreaks to incite prejudice toward foreign outgroups has been demonstrated previously in Italy, in response to the 2014 Ebola epidemic in West Africa. Overall, Italy reported only two cases of Ebola—making its prevalence much less intense than the current outbreak of COVID-19 in the US. Nonetheless, Italian citizens who believed Ebola infection was likely also expressed greater prejudice toward African immigrants (Prati & Pietrantoni, 2016). Such studies examining how actual disease outbreaks relate to outgroup prejudice are relatively rare, but their general conclusions are supported by laboratory-based studies. Stimulating disgust—an emotion frequently associated with disease—can lead people to become less likely to seek out activities with strangers (Sawada *et al.*, 2017) and more likely to harbor prejudice toward outgroup members (Navarrete & Fessler, 2005). Studies have also shown how priming stimuli related to disease can enhance prejudice toward a foreign outgroup, but not toward a more familiar outgroup (e.g., Faulkner *et al.*, 2004).

With respect to the present COVID-19 pandemic, a large survey study revealed that Americans who expressed more concern about COVID-19 also expressed greater anti-Asian sentiment (Reny & Barreto, 2020). Similarly, an experimental study showed that Americans primed to think of COVID-19 as an existential threat reported greater anxiety and arousal, which in turn predicted greater anti-Asian bias (Tabri *et al.*, 2020). These most recent studies have usefully demonstrated how individuals' own concern about COVID-19 infection might enhance their reported prejudice toward an outgroup. Still, the insights offered by these studies are limited in some key respects.

### **Limited Attention to Broader Context of Disease Infection**

For one, prior studies have focused on individuals' concerns about COVID-19 infection, without

taking into account the intensity or pervasiveness of the COVID-19 outbreak in the actual social context in which people live. Rather than attempting to draw conclusions about large-scale social processes from only individual-level data, greater efforts should be made to understand how context-level factors may shape individuals' responses (see Pettigrew, 2018). Thus, a central aim of the present research was to consider how intensity of the COVID-19 outbreak where people live—both as officially recorded in their state of residence and as estimated by individuals themselves—might correspond with anti-Asian prejudice.

### **Limited Exploration of Distinct Dimensions of Prejudice**

In examining how outgroup prejudice may be linked to individuals' concerns about COVID-19 infection, prior studies have focused on assessing prejudice as a single concept, rather than exploring how concerns about disease outbreak might differentially relate to distinct indicators of outgroup prejudice. During periods of disease outbreak, the function of prejudice is largely understood as being motivated by a desire to reduce the possibility of infection (e.g., Ackerman *et al.*, 2018; Schaller & Park, 2011). As such, we expect that links between COVID-19 intensity and anti-Asian prejudice will more likely be observed for prejudice measures that represent the possibility of interaction with Asian people—such as desire for social distance and exclusionary travel policies—and less likely to be observed for prejudice measures that represent negative affect toward Asian people.

### **Limited Consideration of Potential Targets of Outgroup Prejudice**

Prior studies of the outbreak have also been limited by their principal focus on prejudice toward only one specified outgroup. In the present research, we use a sample of White Americans from across the US to test the prediction that COVID-19 would be more strongly linked to prejudice against Asian people—due to prevailing

narratives about the COVID-19 outbreak as well as stereotypes linking “Asian” and “foreignness”—in contrast to the prediction that COVID-19 intensity would be comparably associated with prejudice against Asian people and people from another racial outgroup (e.g., Black people).

## Assessing COVID-19 Intensity: Participant Estimates Versus Objective Reality

To examine links between COVID-19 intensity and prejudice in the present research, we distinguish between indicators based on official public reports and subjective estimates to represent the context-level threat in question (Semyonov et al., 2004; Stephan et al., 2009). Prior research indicates that people’s subjective estimates of context-level threats are often more predictive of their outgroup attitudes than more objective indicators of such threats (see e.g., Pettigrew et al., 2010; Stephan et al., 2009). As one relevant example, Semyonov et al. (2004) showed that it was Germans’ own estimates of the percentage of foreigners living in Germany—and not the actual percentage of foreigners living in Germany—that predicted more exclusionary attitudes toward foreigners (see also Schlueter & Scheepers, 2010; Semyonov et al., 2008). In line with this body of work, we expected that participants’ subjective estimates of COVID-19 intensity, and not actual COVID-19 intensity, would be more predictive of outgroup prejudice.

## Contact as a Moderator of Links Between COVID-19 Intensity and Prejudice

Another aim of this research was to examine whether contact with Asian people might moderate associations between COVID-19 intensity and anti-Asian prejudice. A long tradition of research in social psychology has established that intergroup contact often relates to lower perceptions of intergroup threat (e.g., Schlueter & Scheepers, 2010; Stephan et al., 2002, 2008), and

part of why contact typically reduces prejudice is because it lessens the extent to which people feel threatened by the outgroup (Pettigrew & Tropp, 2008). Correspondingly, we would generally expect that greater contact with Asian people will correspond with less anti-Asian prejudice even in the present context of disease outbreak, as it does under more typical conditions.

Recent research from the UK offers some support for this prediction; during the early days of the pandemic (i.e., late February of 2020), Alston et al. (2020) observed that White British citizens who reported greater contact with Chinese people tended to show less support for anti-Chinese discriminatory policies. However, these authors did not examine whether support for anti-Chinese policies varied in relation to the actual or perceived intensity of the threat posed by the outgroup (in this case, the intensity of COVID-19), and whether contact might moderate this relation. This research extension is important to consider, given other studies showing that threat and contact both play important roles in shaping intergroup prejudice (e.g., Pettigrew et al., 2010), and that contact can often mitigate the negative effects of threat on intergroup attitudes (see Pettigrew & Tropp, 2011; Wagner et al., 2006). In the current research, therefore, we examine both threat and contact as predictors of outgroup prejudice; here, we test whether contact with Asian people will moderate relations between COVID-19 intensity and anti-Asian prejudice among White Americans, such that the positive links between greater COVID-19 intensity and greater anti-Asian prejudice will be weaker among those who report higher—as compared to lower—levels of contact with Asian people. Examining whether contact moderates any relations between COVID-19 intensity and anti-Asian bias allows us to assess whether contact might attenuate the expression of prejudice, even during periods of heightened threat. Finally, to explore under what conditions and in relation to whom contact might attenuate prejudice, we will also examine whether contact with Black people moderates possible relations between COVID-19 intensity and anti-Black prejudice.

## The Current Research

In sum, the current research aimed to test the following hypotheses:

Hypothesis 1: We will be more likely to observe relations between COVID-19 intensity and anti-Asian prejudice for prejudice measures that represent the possibility of interaction with Asian people, and less likely to observe relations for prejudice measures that represent negative affect toward Asian people.

Hypothesis 2: Participants' subjective estimates of COVID-19 intensity will be more predictive of outgroup prejudice than official reports of COVID-19 intensity.

Hypothesis 3: COVID-19 intensity will be more strongly linked to prejudice against Asian people than to prejudice against Black people.

Hypothesis 4: Greater contact with Asian people will correspond with less anti-Asian prejudice even in the context of disease outbreak.

Hypothesis 5: Contact with Asian people will moderate relations between COVID-19 intensity and anti-Asian prejudice among White Americans, such that a positive relation between COVID-19 intensity and greater anti-Asian prejudice will be weaker among those who report higher—as compared to lower—levels of contact with Asian people.

To test our research hypotheses, we conducted an online study of White Americans living across the US during the very initial stages of the COVID-19 outbreak. The World Health Organization officially decreed the COVID-19 outbreak a pandemic on March 11, 2020; then, the former U.S. president declared a state of emergency on March 13, 2020. In the US, the number of confirmed COVID-19 cases and deaths rose substantially between the time we initiated data collection on March 20, 2020 (18,012

cases and 277 deaths) and when we ended data collection on April 13, 2020 (584,018 cases and 26,613 deaths; see “Nytimes/covid-19-data/us-states.csv” 2021). During this same time period, 43 states issued stay-at-home orders, and over 23 million Americans became unemployed in the month of April (U.S. Bureau of Labor Statistics, 2020). Thus, this period of data collection represents a particularly vulnerable time for many Americans—when awareness and salience of the pandemic increased dramatically—and a critical period for examining how objective and perceived intensity of the COVID-19 pandemic might correspond with anecdotal reports of growing anti-Asian sentiment.

## Method

### *Participants and Procedures*

Data were collected on Amazon Mechanical Turk via Qualtrics between March 20 and April 13, 2020. To determine the necessary sample size, we used a conservative lower bound based on effect sizes for the relations between disease threat and lack of willingness to interact with a foreign outgroup ( $r = .21$ ; Faulkner et al., 2004), as well as mean effect size estimates for research on the relations between intergroup contact and belief-based biases ( $r = .24$ ; Tropp & Pettigrew, 2005). Following recommendations in Perugini et al. (2018), power analyses in G\*Power (Faul et al., 2007) indicated the need for at least 606 participants to be able to detect statistically significant effects (at  $p < .05$ ) for two predictors (including the main effect of COVID-19 intensity and potential moderation of contact) with 80% power. To capture responses to the ever-evolving nature of the COVID-19 pandemic, we staggered data collection so that a new group of approximately 100 participants was sampled every 3 days.<sup>2</sup> Anyone living in the US was eligible to participate, and data were collected from participants across 44 states. Only U.S. citizens (by birth or naturalized) who self-identified as White were included in analyses ( $N = 720$ ); these restrictions were used because too few Black American

( $n = 107$ ) or Asian American ( $n = 51$ ) individuals participated to be able to conduct meaningful statistical comparisons across groups of respondents. Moreover, for our analyses, we wished to maintain clear distinctions between the racial background of our participant sample (White people) and the racial backgrounds of outgroup targets explicitly linked to the COVID-19 outbreak (Asian people) and of outgroup targets not explicitly linked to the COVID-19 outbreak (Black people).

Within this subset of White American participants, we excluded any respondents who did not successfully answer at least four of the five Winograd attention check questions (excluded  $n = 90$ ), and those who did not wish to have their data included in our final data set, if requested after debriefing, in line with guidelines of our institutional ethics board (excluded  $n = 21$ ). We also excluded participants who provided estimates of COVID-19 cases or deaths that were more than 2 standard deviations above the mean (estimated case number cut-off  $> 200,000$ ; estimated death number cut-off  $> 30,000$ ; excluded  $n = 20$ ). Thus, our final sample included 589 participants (42% female, 57% male, 1% provided another gender identity) ranging in age from 19 to 79 years ( $M = 39.7$  years).<sup>3</sup>

**COVID-19 intensity.** We assessed actual intensity of the COVID-19 outbreak at the time of data collection by collecting data from public health sources on the actual numbers of cases and deaths linked to COVID-19 at the state level on the date that a participant completed the study (as reported by *The New York Times*; Nytimes/covid-19-data/us-states.csv, 2021). We focused our analysis of official reports at the state level because participants' survey responses were collected very soon after the COVID-19 outbreak began in the US, when many cities or counties had no officially reported cases or deaths (whether due to a lack of actual cases or a lack of testing); thus, the most comprehensive local contextual data available for the largest number of participants were at the state level. Correspondingly, we assessed participants' subjective perceptions of the intensity of

the COVID-19 outbreak by asking them to estimate the number of cases and deaths linked to COVID-19 in their state. We asked about cases and deaths separately given substantial variation in beliefs about the potential danger of COVID-19 infection—ranging from the belief that COVID-19 was no worse than the flu to the belief that COVID-19 is deadly (for discussion of factors that account for variation in COVID-19 risk assessment, see Niño et al., 2021). Thus, participants' estimates of COVID-19 cases might not indicate the same level of perceived threat as their estimates of COVID-19 deaths; but see Table 1 for evidence of moderate correlation ( $r = .41$ ) between estimated cases and deaths.

**Prejudice toward Asian and Black people.** Distinct indicators of prejudice toward Asian people were used to assess desire for social distance from outgroup members, support for exclusionary travel policies, and negative affect toward outgroup members. Where possible, parallel measures were also used to assess prejudice toward Black people, to provide estimates of prejudice toward outgroup targets not explicitly linked to COVID-19; this procedure allowed us to examine whether COVID-19 intensity is uniquely related to anti-Asian prejudice, or whether it might be related to anti-Black prejudice as well.<sup>4</sup>

**Desire for social distance.** To assess how much participants wanted to avoid interaction with members of each target outgroup, participants completed two parallel versions of a seven-item Social Distance Scale (Bogardus, 1933), one asking about Asian people and one about Black people. Sample items asked participants how willing they were “to accept an [Asian/Black] person as a coworker” or “to live next door to an [Asian/Black] person,” with item responses given on a 7-point scale (1 = *strongly agree*, 7 = *strongly disagree*), such that a higher value indicated a greater desire for social distance from the target group (Asian people:  $\alpha = .95$ ; Black people:  $\alpha = .95$ ).

**Support for exclusionary policies.** To assess support for exclusionary policies, we first informed

**Table 1.** Means, standard deviations, and correlations with confidence intervals.

Variable	Range	M	SD	1	2	3	4	5	6	7	8	9	10	11	12
1. Desire for social distance from Asian people	1-7	1.79	1.12												
2. Support for exclusionary anti-Asian travel policy	1-7	6.09	1.35	-.08											
3. Negative affect toward Asian people	0-100	29.63	22.58	[-0.16, 0.00]	.54**										
4. Desire for social distance from Black people	1-7	1.75	1.11	.72**		-.04									
5. Negative affect toward Black people	0-100	30.35	23.36	[0.67, 0.75]	[-.012, 0.04]	[0.31, 0.45]									
6. Actual COVID-19 intensity based on recorded deaths	0-10,056	208.61	545.21	[0.29, 0.43]	[-0.14, 0.02]	[0.76, 0.82]	[0.44, 0.56]								
7. Perceived COVID-19 intensity based on participant-estimated deaths	0-30,000	387.11	1571.97	[-0.11, 0.06]	[-0.20, -0.04]	[-0.01, 0.15]	[-0.08, 0.08]	[-0.08, 0.08]	[-0.01, 0.16]	.03	.33**				
8. Actual COVID-19 intensity based on recorded cases	14-195,031	7656.70	14160.82	[0.04, 0.20]	[-0.14, 0.03]	[-0.01, 0.15]	[0.00, 0.17]	[-0.05, 0.11]	[0.25, 0.40]						
9. Perceived COVID-19 intensity based on participant-estimated cases	5-200,000	8320.70	18659.16	[-0.09, 0.07]	[-0.17, -0.01]	[0.02, 0.18]	[-0.07, 0.09]	[0.01, 0.17]	[0.91, 0.93]	[0.22, 0.37]	.45**	.41**	.48*		
10. Contact with Asian people	0-20	5.35	4.88	[-0.01, 0.16]	[-0.12, 0.04]	[-0.01, 0.15]	[-0.00, 0.16]	[-0.03, 0.13]	[0.38, 0.51]	[0.34, 0.47]	.04	.10*	.08	.06	.09*
11. Asian neighborhood proportion	0-0.80	0.07	0.10	[-0.12, 0.04]	[-0.16, 0.00]	[-0.21, -0.05]	[-0.04, 0.12]	[-0.17, -0.01]	[0.00, 0.16]	[0.02, 0.18]	.05	.08*	.12**	.13**	.20**
12. Contact with Black people	0-20	7.44	5.12	[-0.02, 0.14]	[-0.10, 0.06]	[-0.04, 0.12]	[0.00, 0.17]	[-0.03, 0.15]	[0.00, 0.16]	[0.03, 0.20]	.26**	-.01	.03	.05	.55**
13. Black neighborhood proportion	0-0.97	0.13	0.18	[-0.11, 0.06]	[-0.08, 0.08]	[-0.24, -0.09]	[-0.21, -0.05]	[-0.33, -0.18]	[-0.09, 0.07]	[-0.05, 0.11]	.04	.04	-.03	.01	.01

Note. Values in square brackets indicate 95% confidence interval for each correlation. The confidence interval is a plausible range of population correlations that could have caused the sample correlation (Cunning, 2014).

\* $p < .05$ . \*\* $p < .001$ .

participants about an actual U.S. travel policy: “On February 2, 2020, in response to the spread of COVID-19, the United States government instituted travel restrictions for individuals traveling to and from China”; participants were then asked how much they did or did not support this travel restriction on a 7-point scale (1 = *do not support at all*, 7 = *support completely*). Because official travel policies at the time were only issued for China and Europe (see supplemental material [SM]), we did not include a parallel question about a hypothetical travel policy for a predominantly Black country or continent.<sup>5</sup>

**Negative affect.** Participants were asked to respond to feeling thermometers in which they indicated “how warm or cold they felt toward [Asian/Black] people”; possible scores ranged from 0 (*very cold*) to 100 (*very warm*). Participants’ feeling thermometer score in relation to each target group was reverse-scored by subtracting it from 100, so that a higher value would indicate feeling colder (and thus less warm) toward the target group in question. This procedure allowed us to conduct more straightforward comparisons across prejudice measures, so that higher scores on all three prejudice measures would indicate greater prejudice.

**Contact with Asian or Black people.** In two sets of two separate questions, participants were asked to report the number of Asian friends and acquaintances they had, as well as the number of Black friends and acquaintances they had, on a scale from “0” to “10 or more.” We summed participants’ responses across the “friend” and “acquaintance” questions for each racial outgroup separately to create an overall contact score for each racial outgroup that ranged from 0 to 20.

In addition, given that greater levels of intergroup contact are likely to occur in contexts with greater proportions of outgroup members (Pettigrew et al., 2010; Schlueter & Scheepers, 2010), and greater proportions of outgroup members may in and of itself serve as a form of intergroup threat (e.g., Quillian, 1995), we gathered estimates of group proportions using the

2018 Community Survey (from Rizzo et al., 2020) corresponding with participants’ residential ZIP codes. For example, the proportion of Asian residents in each participant’s neighborhood was calculated by taking the total number of residents in each participant’s ZIP code who self-identified as Asian, and dividing this number by the total number of residents in that ZIP code. This measure of Asian neighborhood proportion was created for use as a control variable, in order to isolate the role of contact with Asian people in data analysis. We created a comparable variable to capture neighborhood proportion of Black people as well.

## Data Analysis Plan

To examine whether COVID-19 intensity was associated with specific indicators of prejudice, and whether any relations among these variables were moderated by contact with the relevant racial outgroup, we analyzed our data using linear regression in R (Version 3.6.3; R Core Team, 2020), specifying a Gaussian distribution in the lme4 package (Bates et al., 2015). All predictor variables were standardized prior to analyses. We report all parameter estimates and *p* values in Table 2 (anti-Asian prejudice) and Table 3 (anti-Black prejudice), and we interpret and discuss any *p* value less than .05, which we consider to be a statistically significant result. Table 1 provides descriptive statistics and correlations between key variables. This study design, hypotheses, and analytic plan were preregistered on the Open Science Framework (OSF; <https://osf.io/d27kc/>).<sup>6</sup>

To examine the relations between COVID-19 and prejudice, we ran six regression models to assess prejudice toward Asian people, and four models to assess prejudice toward Black people, which allowed us to examine how perceived and actual COVID-19 intensity (based either on numbers of deaths or numbers of cases, in separate analyses) related to each of our prejudice indicators—desire for social distance (Asian and Black people), support for exclusionary policy (Asian people only), negative affect (Asian and Black

**Table 2.** Summary of model results, including parameter estimates and  $p$  values when anti-Asian prejudice is the outcome variable.

Predictor	Analyses with COVID-19 intensity based on deaths						Analyses with COVID-19 intensity based on cases					
	Desire for social distance from Asian people			Support for exclusionary anti-China travel policy			Negative affect toward Asian people					
	$\beta$	SE	$t$	$\beta$	SE	$t$	$\beta$	SE	$t$	$\beta$	SE	$t$
Perceived COVID-19 intensity	<b>1.06 x 10<sup>-4</sup></b>	<b>3.13 x 10<sup>-5</sup></b>	<b>3.38</b>	< .001	<b>6.51 x 10<sup>-6</sup></b>	<b>2.90 x 10<sup>-6</sup></b>	<b>2.25</b>	<b>.03</b>				
Actual COVID-19 intensity	-6.24 x 10 <sup>-5</sup>	1.18 x 10 <sup>-4</sup>	-0.53	.60	-3.20 x 10 <sup>-6</sup>	4.01 x 10 <sup>-6</sup>	-0.78	.44				
Contact with Asian people	-0.02	9.72 x 10 <sup>-3</sup>	-1.82	.07	-0.02	9.75 x 10 <sup>-3</sup>	-1.77	.08				
Perceived Intensity x Contact interaction	1.98 x 10 <sup>-6</sup>	6.90 x 10 <sup>-6</sup>	0.29	.77	2.61 x 10 <sup>-7</sup>	5.89 x 10 <sup>-7</sup>	0.44	.66				
Actual Intensity x Contact interaction	-1.78 x 10 <sup>-5</sup>	1.92 x 10 <sup>-5</sup>	-0.93	.35	-7.09 x 10 <sup>-7</sup>	7.39 x 10 <sup>-7</sup>	-0.96	.34				
Asian neighborhood proportion	0.64	0.49	1.30	.20	0.69	0.50	1.39	.17				
Desire for social distance from Asian people												
Perceived COVID-19 intensity	-1.73 x 10 <sup>-5</sup>	3.86 x 10 <sup>-5</sup>	-0.48	.65	4.73 x 10 <sup>-7</sup>	3.58 x 10 <sup>-6</sup>	0.13	.90				
Actual COVID-19 intensity	-6.24 x 10 <sup>-5</sup>	1.46 x 10 <sup>-4</sup>	-0.43	.67	-5.97 x 10 <sup>-6</sup>	1.95 x 10 <sup>-6</sup>	-1.21	.23				
Contact with Asian people	-0.02	0.02	-1.48	.14	-0.02	0.01	-1.49	.14				
Perceived Intensity x Contact interaction	3.24 x 10 <sup>-6</sup>	8.46 x 10 <sup>-6</sup>	0.38	.70	-3.80 x 10 <sup>-7</sup>	7.26 x 10 <sup>-7</sup>	-0.52	.60				
Actual Intensity x Contact interaction	<b>-4.93 x 10<sup>-5</sup></b>	<b>2.37 x 10<sup>-5</sup></b>	<b>-2.08</b>	<b>.04</b>	-1.05 x 10 <sup>-6</sup>	9.11 x 10 <sup>-7</sup>	-1.15	.25				
Asian neighborhood proportion	-0.04	0.61	-0.07	.95	6.77 x 10 <sup>-3</sup>	0.61	0.01	.99				
Support for exclusionary anti-China travel policy												
Perceived COVID-19 intensity	7.96 x 10 <sup>-4</sup>	6.47 x 10 <sup>-4</sup>	1.23	.22	4.53 x 10 <sup>-5</sup>	5.95 x 10 <sup>-5</sup>	0.76	.45				
Actual COVID-19 intensity	3.29 x 10 <sup>-3</sup>	2.44 x 10 <sup>-3</sup>	1.35	.18	1.47 x 10 <sup>-4</sup>	8.25 x 10 <sup>-5</sup>	1.78	.08				
Contact with Asian people	<b>-0.76</b>	<b>0.20</b>	<b>-3.83</b>	< .001	<b>-0.76</b>	<b>0.20</b>	<b>-3.81</b>	< .001				
Perceived Intensity x Contact interaction	5.83 x 10 <sup>-5</sup>	1.42 x 10 <sup>-4</sup>	0.41	.68	8.60 x 10 <sup>-6</sup>	1.21 x 10 <sup>-5</sup>	0.71	.48				
Actual Intensity x Contact interaction	-1.71 x 10 <sup>-4</sup>	3.86 x 10 <sup>-4</sup>	-0.43	.67	-6.72 x 10 <sup>-6</sup>	1.52 x 10 <sup>-5</sup>	-0.44	.66				
Asian neighborhood proportion	14.52	10.19	1.43	.15	13.88	10.21	1.36	.17				
Negative affect toward Asian people												

Note. Boldfaced values indicate relations where  $p < .05$ .

Table 3. Summary of model results, including parameter estimates and  $p$ -values when anti-Black prejudice is the outcome variable.

Predictor	Analyses with COVID-19 intensity based on deaths				Analyses with COVID-19 intensity based on cases			
	Desire for social distance from Black people				Negative affect toward Black people			
	$\beta$	SE	$t$	$p$	$\beta$	SE	$t$	$p$
Perceived COVID-19 intensity	<b>7.82 x 10<sup>-5</sup></b>	<b>3.04 x 10<sup>-5</sup></b>	<b>2.57</b>	<b>.01</b>	<b>7.66 x 10<sup>-6</sup></b>	<b>3.14 x 10<sup>-6</sup></b>	<b>2.44</b>	<b>.02</b>
Actual COVID-19 intensity	-6.25 x 10 <sup>-5</sup>	8.74 x 10 <sup>-5</sup>	-0.72	.47	-3.74 x 10 <sup>-6</sup>	3.79 x 10 <sup>-6</sup>	-0.99	.32
Contact with Black people	<b>-.03</b>	<b>9.00 x 10<sup>-3</sup></b>	<b>-3.65</b>	<b>&lt; .001</b>	<b>-0.03</b>	<b>9.04 x 10<sup>-3</sup></b>	<b>-3.73</b>	<b>&lt; .001</b>
Perceived Intensity x Contact interaction	1.08 x 10 <sup>-5</sup>	7.71 x 10 <sup>-6</sup>	1.40	.16	-1.87 x 10 <sup>-7</sup>	6.43 x 10 <sup>-7</sup>	-0.29	.61
Actual Intensity x Contact interaction	-1.00 x 10 <sup>-5</sup>	2.23 x 10 <sup>-5</sup>	-0.45	.65	4.00 x 10 <sup>-7</sup>	7.89 x 10 <sup>-7</sup>	0.51	.61
Black neighborhood proportion	0.37	0.25	1.49	.14	0.40	0.25	1.57	.12
Perceived COVID-19 intensity	3.50 x 10 <sup>-4</sup>	6.40 x 10 <sup>-4</sup>	0.55	.58	3.06 x 10 <sup>-5</sup>	3.31 x 10 <sup>-5</sup>	0.46	.64
Actual COVID-19 intensity	3.23 x 10 <sup>-3</sup>	1.84 x 10 <sup>-3</sup>	1.75	.08	1.26 x 10 <sup>-4</sup>	7.97 x 10 <sup>-5</sup>	1.57	.11
Contact with Black people	<b>-1.23</b>	<b>0.19</b>	<b>-6.53</b>	<b>&lt; .001</b>	<b>-1.22</b>	<b>0.19</b>	<b>-6.44</b>	<b>&lt; .001</b>
Perceived Intensity x Contact interaction	1.22 x 10 <sup>-4</sup>	1.62 x 10 <sup>-4</sup>	0.75	.45	4.31 x 10 <sup>-6</sup>	1.35 x 10 <sup>-5</sup>	0.32	.75
Actual Intensity x Contact interaction	-4.97 x 10 <sup>-4</sup>	4.69 x 10 <sup>-4</sup>	-1.06	.29	-8.60 x 10 <sup>-6</sup>	1.66 x 10 <sup>-5</sup>	-0.52	.60
Black neighborhood proportion	<b>12.31</b>	<b>5.28</b>	<b>2.33</b>	<b>.02</b>	<b>12.17</b>	<b>5.28</b>	<b>2.30</b>	<b>.02</b>

*Note.* Boldfaced values indicate relations where  $p < .05$ .

people)—and whether these relations were moderated by contact (see Table 2 for a summary of models examining prejudice toward Asian people, and Table 3 for a summary of models examining prejudice toward Black people).

In the models for each prejudice indicator, we included as predictors both the main effects of perceived COVID-19 intensity (i.e., perceived number of deaths or perceived number of cases at the state level) and those of actual COVID-19 intensity (i.e., officially reported number of deaths or number of cases at the state level). This allowed us to examine how COVID-19 intensity was related to specific dimensions of prejudice (Hypothesis 1), and whether perceived or actual intensity of COVID-19 was differentially related to prejudice (Hypothesis 2). By comparing the patterns of results across models predicting prejudice toward Asian people to those predicting prejudice toward Black people, we were additionally able to ascertain whether COVID-19 intensity was specifically related to anti-Asian prejudice, or whether it might also be related to anti-Black prejudice (Hypothesis 3).<sup>7</sup>

In each of these models, we also included as predictors neighborhood proportion of the racial outgroup in question, the main effect of contact with that racial outgroup, the interaction of perceived COVID-19 intensity and contact, and the interaction of actual COVID-19 intensity and contact. For each model, the contact, neighborhood proportion, and prejudice variables were matched by racial outgroup (i.e., when examining anti-Asian prejudice, we included contact with Asian people and neighborhood proportion of Asian people, and when examining anti-Black prejudice, we included contact with Black people and neighborhood proportion of Black people). This approach allowed us to test whether contact was associated with less prejudice even during this exceptional period of disease outbreak (Hypothesis 4), and whether any relations between COVID-19 intensity and prejudice were moderated by contact (Hypothesis 5). Observing only a main effect of contact might suggest that the role of contact remains consistent across a variety of contexts (e.g., during periods of calm

and periods of turmoil). In contrast, observing that contact moderates any relations between COVID-19 intensity and prejudice might suggest that contact functions differently during periods of disease outbreak—for instance, contact might relate to greater desire for social distance when infection risk is higher, because social distance is likely to reduce infection risk.

Because our predictor variables were in some cases moderately correlated (see Table 1), we used the “vif” function in the car package (Fox & Weisberg, 2019) to test for multicollinearity. All variables in all models showed variance inflation factors lower than 2.19, suggesting that none of our models suffered from multicollinearity among predictors; we therefore retained all predictor variables.

## Results

Analyses examining each indicator of prejudice for anti-Asian and anti-Black prejudice are presented separately and are subdivided based on whether COVID-19 intensity was measured in number of deaths or number of cases. As a reminder, perceived COVID-19 intensity was based on participant estimates of the number of deaths and cases linked to COVID-19 in their state, while actual COVID-19 intensity was determined by the officially reported number of deaths and cases linked to COVID-19 at the state level (“Nytimes/covid-19-data/us-states.csv,” 2021). Model results, including parameter estimates and *p* values, are presented in Table 2 (anti-Asian prejudice) and Table 3 (anti-Black prejudice).<sup>8</sup>

### Desire for Social Distance

*Deaths due to COVID-19.* Only perceived intensity of COVID-19 was positively associated with a desire for social distance from Asian people; actual intensity of COVID-19 was not significantly related to desire for social distance from Asian people. There were no main effects of neighborhood proportion or contact, and no interactive effects of contact.<sup>9</sup>

We found a similar pattern of results when predicting desire for social distance from Black people. Again, only perceived intensity of COVID-19 was positively associated with a desire for social distance from Black people; actual intensity of COVID-19 was not significantly related to desire for social distance from Black people. There was no main effect of neighborhood proportion of Black people, but there was an effect of contact; participants who had greater contact with Black people expressed less of a desire for social distance from Black people. However, contact did not interact with either COVID-19 intensity variable.

*Cases due to COVID-19.* When number of cases due to COVID-19 was used as the predictor variable, we found the same pattern of results as when number of deaths due to COVID-19 was used.

Taken together, this pattern of results suggests that perceptions of COVID-19 intensity are not related to a specific desire for social distance from Asian people, but rather a more generalized desire for social distance from racial outgroups, including both Asian and Black people. Additionally, we found no evidence that contact with outgroup members moderates the relation between COVID-19 intensity and desire for social distance, although greater contact with Black people was associated with less prejudice toward that population sector, suggesting that the benefits of contact sometimes persist during periods of crisis.

### *Support for Exclusionary Travel Policies*

*Deaths due to COVID-19.* Neither actual nor perceived intensity of COVID-19 were associated with support for an anti-Asian travel policy. We observed a significant interaction between official reports of COVID-19 intensity and contact on support for an anti-Asian travel policy. Among participants who scored high on contact with Asian people, higher COVID-19 intensity corresponded with significantly less support for anti-Asian policy (see Figure 1 for a graphical depiction

of this relation, where the data are split into 1 *SD* above [4.79 or greater] and 1 *SD* below [−4.95 or lower] the mean of standardized contact with Asian people). To clarify the nature of the interaction, we decomposed it using the Johnson–Neyman technique (using the “sim\_slopes” function in the interactions package in R), with a conservative test statistic to reduce the likelihood of Type I error (see Esarey & Sumner, 2017). This approach revealed that we only observed a significant ( $p < .05$ ) relation between official reports of COVID-19 intensity and decreased support for anti-Asian travel policy among participants for whom the standardized variable capturing contact with Asian people was greater than 3.68 (a value that is slightly lower than 1 *SD* above the mean contact score).

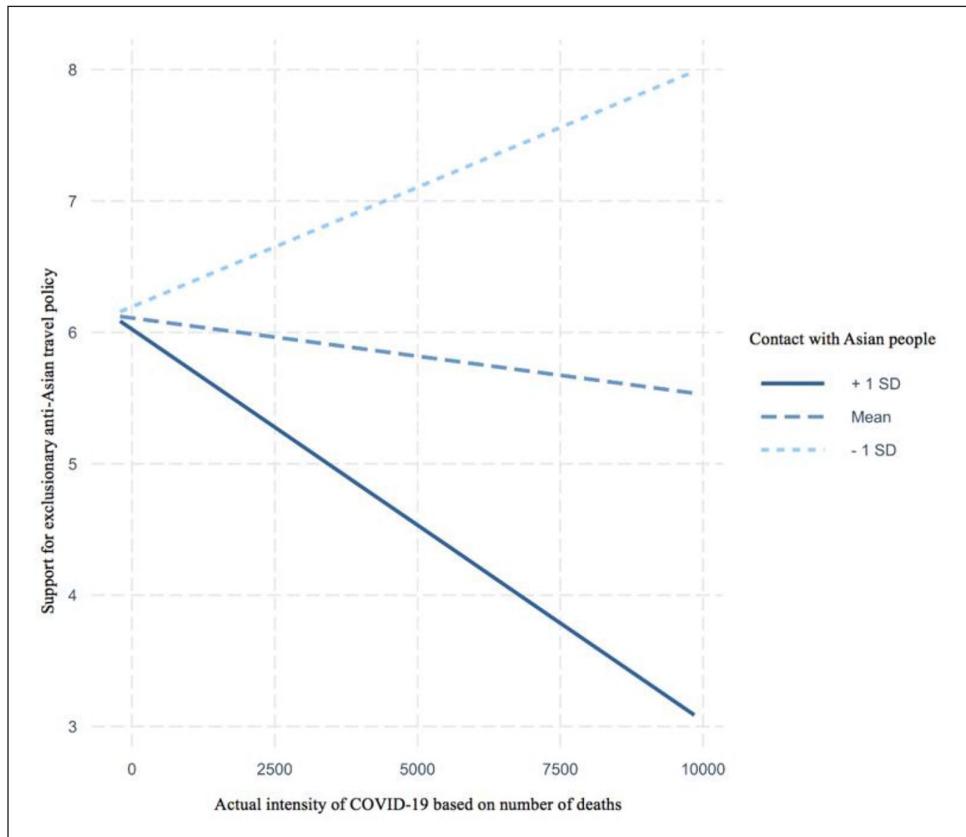
*Cases due to COVID-19.* There were no main or interactive effects of any variables on support for anti-China travel policy, in contrast to the interactive effect described before.

Together, the patterns of results provide some preliminary evidence that contact might moderate the relation between COVID-19 intensity and support for exclusionary policy that targets Asian people. However, the evidence in support of this proposition should be further interrogated before drawing any strong conclusions. Further, these results suggest that both actual and perceived intensity of COVID-19 may relate to outgroup prejudice, although which type of intensity best relates to prejudice might vary across different indicators of the outcome.

### *Negative Affect*

*Deaths due to COVID-19.* Neither perceived COVID-19 intensity nor actual COVID-19 intensity was significantly associated with participants’ reported affect toward Asian people. At the same time, the main effect of contact with Asian people was significant, such that participants who reported greater contact with Asian people expressed less negative affect toward that population. We found no evidence that contact moderated the relation between perceived or

**Figure 1.** Relations between actual intensity of COVID-19 (based on official reports of COVID-19 deaths) and support for an exclusionary anti-Asian policy, with participants separated by relative contact with Asian people. Colored lines represent the model fit regression lines at the mean and for each level of the moderator (+1 SD, -1 SD).



*Note.* Official number of deaths from COVID-19 was related to less support for exclusionary anti-Asian policy among participants with greater contact with Asian people.

For participants +1 SD above the contact mean, there was a significant relation between actual intensity of COVID-19 and decreased support for anti-Asian policy,  $\beta = -4.73 \times 10^{-4}$ ,  $p = .003$ . There was no relation between actual intensity and support for anti-Asian policy for participants -1 SD below the contact mean,  $\beta = -7.28 \times 10^{-4}$ ,  $p = .17$ .

actual COVID-19 intensity and negative affect toward Asian people.

We found a comparable effect of contact with Black people; participants who reported greater contact with Black people also reported less negative affect toward that population sector. We found the inverse relation for exposure to Black people; participants with greater exposure to Black people expressed more negative affect toward that demographic sector. However, there were no main or interactive effects of

COVID-19 intensity on negative affect toward Black people.

*Cases due to COVID-19.* We found the same pattern of results when cases due to COVID-19 were included in place of deaths due to that disease.

In sum, this pattern of results supports the prediction that COVID-19 intensity would be unrelated to affective measures of prejudice, as this dimension of prejudice might be less likely to

correspond with the actual likelihood of exposure to infection or disease. However, we did replicate previous work finding a positive relation between intergroup contact and affect-based indicators of prejudice (e.g., Tropp & Pettigrew, 2005), and some evidence that larger neighborhood proportions may be negatively related to affect toward certain racial outgroups (e.g., Quillian, 1995). This suggests that even during exceptional periods in history that have the potential to exacerbate intergroup threat, such as during a global pandemic, intergroup contact and neighborhood proportions might operate as in more typical times.

## Discussion

In the context of the COVID-19 pandemic that has been ravaging the United States, we tested five hypotheses about how this period of disease outbreak might correspond with White Americans' prejudice toward racial outgroups, specifically toward Asian and Black people, and how contact with the relevant racial outgroup might moderate relations between COVID-19 intensity and prejudice. Our first hypothesis was that we would be more likely to observe relations between COVID-19 intensity and anti-Asian prejudice for prejudice measures that represent the possibility of interaction with Asian people, and less likely to observe relations for prejudice measures that represent negative affect toward Asian people. This hypothesis, derived from evolutionary frameworks, was supported by the finding that COVID-19 intensity corresponded with indicators of outgroup prejudice that might serve to reduce the likelihood of infection, but not with indicators of outgroup prejudice that assess affect. We observed that perceived COVID-19 intensity was associated with a greater desire for social distance from both Asian people and Black people; at the same time, we observed no relation between COVID-19 intensity (either actual or perceived) and negative affect toward these racial outgroups. This finding adds to a body of work illustrating the value of examining different indicators of prejudice and different targets of

prejudice in theoretically informed ways (see Cottrell & Neuberg, 2005; Lin et al., 2005; Tropp & Pettigrew, 2005). Thinking about prejudice from a functional perspective—such as an (unfortunate) adaptation in response to a particular type of threat—can help researchers make clear and precise predictions about when we might expect prejudice to emerge, and what form(s) that prejudice might take. Future work should continue to employ nuanced conceptualizations of prejudice in relation to varied outgroups to gain purchase on the root causes and functions of prejudice across contexts.

Our second hypothesis was that, in line with prior work (e.g., Schlueter & Scheepers, 2010; Semyonov et al., 2008), participants' subjective estimates of COVID-19 intensity would be more predictive of outgroup prejudice than actual COVID-19 intensity. This was borne out when examining the relation between perceived intensity and desire for social distance from both Asian people and Black people. However, there was some suggestion that actual COVID-19 intensity might better relate to support for anti-Asian travel policies than perceived COVID-19 intensity. One remaining question is whether we would observe a similar pattern of results now, in the context of a pandemic that has not just begun, but that has been raging across the US, and globally, for more than a year. Actual and perceived intensity of the COVID-19 pandemic were reasonably correlated among our participants at the initial stages of disease outbreak (official reports and participants' estimated number of deaths:  $r = .45$ ; official reports and participants' estimated number of cases:  $r = .54$ ); this suggests that, overall, White Americans in our sample were moderately accurate when estimating the actual intensity of the COVID-19 outbreak during the early days of the pandemic. However, participants in our sample also varied wildly in their estimates of COVID-19 intensity, as evidenced by the large standard deviations in participant estimates of cases and deaths due to COVID-19 (see Table 1). This huge variation perhaps reflects a general uncertainty about the actual severity of COVID-19 and might explain why we do not

consistently observe a relation between participants' perceptions of COVID-19 intensity and prejudice. It is possible that people would provide more accurate estimates of the number of COVID-19 cases now, since diagnostic testing has become more widespread in the United States (Tromberg et al., 2020), and information about COVID-19 is more readily available than during the early days of the pandemic (see e.g., Gordon et al., 2020; see <https://www.nytimes.com/interactive/2020/us/coronavirus-us-cases.html>). Examining whether estimates of actual and perceived COVID-19 intensity have become more highly correlated over the course of the pandemic, and whether they have begun to converge in predicting prejudice, would be a worthwhile direction for future research.

Our third hypothesis was that COVID-19 intensity would be more strongly linked to prejudice against Asian people than to prejudice against Black people. Overall, we observed that the perceived intensity of the COVID-19 outbreak tended to be associated with a greater desire to maintain social distance from both Asian and Black people. The relation between perceived intensity of COVID-19 and anti-Asian prejudice can be explained by considering both current cultural narratives—including attempts to tie the pandemic to Asian people via geographic origins of COVID-19 (Wu et al., 2020) and racist, anti-Asian language used to describe the pandemic (Zhou, 2020)—as well as theoretical frameworks focused on evolutionary responses to disease outbreak (e.g., Schaller & Neuberg, 2012; Schaller & Park, 2011). However, in contrast to the possibility that this period of disease outbreak would be associated specifically with anti-Asian prejudice, we found similar relations between COVID-19 intensity and anti-Black prejudice. This suggests that periods of disease outbreak might compel White Americans to distance themselves from any racial outgroup, and not only from the racial outgroup most closely tied to the disease in public discourse or via stereotypes about "foreignness." Increases in acts of anti-Black racism have been less well publicized in relation to the COVID-19

pandemic than increases in acts of anti-Asian racism; nonetheless, over the past year, both Black and Asian people reported experiences with racism and fear of physical attacks at similar rates, and at rates substantially higher than those reported by their White or Hispanic peers (Ruiz et al., 2020). Moreover, as described in more detail in the SM, we found no evidence that a desire for social distance from White people was related to perceived or actual COVID-19 intensity among our White American participants. This suggests that the intensity of disease outbreak is related specifically to prejudice toward racial outgroups, and not related to attitudes toward the racial ingroup.

Our fourth hypothesis was that White Americans' greater contact with Asian people would correspond with less anti-Asian prejudice even in the context of disease outbreak. In this way, our research speaks to and extends the literature on intergroup contact by testing whether contact with members of specific racial outgroups generalizes to lower prejudice toward those racial outgroups overall, in a manner that persists even during a period of disease outbreak. Replicating earlier work (see e.g., Tropp & Pettigrew, 2005), we found that greater contact was associated with less negative affect, and this pattern was consistent when examining links between contact and affect either in relation to Asian people or in relation to Black people. We also found some evidence that greater contact was associated with less desire for social distance (although, in relation to Asian people, this association was a nonsignificant trend). We suspect these trends emerged because participants' reported contact experiences with Asian or Black friends and acquaintances reflect preexisting cross-group relationships that developed over time (see Pettigrew, 1998), and well before the onset of the COVID-19 pandemic. Cross-group relationships that grow from repeated interactions over time typically correspond with lower levels of intergroup prejudice (see Pettigrew & Tropp, 2006, 2011).

At the same time, in line with work suggesting that larger neighborhood proportions of racial

outgroups can sometimes be threatening and have detrimental effects on White people's intergroup attitudes (e.g., Knowles & Tropp, 2018; Quillian, 1995), we found that larger neighborhood proportions of Black people were associated with more negative affect toward that population. However, we did not observe this relation when examining associations between neighborhood proportions of Asian people and affect toward that demographic sector. We suspect that these divergent trends correspond with differences in prevailing stereotypes of Black communities and Asian communities in the US, such that larger neighborhood proportions of Black residents tend to be associated with negative attitudes and perceptions of threat (Dixon, 2006) and crime among White Americans (Quillian & Pager, 2001; Taylor, 1998), whereas such negative attitudes tend not to be associated with larger neighborhood proportions of Asian residents (see Dixon, 2006; Oliver, 2010; Taylor, 1998).

Finally, our fifth hypothesis was that contact with Asian people would moderate relations between COVID-19 intensity and anti-Asian prejudice among White Americans. We found limited evidence for such moderation. It is worth noting that our sample was slightly underpowered to detect an interaction between COVID-19 intensity and contact. However, there was some suggestion that contact moderated the relation between actual COVID-19 intensity and support for anti-Asian travel policy: As the actual intensity of COVID-19 increased (assessed by official reports of COVID-19-related deaths), White Americans who reported greater levels of contact with Asian people reported being significantly less likely to support anti-Asian travel policies. Although we wish to be cautious in our interpretation of this moderation effect of contact, it is worth noting that the moderation we observed was in some ways a variation on what we originally predicted. We expected to observe a positive relation between COVID-19 intensity and support for anti-Asian travel policies among participants who reported less contact with Asian people—that as COVID-19 intensity increased, so too

would support for exclusionary policy. Given the strong endorsement of anti-Asian travel policy overall ( $M = 6.09$  out of 7; see Table 1), it would have been difficult for us to observe a significant relation between COVID-19 intensity and higher endorsement. Instead, we observed a negative relation between COVID-19 intensity and support for anti-Asian travel policies among participants who reported more contact with Asian people—that is, as COVID-19 intensity increased, support for exclusionary policy went down among participants with greater intergroup contact. While speculative, it is possible that greater contact with Asian people may have highlighted the unfair nature of anti-Asian exclusionary policies. When such anti-Asian travel policies were put into place, COVID-19 outbreaks in China were coming under control, while outbreaks in European countries were prevalent and rapidly growing (Bollyky & Nuzzo, 2020). As outbreaks of COVID-19 have unfortunately taken hold across a wide variety of countries that vary in their racial demographics, future work can explore whether prior intergroup contact might buffer people from their worst impulses and help them to evaluate exclusionary policies based on fact rather than fear of infection.

Another curious finding was the lack of a significant main effect of intergroup contact on less support for anti-Asian travel policy. This finding is somewhat unexpected given recent work from the UK showing that prior positive intergroup contact with Chinese people was associated with less support for anti-Chinese discriminatory policies among White British citizens during the COVID-19 pandemic (Alston et al., 2020). One possible reason for the difference in results concerns the particular measures used to assess support for discriminatory policies. In the UK context, a composite measure was used to assess support for a range of hypothetical discriminatory measures (e.g., "Enforce a quarantine of all Chinese nationals in the UK," "Close all Chinese restaurants"), whereas the present study used a single-item measure to assess support for an official US policy that had already been enacted. As noted before, it is also worth mentioning that, in

the present study, support for a China-specific travel ban was already quite high among our White American participants at this point in the pandemic; the restricted range in scores may have further limited our ability to observe links between variation in COVID-19 intensity and variation in support for exclusionary travel policies.

### *Limitations and Future Directions*

There are, of course, a number of factors that may limit the generalizability of our results and the conclusions that can be drawn from the present research. In particular, we note that our data are limited to responses from White, US citizens during a particular moment in the history of the COVID-19 pandemic. Many aspects of life in the United States have changed since the early days of the COVID-19 outbreak, when our data were collected—perhaps most notably, the intensity of the COVID-19 pandemic itself. At the time of data collection, approximately 23,000 Americans were reported to have died of COVID-19, with most of those deaths occurring in a few large cities (e.g., New York City, Los Angeles; see Kates et al., 2020). At the time of writing (August 2021), more than 617,000 Americans have died of COVID-19, with those deaths occurring across all 50 states, including in urban, suburban, and rural areas (see <https://www.nytimes.com/interactive/2020/us/coronavirus-us-cases.html>). We are inclined to believe that the research questions examined here would be as applicable now as they were early on in the pandemic, but future research should explore whether relations between intensity of disease outbreak and prejudice shift or remain consistent across the lifespan of pandemics, especially as people's exposure and proximity to disease changes. Additionally, given that we sampled a new group of participants every 3 days, the present research did not allow us to examine changes in contact and prejudice within participants over time. Recent work exploring the temporal nature of intergroup contact, threat, and prejudice has theorized that during heightened periods of threat, contact between

groups might decrease and thus prejudice may subsequently increase (Abrams & Eller, 2017). Likewise, it is possible that efforts to promote social distancing, such as stay-at-home recommendations, during the COVID-19 pandemic could have reduced or changed the quality and nature of intergroup contact.

Additionally, the present research is limited by its inability to speak directly to the roles of perceived threat or perceived foreignness of out-group members. Although previous work has clearly established that White Americans tend to perceive Asian people as foreign, and as more foreign than Black people (Devos & Banaji, 2005; Kim, 1999; Zou & Cheryan, 2017), we did not assess individual participants' perceptions of Asian or Black foreignness in this study. It would be useful to examine what happens when public discourse linking a disease threat to a particular group comes into conflict with one's own perceptions or stereotypes about who is "foreign." Understanding the relative contribution of both stereotypes and evolved heuristics to relations between disease outbreaks and prejudice is important for determining what types of interventions might most effectively reduce the extent to which disease foments prejudice.

Moreover, while it is plausible that people who estimated greater numbers of COVID-19 deaths or cases also perceived COVID-19 as posing a greater threat, we did not directly assess the extent to which participants perceived the COVID-19 pandemic as threatening. Emerging work suggests that people's perceptions of COVID-19 as threatening may be shaped by demographic characteristics such as age, gender, and race, as well as by factors that make chances of health complications associated with COVID-19 more likely (Niño et al., 2021). Choosing to study COVID-19 intensity rather than participants' feelings of risk or threat from COVID-19 might also partially explain why we did not find stronger relations between our measures of COVID-19 intensity and prejudice. However, while we recommend that future studies include more direct indicators of perceived threat, we nevertheless find it compelling that we observed links between

COVID-19 intensity and indicators of prejudice most closely tied to cross-group interaction and potential risk of infection (e.g., social distance, exclusionary travel policy), and not with respect to other prejudice indicators (e.g., negative affect). It is also noteworthy that we found similar patterns of results whether perceived intensity of COVID-19 was assessed via estimated cases or deaths. That we were able to replicate our results across both predictors suggests that we captured a meaningful underlying relation between disease threat and certain indicators of prejudice toward racial outgroups.

Although there is much more to be learned, this study of White Americans has shown that specific types of anti-Asian and anti-Black prejudice—and particularly those associated with minimizing the prospect of cross-group interaction—are related to disease intensity. By examining relations between prejudice, disease intensity, and intergroup contact during an unprecedented period of disease outbreak, this research usefully extends and integrates prior work from both evolutionary and social psychological frameworks. These findings have applied value, as intergroup relations are most likely to deteriorate during periods of threat and uncertainty (Fritzsche et al., 2011; Stephan et al., 2009), including periods of disease outbreak (see Schaller & Neuberg, 2012; Schaller & Park, 2011). As intense outbreaks continue across the globe and the emergence of new COVID-19 variants poses a continual threat (Stein, 2021), understanding how prejudice relates to the intensity of the COVID-19 outbreak, and especially people's estimates of the intensity of disease outbreak, remains quite relevant.

These findings also have theoretical value, in that studying relations between intergroup contact and prejudice during periods of disease outbreak can complement research conducted during periods of societal well-being and illuminate both the processes and boundary conditions under which contact may yield salutary effects (e.g., Rosenfeld et al., 2020). Like other forces driving societal instability (e.g., Doherty & Clayton, 2011; Tir & Diehl, 1998), global pandemics are likely to become more frequent in the

future (Jones et al., 2008), making clear the urgency of understanding how and when disease outbreaks may contribute to intergroup prejudice. Moreover, the present results reinforce the potential for intergroup contact to lessen prejudice, suggesting that programs, policies, and personal actions that encourage contact between groups are likely to have sustained benefits for intergroup relations, even during our most trying times.

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## Supplemental material

Supplemental material for this article is available online.

## Notes

1. As of the submission of this manuscript (August 10, 2021), an estimated 617,314 Americans have died due to the COVID-19 pandemic (see <https://www.nytimes.com/interactive/2020/us/coronavirus-us-cases.html>).
2. Given the rapidly changing situation around COVID-19 during this period of time, we initially conducted an analysis to examine whether date of testing (rather than official reports of or estimated COVID-19 numbers) might predict anti-Asian or anti-Black sentiment. We found no evidence on any measure of prejudice that this was the case, allowing us to rule out the potential explanation that anti-Asian or anti-Black sentiment increased over this time period in a way that was divorced from COVID-19. Model details and results can be found in full in the supplemental material.
3. The exclusions left our final data set slightly underpowered to detect moderation; we discuss this limitation further in the Discussion section.
4. Parallel measures were also used to assess prejudice toward White people to provide estimates of attitudes toward ingroup targets and allow

for tests of whether COVID-19 intensity is (a) uniquely related to anti-Asian prejudice, (b) related to prejudice toward any racial outgroup (Asian and Black people), or (c) whether it might relate to generalized prejudice toward racial ingroups and outgroups (Asian, Black, and White people). Because the primary focus of our manuscript is on relations between COVID-19 intensity and prejudice toward racial outgroups, we only describe indicators of prejudice toward Asian and Black people in the main text. All measures and analyses concerning potential links between COVID-19 intensity and attitudes toward White people can be found in the supplemental material.

5. Our original plan was to examine support for exclusionary policies using a composite variable comprising several questions, including “Do you think the amount of legal immigration from [Asian/African] countries to the United States should increase or decrease?”, “People from [Asia/Africa] should be quarantined before entering the US”, “People from [Asia/Africa] should engage in social isolation and social distancing when in the US”, as well as questions assessing participants’ endorsement of actual U.S. travel policies barring travel from China. However, initial analyses revealed that these questions did not cohere statistically to create reliable composite measures. However, the question assessing participants’ endorsement of actual US travel policies barring travel from China was comparable to questions about exclusionary policies used in previous work. Given the clear interpretability of this question, and because our theoretical framework makes clear predictions about how disease outbreak might affect support for exclusionary policies, we opted to explore that particular question in our analyses.

6. Although the study design and hypotheses have not changed since preregistration, in response to thoughtful suggestions offered during the peer review process, we adopted an analytical approach that deviated substantially from our preregistered analysis plan. In brief, our preregistered analytic plan proposed using two models to test our hypotheses: (a) repeated measures regression models where prejudice toward Asian, Black, and White targets was assessed as a function of COVID-19 intensity (for actual and perceived intensity, separately) to test Hypotheses 1, 2, and 3; and (b) multiple regression analyses where prejudice toward Asian targets was assessed as a function of COVID-19 intensity (actual and perceived, separately) and contact or exposure (Hypotheses 4 and 5). Given the extent to which our actual analyses differed from our planned analyses, we do not provide a more detailed report of the differences here, but our preregistrations (Hypotheses 1, 2, and 3: <https://osf.io/m46cv>; Hypotheses 4 and 5: <https://osf.io/jk7e5>), data, and analytic code are all publicly available on OSF (<https://osf.io/d27kc/>). In addition to the variables described in detail in this text, we have included an explanation of variables measured but not included in the main text as well as the raw data on OSF for anyone interested in exploring them.

7. As described in detail in the supplemental material, we also examined whether intensity of COVID-19 was related to prejudice toward White people, but we did not find any evidence of that relationship. That COVID-19 was related to some measures of outgroup prejudice but not to any measures of ingroup prejudice suggests that links between COVID-19 intensity and prejudice are specific to racial outgroups rather than generalized across all people.

8. In Tables 2 and 3, we used scientific notation (e.g.,  $x 10^{-4}$ ) where the ranges of the predictor and outcome variables are substantially different. Take, for example, the relation between perceived COVID-19 intensity (based on estimated number of deaths) and desire for social distance from Asian people. The range of the perceived COVID-19 intensity variable is 0–30,000, while the range of the social distance variable is 1–7. Thus, for every one-unit change in perceived intensity, we could only expect a tiny change in desire for social distance. However, despite the small absolute value of change, that change, as indicated by statistical tests, is still significantly related to COVID-19 intensity. When variables are more comparable in range (i.e., desire for social distance: 1–7, and contact: 0–20), we use standard notation instead.

9. We observed a nonsignificant trend where greater contact with Asian people was associated with a weaker desire for social distance from that population ( $p < .10$ ; see Table 2). This trend is consistent with literature on the beneficial effects of intergroup contact.

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