Dual pandemics? Assessing associations between area racism, COVID-19 case rates, and mental health among U.S. adults

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Abstract

Mental health worsened during the COVID-19 pandemic, especially among racially minoritized adults. Population-level racial attitudes, or area racism, may be associated with mental health, particularly during this historical moment, but this possibility has not been tested in prior research. In the present study, we use nationally representative data from the Household Pulse Survey (April-October 2020) to document associations between area racism and depression/anxiety in the United States among non-Hispanic Black, non-Hispanic Asian, Hispanic, non-Hispanic White, and other racial/ethnic minority adults. We further consider the national COVID-19 case rate to examine an additional macro-level stressor. Findings indicate that area racism was positively associated with depression and/or anxiety for Black, Hispanic, White, and other racial/ethnic minority adults. Moreover, COVID-19 cases posed an additional, independent mental health threat for most groups. This study points to area racism as a macro-level stressor and an antecedent of mental health for racially diverse groups of Americans.

Keywords

Racism; Stress; Mental health; COVID-19

The emergence of the COVID-19 pandemic marked a tumultuous historical period wherein myriad social and economic stressors contributed to a dramatic rise in depression and anxiety in the population (e.g., Czeisler et al., 2021; Zheng et al., 2021). Moreover, mental health worsened significantly among racially minoritized adults during this time (Thomeer et al., 2023), likely because of a disproportionate stress burden that included higher rates of COVID-19 infection and mortality (Andrasfay and Goldman, 2021; Garcia et al., 2021) alongside exposure to racially traumatic events (Laurencin and Walker, 2020). Although

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prior research documents the insidious effects of racism (e.g., Adkins-Jackson et al., 2022; Brown and Homan, 2022; Gee and Hicken, 2021; Williams, 2018), we know much less about how population-level racial attitudes in the United States, a measure we refer to as area racism, are associated with mental health. Even less is known about linkages between area racism and mental health during a unique period characterized by the co-occurrence of a pandemic and massive protests in response to racialized police brutality.

To address this gap in the literature, we use nationally representative data from the Household Pulse Survey (April-October 2020) to document associations between area racism and depression and anxiety in the United States. Area racism is a novel measure that could capture racial attitudes that people are unwilling to report in a survey and/or could correspond to a greater likelihood of experiences of interpersonal discrimination, whether known or unknown. In the present study, we measure area racism as the prevalence of internet searches in the United States containing the "n-word" in each week of the study period using data from Google Trends. Although this measure specifically captures anti-Black area racism, we use the phrase "area racism" throughout to align with the existing literature. To guide this study, we draw on theoretical frameworks of racial minority stress and the stress process model to theorize area racism as a stressor that undermines mental health, especially for minoritized adults. We consider linkages between area racism and mental health for non-Hispanic Black, non-Hispanic Asian, Hispanic, non-Hispanic White, and other racial/ethnic minority adults. We also merge data on the national COVID-19 case rate in each week to understand the role of an additional racialized stressor during the pandemic. In doing so, we assess the extent to which area racism and COVID-19 case rates jointly operate as macro-level stressors to influence the mental health of racially diverse groups of Americans.

The present study extends prior literature on racism and mental health by considering a novel macro-level measure of racism-related stress exposure: area racism. Although prior research documents the adverse effects of area racism for depression among Black adults (Isoya and Yamada, 2021), area racism may also spill over to affect the mental health of other racial/ethnic groups – a possibility that has not been tested in prior research. Moreover, we consider area racism alongside COVID-19 case rates, which likely represented an additional stress exposure that disproportionately burdened racially minoritized individuals (Andrasfay and Goldman, 2021; Garcia et al., 2021). The present study informs public health by documenting an antecedent of mental health during a mental health crisis in the United States. Findings may also inform screenings and interventions in future instances marked by high levels of area racism.

1. Background

As the COVID-19 pandemic unfolded in the United States in early 2020, so too did a mental health crisis. In April-June 2020, rates of depression and anxiety were about three times higher than a similar period in 2019 (Czeisler et al., 2021; Ettman et al., 2020). Many factors likely contributed to these mental health challenges such as loneliness, concerns about one's health and the health of loved ones, and economic strain from lost wages (e.g., Donnelly and Farina, 2021; Zheng et al., 2021). However, recent research finds that mental health

outcomes did not change similarly for all racial/ethnic groups; in fact, the mental health of Black, Hispanic, and Asian adults worsened relative to non-Hispanic White adults during the COVID-19 pandemic (Thomeer et al., 2023). Exposure to racialized stressors may have contributed to these stark racial inequities in mental health, yet prior research has not tested this possibility. In the present study, we aim to understand how area racism, a macro-level stressor, influenced the mental health of communities of color during the co-occurrence of a pandemic and massive protests in response to racial injustices.

Indeed, this study examines the consequences of area racism for mental health in the United States from April to October of 2020. The summer of 2020 ushered in a unique historical moment characterized by increased awareness to and advocacy surrounding racial injustices in the United States. Following the murder of George Floyd in May 2020, millions of Americans participated in protests across the United States (Buchanan et al., 2020; Parker et al., 2020). However, these protests were sometimes met with counter-protests, car rammings at demonstrations, and other forms of violence (Chaudhary and Richardson, 2022; Kaske et al., 2021). Moreover, racial hate crimes increased in 2020 relative to 2019 for Black Americans (Department of Justice, 2021). As such, these violent responses to protests for racial justice signal that the United States may have experienced heightened levels of racism at the population level during this time. We hypothesize, then, that area racism will provide a proxy for racial attitudes in the United States, with likely consequences for the mental health of racially minoritized individuals.

The stress process model offers a useful framework for theorizing about inequities in mental health by race/ethnicity. Indeed, the stress process model explicates how exposure to stress launches myriad re-actions that undermine mental health and well-being (Pearlin et al., 1981). The stress process model also posits that stress is most likely to impinge upon individuals with less power and privilege in society, and that the unequal distribution of stress contributes to inequities in mental health (Pearlin et al., 2005). Although individuals can draw upon resources (e.g., socioeconomic, psychosocial) to buffer against the impact of mental health, the stress process model emphasizes that these resources are also unequally distributed in the population. In line with this model, prior research documents considerable racial inequity in stress exposure during the pandemic. For example, communities of color experienced higher rates of COVID-19 infection and mortality (Chatters et al., 2020; Do and Frank, 2021; Garcia et al., 2021; Siegel et al., 2022), resulting in a reduction in life expectancy at birth that was about 2.5 times larger for non-Hispanic Black adults and Hispanic adults relative to non-Hispanic White adults in 2020 (Andrasfay and Goldman, 2021). The unequal effect of COVID-19 cases and mortality could be a source of stress, as individuals may be more likely to worry about their own health and the health of their loved ones. Racially minoritized adults also experienced a disproportionate burden of unemployment and income loss during the early months of the pandemic (Acs and Karpman, 2020; Donnelly et al., 2022; Moen et al., 2020), which can launch a stress process that undermines well-being and can reduce access to resources (e.g., income) that could be used to buffer stress.

In addition to the stress process model, racial minority stress theory situates racism as a root cause of mental and physical health inequities (Clark et al., 1999; Harrell, 2000;

Williams, 2018). Racism can occur at the interpersonal level (e.g., discrimination) to the institutional level (e. g., residential segregation) and has far-reaching effects on the health and well-being of racially minoritized individuals (e.g., Gee and Hicken, 2021; Krieger, 2020; Williams, 2018; Williams and Mohammed, 2013). In the context of the pandemic, historical and contemporary forms of racism place Black and Hispanic adults at heightened risk of COVID-19 infection and mortality (Garcia et al., 2021; Laster Pirtle, 2020). Moreover, racism underlies the unequal exposure to possible sources of stress during the pandemic, including unemployment and increased racial discrimination (e.g., Moen et al., 2020; Strassle et al., 2022). As an example of the confluence of racialized stressors during this time, a recent study found that race-related stress (i.e., anticipation of unfair treatment by medical professionals) in combination with perceiving COVID-19 as a threat to one's health was associated with elevated psychological distress among Black Americans (Cobb et al., 2021). Taken together, the pandemic offers numerous examples of racial inequity in stress exposure that likely contributed to unequal rates of mental health challenges during the COVID-19 pandemic.

Although race-based stress exposures at the individual level are salient and consequential, racism can also manifest on a broader scale. That is, an examination of interpersonal racism often focuses on experiences of everyday discrimination (e.g., being treated with less courtesy and respect than others) or major discrimination (e.g., not being hired for a job) (e.g., Essed, 1991; Williams et al., 1997; Williams et al., 2019). Area racism, on the other hand, can capture general racial animus in a specific location and time period. In this way, area racism is different from, although likely related to, interpersonal racism because it can capture the prevalence or concentration of racial prejudice in a time and place. For instance, variation over time in the severity of area racism in the United States could point to ebbs and flows in the intensity of racial animus in the population. Indeed, population-level racial animus could lead to more instances of interpersonal discrimination, but it could also help fuel a system that advantages one racialized group over others. For example, an undercurrent of racial prejudice could influence policies and procedures that inform zoning laws, lending practices, policing procedures, and funding for public education in ways that impinge upon marginalized communities and privilege White communities. Taken together, area racism could point to racism that exists in the population regardless of individual perception of it.

Area racism aims to measure population-level characteristics of racism by harnessing Internet search data, most often using data from Google Trends. Measuring racism in this way has several benefits. For instance, Internet search data may be more sensitive to racist attitudes and beliefs that would go unreported in survey data. Area racism may also tap into more covert forms of racism that would be harder to identify in survey or administrative data. That is, individuals may be unaware that they have been discriminated against in certain situations, but these experiences could be more likely to occur during periods when racism is most salient at the population level. Thus, using Internet search data to measure area racism may provide information about racism in the population that complements measures of racism based on survey or administrative data. We note, however, that despite the benefits of area racism as a measure, it is not a panacea for the measurement of racism. For instance, racism is complex and multifaceted, and area racism is unable to measure entire systems of racism, such as the policies and practices that exist in institutions and

impinge upon marginalized communities (Adkins-Jackson et al., 2022; Brown and Homan, 2022) and the routine behaviors that uphold racial hierarchy (Bonilla-Silva, 2021).

Nonetheless, emerging research documents the consequences of area racism for health and well-being (Michaels et al., 2022). For example, higher levels of area racism are associated with worse birth outcomes (Chae et al., 2018), greater risk of mortality (Chae et al., 2015; Leitner et al., 2016), and higher rates of depression (Isoya and Yamada, 2021) among Black adults. These effects likely exist because area racism increases exposure to racism-related stressors, which erode health and well-being. Similarly, prior research documents that racially traumatic events can spillover to affect the health of Black individuals. For example, highly public anti-Black violence is associated with higher odds of preterm birth (Curtis et al., 2022) and more poor mental health days (Curtis et al., 2021) for Black Americans. Moreover, Thomeer and colleagues (2023) show that symptoms of depression and anxiety spiked after the murder of George Floyd by police for Black adults, but not for White, Hispanic, or Asian adults. Area racism and racially traumatic events likely mark periods of high stress, which, in turn, take a toll on mental and physical health for Black adults. While prior research has used Internet search data to consider how highly public anti-Black violence undermines mental health (Curtis et al., 2021), we provide new knowledge by examining the consequences of fluctuations in area racism in the United States regardless of specific racially traumatic events. Moreover, we contribute to the literature on area racism by examining possible consequences of area racism for White and other racially minoritized adults, especially during this unique historical moment.

Although the measure of area racism is specific to anti-Black racism, there are several reasons to suspect that periods of increased anti-Black area racism may impact the mental health of other racial/ethnic groups. For instance, area racism could signify an increased threat against other non-White individuals, with ramifications for mental health. This is especially likely as Hispanic and Asian communities experienced additional racialized stressors in 2020. Indeed, evidence suggests that Asian individuals experienced a surge in racially motivated hate crimes and discrimination (Gover et al., 2020; Strassle et al. 2022; Tessler et al., 2020; Zhou et al., 2021) as the pandemic exacerbated existing prejudices and reawakened historically rooted nativist sentiments against Asian Americans. Moreover, Hispanic adults experienced high rates of COVID-19-related discrimination (Strassle et al. 2022), perhaps because the pandemic intensified resentment against all racially minoritized individuals in the United States. At the same time, Hispanic individuals encountered a political environment characterized by anti-immigrant policies and anti-Hispanic political rhetoric, to the detriment of mental health (Diaz McConnell et al., 2023). Asian and Hispanic individuals, therefore, may also experience heightened rates of depression and anxiety when anti-Black area racism is more prevalent in the population.

At the same time that demonstrations for racial justice unfolded across the country in the summer of 2020, cases of COVID-19 continued to rise and stark racial/ethnic inequities in the effects of COVID-19 emerged. Black and Hispanic Americans, for instance, experienced a disproportionate burden of infection and mortality due to COVID-19 (Chatters et al., 2020; Do and Frank, 2021; Garcia et al., 2021; Siegel et al., 2022). Racial/ethnic inequities in COVID-19 infection and mortality began to garner national attention in Spring (2020) when

journalists and local public health officials started to report on statistics pieced together from various cities and states. Not until June 2020 did the Trump administration issue reporting requirements stating that public health departments and the Centers for Disease Control and Prevention should report cases and deaths by race/ethnicity beginning in August 2020 (Krieger et al., 2020). While communities of color likely noticed the burden of COVID-19 in their networks, this national media attention pushed the inequity to the forefront. In sum, inequities in exposure to COVID-19, and knowledge of such inequities, likely served as an additional stressor that impinged upon racially minoritized individuals. We examine, then, how COVID-19 case rates and area racism jointly operate as macro-level stressors that influence mental health.

In the present study, we consider linkages between U.S.-level area racism and mental health from April to October 2020. Using a large, nationally representative dataset, we ask the following research questions: 1) Is area racism in the United States associated with depression and anxiety for non-Hispanic Black, non-Hispanic Asian, Hispanic, non-Hispanic White, and other racial/ethnic minority adults? 2) Is the national COVID-19 case rate associated with depression and anxiety for non-Hispanic Black, non-Hispanic Asian, Hispanic, non-Hispanic White, and other racial/ethnic minority adults? 3) Do area racism and COVID-19 case rates jointly shape experiences of depression and anxiety? Because of the national nature of these protests and counter-protests, we consider area racism at the national level rather than a smaller geographic level like the state. We contribute to the literature in at least three ways. First, we extend past studies of area racism by documenting the consequences for mental health – an outcome that has received little attention in prior research – and by considering the effects for racially minoritized individuals, including Black, Asian, Hispanic, and other racial/ethnic minority groups. This attention to other racial/ethnic groups helps to document the insidious effects of racism beyond Black Americans. Second, we consider the role of both national area racism and national COVID-19 case rates to demonstrate the consequences of two crises that unfolded at the same time. Finally, we make a theoretical contribution by drawing attention to the role of macro-level stress exposures as determinants of individual-level mental health outcomes.

2. Methods

2.1. Data and sample

We use nationally representative data from the Household Pulse Survey, a repeated cross-sectional survey administered by the U.S. Census Bureau and other federal agencies during the COVID-19 pandemic. The Household Pulse Survey uses a probability design, relying on the Census' Master Address File to select a very large sample. The goal of the Household Pulse Survey is to document the social and economic effects of the pandemic on households. As part of these efforts, the survey consistently and frequently collects data on mental health outcomes (described below), making it the ideal dataset for the present study. The survey is administered online, and data collection began with weekly cross-sectional surveys from April 23, 2020 to July 21, 2020. Data collection then turned to a biweekly cross-sectional schedule beginning on August 19, 2020 and continuing into the present (at the time of publication). In the initial data collection period, households could remain in the sample for

up to three weekly interviews; however, this design was not carried forward. As such, we only use the first interview for the few respondents who completed more than one survey.

Because the present study focuses on the confluence of protests for racial justice in the summer of 2020 and the unfolding of the COVID-19 pandemic, we use data from the first 17 waves of the Household Pulse Survey, spanning April 23, 2020 to October 26, 2020. To examine the role of racism and COVID-19 cases on mental health during this time, we merge national data on area-level racism and COVID-19 case rates (detailed below) with the Household Pulse Survey based on the week of data collection. We exclude respondents with missing data on the dependent variables, resulting in an analytic sample of n=1,195,391 individuals for analyses of depression and n=1,196,286 individuals for analyses of anxiety.

2.2. Measures

Depression and anxiety are the two dependent variables. Depression was measured using a validated version of the two-item Patient Health Questionnaire (PHQ-2; Gilbody et al., 2007) and anxiety was measured using a validated version of the two-item Generalized Anxiety Disorder scale (GAD-2; Kroenke et al., 2007). Depression was assessed by asking respondents how often in the past seven days they had been bothered by 1) having little interest or pleasure in doing things and 2) feeling down, depressed, or hopeless. Anxiety was assessed by asking respondents how often in the past seven days they had been bothered by 1) feeling nervous, anxious, or on edge and 2) not being able to stop or control worrying. Response options for each question were: not at all (0), several days (1), more than half the days (2), and nearly every day (3). Each of the scale's two items were added together (range 0–6). Based on prior research (Gilbody et al., 2007; Kroenke et al., 2003; Kroenke et al., 2007), we classified scores of three or more on the PHQ-2 as indicative of depressive disorder and, similarly, a score of three or more on the GAD-2 as indicative of anxiety disorder.

In descriptive analyses below, we examine population-level estimates of depression and anxiety in each week. To do so, we aggregate data within each racial/ethnic group by week to represent the average percentage of adults with depression or anxiety in each week among each racial/ethnic population.

Area racism was assessed using Internet query data from Google Trends. Google Trends provides users with information on the proportion of Internet searches containing a specific word for a given location and time period. In this study, we focus on Internet searches within the United States for each week of the survey (spanning April 23-October 26, 2020). Consistent with prior research (Chae et al. 2015, 2018), the present study assesses area racism using Internet search queries containing the "n-word" in each survey week. While other search terms may be indicative of racism, we focus on searches using the "n-word" because it is clearly a pejorative term, and this approach aligns with prior studies of area racism. Search terms for other racially minoritized groups have not been validated and, therefore, are beyond the scope of the present study, although we note this as an important avenue for future research below. Values from Google Trends are normalized such that a value of 100 represents the highest share of total searches including the specific term over the specified time. In our dataset, the measure of area racism ranges from 27 to 84. We

merge the score on area racism in each week of the survey into the Household Pulse Survey data. In the present study, we standardize the measure of area racism.

Scholars note that Google Trends is a valid tool for social science research (e.g., Stephens-Davidowitz and Varian, 2014). Indeed, Internet search data can be beneficial to measure population-level trends and characteristics; for example, prior research uses these data for mental health and suicide surveillance (Bruckner et al., 2014). Moreover, prior research points to the validity of using Google Trends data to assess racial animus via Internet searches containing the "n-word" (e.g., Chae et al., 2015; Stephens-Davidowitz, 2014). For instance, Chae et al. (2015) note the validity of this measure by finding correlations between area racism and explicit measures of racial attitudes from the General Social Survey.

We also consider the role of the COVID-19 case rate in each week of the study period. Data on the 7-day average number of COVID-19 cases come from the *New York Times*. In the present study, we convert the 7-day average number of cases into a weekly COVID-19 case rate such that values indicate the number of cases per 100,000 people. During the study period, the COVID-19 case rate ranged from 6.28 to 19.06 cases per 100,000 individuals. We merge these data on the weekly COVID-19 case rates into the Household Pulse Survey data. Although COVID-19 cases have varied regionally throughout the pandemic, we examine COVID-19 cases at the national level because in these early months of the pandemic (April-October 2020), rising COVID-19 cases were likely a stressor across the United States as so much remained unknown about the virus. Put differently, the uncertainty surrounding the pandemic likely resulted in COVID-19 case rates serving as a macro-level stressor for many Americans.

We include sociodemographic control variables that may be associated with area racism and mental health. Models account for age (in years), gender (1=female), and educational attainment (less than high school diploma, high school diploma or Associate's degree (reference), Bachelor's degree, graduate degree). Race/ethnicity is central to this study, and we present results separately for non-Hispanic Black, non-Hispanic Asian, Hispanic, non-Hispanic White, and other racial/ethnic minority adults.

2.3. Analytic strategy

Analyses are presented in two main steps. The first set of analyses comprise a descriptive analysis of population-level trends in depression and anxiety. That is, we aggregate individual cases of depression/anxiety to examine the average percentage of adults in the United States with depression/anxiety in each week. With this approach, the unit of analysis is the week, resulting in 17 observations (i.e., weeks). We first present trends in mean levels of area racism, COVID-19 case rates, and depression/anxiety across each week to demonstrate how the focal variables fluctuate over time. We then harness linear regression models as an additional descriptive test to regress the average percentage of adults depressed in each week (i.e., a continuous measure) on weekly area racism and weekly COVID-19 case rates. Analyses are race-stratified and comprise three models for each racial/ethnic group. The first model includes the measure of area racism, the second model includes COVID-19 case rates, and the third model jointly includes area racism and COVID-19 cases. We replicate this approach using the average percentage of adults with anxiety in each week.

This analysis provides a population-level approach to understanding descriptive linkages between area racism, COVID-19 cases, and mental health outcomes.

The second set of analyses, the focal analyses for this study, focus on individual-level mental health outcomes. This approach allows us to test predictors of individual-level log-odds of depression/anxiety. We take a similar approach as above, wherein analyses are race-stratified and include three models. Models progressively include area racism and COVID-19 case rates before jointly including both variables together in a final model. Logistic regression models predict the log-odds of depression and anxiety (i.e., dichotomous measures) among respondents. Models include sociodemographic covariates, apply sampling weights, and account for clustering within weeks by using a Huber-White clustered standard error calculation.

In all analyses, we lag area racism by one week to align with the measures of depression and anxiety which ask about symptoms in the past seven days. We do not lag the COVID-19 case rate since it assesses the previous 7-day average of cases and thus aligns with the timing of mental health symptoms.

3. Results

3.1. Descriptive results

Table 1 presents the weighted descriptive results for the analytic sample stratified by race/ethnicity. Two-tailed t-tests compare descriptive results across race/ethnicity. Table 1 shows that Non-Hispanic Black, Hispanic, and other racial/ethnic minority adults had the highest prevalence of depression and anxiety, whereas non-Hispanic Asian and non-Hispanic White adults had the lowest prevalence. Table 1 also shows that, compared to non-Hispanic White adults, non-Hispanic Black, non-Hispanic Asian, Hispanic, and adults reporting another race/ethnicity had lower levels of educational attainment and were slightly younger. The average score for area racism during the study was about 42 (range 0–100), and average COVID-19 case rates throughout the study period were approximately 11 cases per 100,000 people. Because measures were assessed at the U.S. population level, small differences in these exposures by race/ethnicity in Table 1 reflect weekly variation in sample composition.

3.2. Descriptive results: Population-level mental health results

Turning to the analysis of population-level mental health outcomes, Fig. 1 plots the average percentage of adults in each racial/ethnic group who are classified as having symptoms of depression (Panel A) or anxiety (Panel B) in each week of the survey in the United States. For instance, 25% of Black adults in the sample were classified as having symptoms of depression in week 1 (April 23, 2020). For each data point, the denominator is the number of respondents of that racial/ethnic group in the study in that specific week. We point to three key findings from this figure. First, Fig. 1 shows that, in every week, a greater percentage of non-Hispanic Black, Hispanic, and other racial/ethnic minority adults experienced symptoms indicative of depression (Panel A) and anxiety (Panel B) compared to non-Hispanic White and non-Hispanic Asian adults. Second, Fig. 1 shows that the percentage of adults with depression or anxiety generally increased from the start of the

study until week 12 (mid-July 2020) before declining. Finally, while all adults experienced a spike in depression and anxiety around week 12, trends of depression and anxiety differed somewhat by race/ethnicity throughout the study period, suggesting heterogeneity in mental health experiences over time.

In addition to an examination of trends in mental health outcomes over time, we plot trends in area racism and COVID-19 case rates across survey week in Fig. 2. Fig. 2 shows a sharp increase in area racism throughout the first half of the study period, with a peak around week 8 (mid-June 2020), followed by a general decline throughout the remainder of the study period. At the same time, COVID-19 case rates increased rapidly from Week 7 (June 11, 2020) until Week 12 (July 16, 2020), then declined for several weeks before an increase in the final weeks of the observation period (late October 2020).

To better understand linkages between area racism, COVID-19 cases, and mental health at the population level, we examine the average percentage of adults with depression (Table 2) and anxiety (Table 3) in each week regressed on weekly measures of area racism and COVID-19 case rates. Results are race-stratified, thereby examining the average percentage of Black adults with depression/anxiety relative to Black adults without depression/anxiety, and so on for each racial/ethnic group. This approach shifts the unit of analysis from the individual to the week, resulting in 17 observations (i.e., weeks). Table 2 shows that area racism is positively associated with depression for non-Hispanic Black (Model 1), non-Hispanic Asian (Model 4), Hispanic (Model 7), and non-Hispanic White (Model 10) adults such that weeks with higher values of area racism are associated with weeks with a higher percentage of adults with depression. For example, for Black and Asian adults, a one standard deviation increase in area racism is associated with about a one percentage point increase in the percentage of Black and Asian adults with depression. Weekly COVID-19 cases are positively associated with depression for Hispanic (Model 8) and non-Hispanic White (Model 11) adults. These patterns hold when area racism and COVID-19 cases are both included in the model.

Results are generally the same when examining the percentage of adults with anxiety (Table 3), with the exception that area racism and COVID-19 cases are both positively associated with anxiety for adults reporting another race/ethnicity. The r-squared values in Tables 2 and 3 further show that area racism explains a significant amount of variation in mental health outcomes for Black and Asian adults, whereas COVID-19 cases are more salient for the mental health of White adults. Area racism and COVID-19 cases both explain considerable variation in mental health for Hispanic adults.

3.3. Individual-level mental health results

We next turn to our focal analyses examining whether area racism and COVID-19 cases are associated with individual-level mental health outcomes, net of sociodemographic covariates. Starting with depression, Table 4 shows that area racism is positively associated with the log-odds of depression for non-Hispanic Black (Model 1), non-Hispanic White (Model 10), and other racial/ethnic minority adults (Model 13), net of covariates. For instance, a one standard deviation increase in weekly area racism is associated with 4% greater odds of depression among non-Hispanic Black adults (coef: 0.04; p<.05). We note

that, while not statistically significant, the coefficient for non-Hispanic Asian adults is similar in magnitude to non-Hispanic Black and other racial/ethnic minority adults.

Results in Table 4 also show that COVID-19 cases are positively associated with depression for Hispanic (Model 8), non-Hispanic White (Model 11), and other racial/ethnic minority adults (Model 14). The association between COVID-19 cases and depression is marginally significant for non-Hispanic Black adults (Model 2) and we note that the magnitude of the coefficient is similar to the coefficients for Hispanic, non-Hispanic White, and other racial/ethnic minority adults. The pattern of results holds when area racism and COVID-19 cases are jointly included in the third model. Thus, the effects of racism and COVID-19 cases are independent for non-Hispanic Black, non-Hispanic White, and other racial/ethnic minority adults, resulting in a double disadvantage for mental health. For Hispanic adults, COVID-19 cases pose the main threat to mental health.

When examining anxiety, Table 5 shows that area racism is positively associated with the log-odds of anxiety for non-Hispanic Black (Model 1), Hispanic (Model 7), non-Hispanic White (Model 10), and other racial/ethnic minority adults (Model 13), net of covariates. Again, the coefficient for Asian adults is similar in magnitude to Black and other racial/ethnic minority adults, but not statistically significant. The COVID-19 case rate is statistically significant for non-Hispanic White adults only (Model 11), although the magnitude of the coefficient is similar across all other racial/ethnic populations (with the exception of non-Hispanic Black adults). Overall, Tables 4 and 5 show that area racism is associated with worse mental health for almost all racial/ethnic groups (with the exception of Asian adults) and the COVID-19 case rate represented an additional, independent factor contributing to worse mental health for many of the racial/ethnic groups examined in the study.

4. Discussion

Mental health worsened significantly in the population at the onset of the COVID-19 pandemic in the United States, especially for racially minoritized adults (Czeisler et al., 2021; Thomeer et al., 2023; Zheng et al., 2021). Exposure to racialized stressors likely contributed to worse mental health outcomes among racially diverse groups of Americans, but this possibility has not been tested in prior research. Using nationally representative data from the Household Pulse Survey from April to October 2020, we provide new insight into how area racism and COVID-19 cases posed a dual threat that weakened the mental health of Americans. We contribute to the literature on area racism and mental health more broadly by considering the effects of area racism on mental health for Black Americans, as well as possible spillover effects for Asian, Hispanic, White, and other racial/ethnic minority individuals. We highlight two key themes from the present study.

First, we situate area racism as a determinant of mental health for a racially diverse group of Americans. Indeed, area racism was positively associated with depression and/or anxiety for non-Hispanic Black, Hispanic, non-Hispanic White, and other racial/ethnic minority adults. This finding builds on prior research documenting how area racism undermines the mental health, physical health, and mortality risk of Black Americans (Chae et al., 2015,

2018; Isoya and Yamada, 2021; Leitner et al., 2016). Yet we extend this prior research by showing that area racism undermines the mental health of Black Americans and spills over to affect the mental health of other populations, too. The present study, then, provides evidence that area racism is an important measure of racism that has adverse consequences for mental health. Indeed, area racism likely operates in concert with other forms of racism that undermine mental health. Periods of heightened levels of area racism, for instance, may correspond to a greater likelihood of exposure to interpersonal discrimination and may help to fuel policies and procedures that impinge upon racially minoritized groups. Given that racism is dynamic and operates at multiple levels (e.g., institutional, individual), area racism co-exists with and is mutually reinforced by structural racism. Thus, future research can benefit from examining how area racism coalesces with structural measures of racism to, in turn, impact psychological well-being for racialized groups in the United States.

While key mechanisms linking area racism and mental health were not tested in the present study, we hypothesize that periods of high levels of area racism may result in more exposure to myriad forms of discrimination or bias (observed or unobserved), which, in turn, takes a toll on mental health. Even if direct exposure to racism does not occur, the public outcry against and media coverage of several high-profile murders of Black men and women during this time period (e.g., George Floyd, Breonna Taylor) likely incited hypervigilance among racially minoritized populations (Alang et al., 2022). Hypervigilance is characterized by psychological arousal brought on by monitoring, responding to, and trying to insulate one's self from potential threats of discrimination (Williams, 2018), which could contribute to symptoms of depression and anxiety. Relatedly, another mechanism potentially linking area racism to mental health is anticipatory race-related stress. As area racism increases, individuals from historically marginalized racial groups may anticipate being discriminated against – a psychological state that is associated with prolonged activation of physiological stress responses (Utsey et al., 2013). In essence, future research should aim to understand the mechanisms underlying linkages between area racism and mental health for racially minoritized people.

Importantly, we found that area racism was associated with mental health for adults classified as having another racial/ethnic identity. Future research should examine the heterogenous group of individuals that are included in the "other" racial/ethnic subgroup in this study. For instance, adults in this population could include Indigenous adults as well as multiracial adults who may have unique experiences of stress and discrimination during this time. Though the "other" group consists of a heterogenous group of people, the powerful influence of area racism on mental health may be a manifestation of how racial "othering" de-lineates any non-White person from Whiteness (Song, 2020). That is, all non-White people may reckon with their minoritized and disadvantaged social status even when another minoritized group's (e.g., Black lives) plight is in focus.

Interestingly, we also found that area racism was associated with mental health outcomes for non-Hispanic White adults. This aligns with prior research documenting the adverse effects of community- or state-level racial prejudice for the self-rated health (McKetta et al., 2017) and mortality risk (Lee et al., 2015) of White adults. In the present study, one possibility is that this finding is specific to the unique historical moment characterized by

the study period. Indeed, a diverse group of millions of Americans participated in protests in the summer of 2020 (Buchanan et al., 2020; Parker et al., 2020), creating a heightened sense of racial awareness. Support for Black Lives Matter soared in June 2020, including among White adults, although support among White Americans was already waning by September 2020 (Thomas and Juliana Menasce, 2020). Nonetheless, this (temporary) spike in support may have made some White Americans more aware of and vulnerable to the co-occurring spike in area racism. On the other hand, another possibility is that White Americans could have experienced distress because the ubiquity of protests during this period was perceived as challenging the existing racial hierarchy which positions Whites at the apex (Bonilla--Silva, 2004). As such, some White Americans could have felt particularly vulnerable during this period of racial upheaval because it had the potential to threaten their group's advantaged position (Blumer, 1958; Bonilla-Silva, 2021). Future research should examine whether the association between area racism and mental health among White adults existed prior to 2020, whether it will persist in the coming years, and what race-specific mechanisms link area racism to mental health. Findings could reflect and inform a blended stress and life course perspective (e.g., Pearlin et al., 2005) by situating stressful experiences within historical time.

In the present study, area racism was not predictive of mental health for Asian respondents. Given the magnitude of the coefficients in these models, one possibility is that the lack of statistical significance is primarily due to the smaller sample size of Asian adults. Another possibility is that the mental health of Asian adults may be more influenced by other forms of racism that were specific to the anti-Asian and xenophobic prejudice that spiked during the initial months of the COVID-19 pandemic. Indeed, Asian individuals experienced a surge in hate crimes and discrimination (Gover et al., 2020; Strassle et al., 2022; Tessler et al., 2020) as public discourse reawakened and exacerbated existing prejudices toward Asian Americans. Thus, Internet search queries using terms other than the "n-word" may be better indicators of area racism toward Asian individuals and produce different results – an avenue for future research.

The second theme concerns the dual threat of area racism and COVID-19 cases for mental health. Indeed, prior research documents that Black and Hispanic Americans experienced higher rates of COVID-19 infection and mortality (Chatters et al., 2020; Do and Frank, 2021; Garcia et al., 2021; Siegel et al., 2022), which may serve as a source of stress as individuals worry about their own health and the health of others in their family and community. Results from the present study confirmed that higher COVID-19 case rates were associated with higher odds of depression for almost all adults in the sample. Moreover, we find evidence of independent effects of racism and unequal exposure to COVID-19 on mental health for non-Hispanic Black, non-Hispanic White, and other racial/ethnic minority adults. For Hispanic adults, COVID-19 cases were associated with depression, whereas area racism was associated with anxiety, representing a dual threat across mental health outcomes. These findings, then, generally confirm the existence of what Laurencin and Walker (2020) referred to as a "pandemic on a pandemic," wherein racism and racially traumatic events occurred alongside the COVID-19 pandemic. The present study points to the threat of macro-level stressors (i.e., area racism, COVID-19 cases) for mental health.

While this study provides new and important insight into the consequences of area racism, limitations should be noted. First, the present study does not incorporate a causal design when assessing area racism and mental health. For instance, we are unable to examine within person changes in mental health in response to changes in area racism during the study period. Second, while area racism may be interconnected with interpersonal discrimination, we do not have the ability to also measure direct exposure to interpersonal discrimination or racial bias. That is, the Household Pulse Survey does not ask about experiences of major and/or everyday discrimination, which could add additional nuance to the findings. We also cannot evaluate respondents' assessment of how stressful they find certain events or experiences. Because Black and Hispanic adults may appraise stressful exposures differently than White adults (Brown et al., 2020), we lack information that could illuminate race-specific pathways linking area racism and COVID-19 cases to mental health. Finally, the Household Pulse Survey does not collect data on nativity status, which precludes an analysis of mental health at the intersection of race/ethnicity and nativity, despite evidence of significant differences in mental health by immigrant status (Erving and Smith, 2022; Sternthal et al., 2011).

4.1. Conclusion

The present study provides evidence of the pernicious consequences of area racism for mental health during the unique historical period from April to October 2020. We add to prior research on area racism to document the implications for mental health for a racially diverse group of adults. Our findings further speak to the dual threat of area racism and COVID-19 cases during this time – a "pandemic on a pandemic" (Laurencin and Walker, 2020). Overall, we draw attention to the insidious effects of racism, including area racism and the unequal burden of COVID-19 cases and deaths among racially minoritized adults (Chatters et al., 2020; Do and Frank, 2021; Garcia et al., 2021; Siegel et al., 2022). Findings point to the need to monitor area racism, to identify those affected by area racism, and to work to eliminate racism in general. Alongside the fight to eliminate racism, policymakers should work to ameliorate the consequences of area racism. For instance, a prudent goal would be to increase mental health care access and utilization and to monitor mental health parity requirements of health insurance plans. Moreover, states should expand eligibility for Medicaid to ensure that more people have access to care. At the same time, mental health care providers often lack the training and expertise needed to help racially minoritized clients process and cope with racism. Incorporating cultural humility and race-conscious training into the ongoing educational certifications of providers could foster a therapeutic environment in which members of historically disadvantaged racial groups can disclose and process experiences of racism. These recommendations offer a starting point to help individuals cope with racism, but much work is needed to eliminate racial inequities in mental health.

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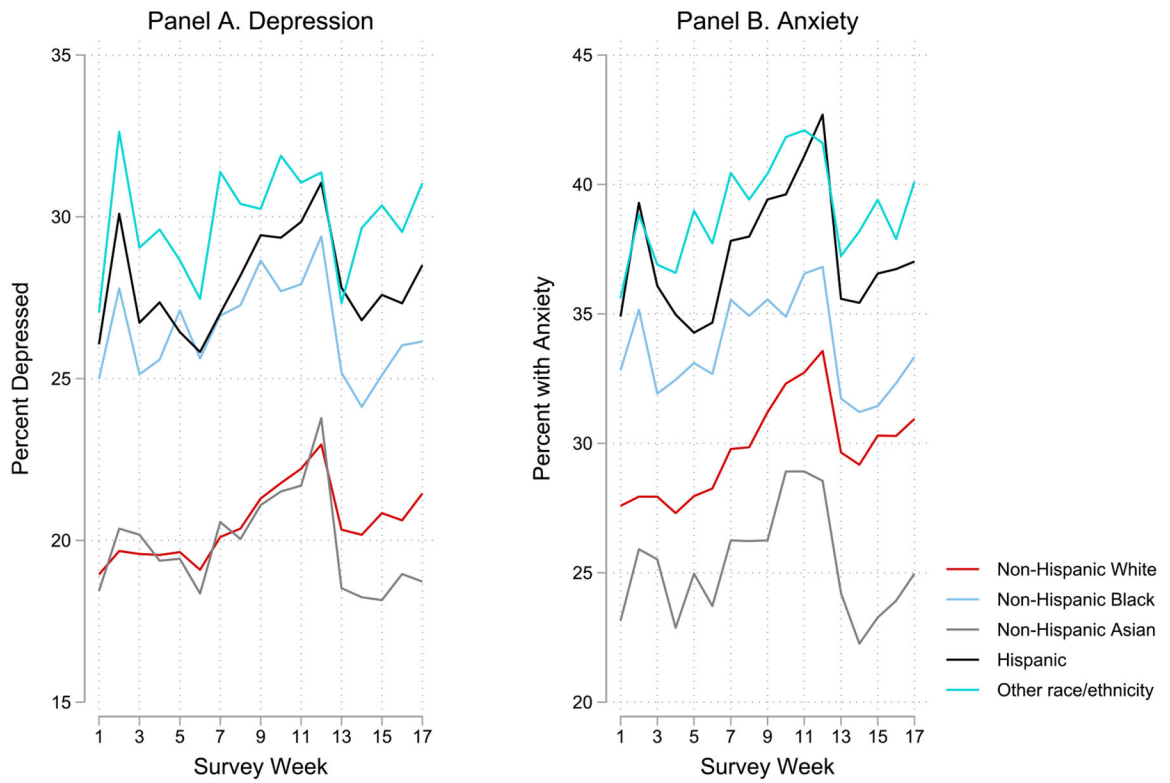
Fig. 1.
Percentage of respondents with symptoms of depression (Panel A) and anxiety (Panel B) by survey week and race/ethnicity (Household Pulse Survey; April-October 2020).
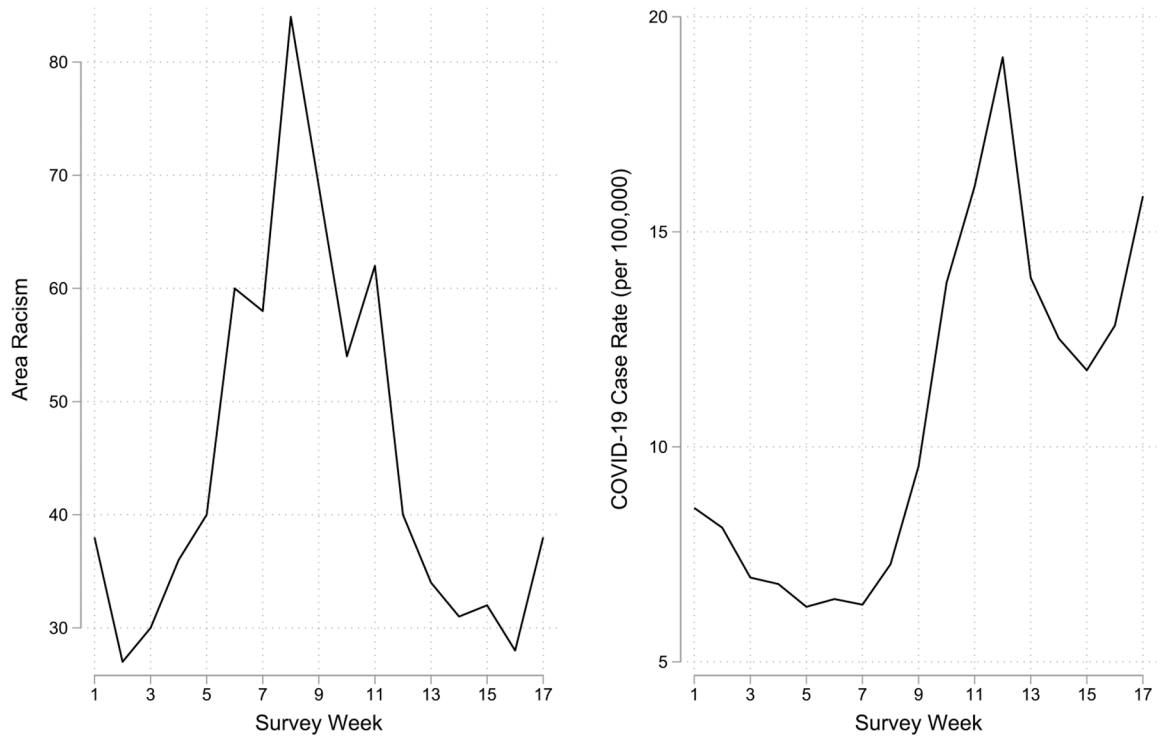
Fig. 2.
Area racism and COVID-19 case rate by survey week (Household Pulse Survey; April-October 2020).

Table 1

Weighted descriptive results for the analytic sample by race/ethnicity (Household Pulse Survey, April-October 2020).

	Non-Hispanic Black		Non-Hispanic Asian		Hispanic		Non-Hispanic White		"Other" race/ethnicity	
	Mean or %	(St. Dev.)	Mean or %	(St. Dev.)	Mean or %	(St. Dev.)	Mean or %	(St. Dev.)	Mean or %	(St. Dev.)
Depression	28.71[bcde]		22.78[acde]		30.20[abde]		24.25[abce]		32.94[abcd]	
Anxiety	34.00[bcde]		27.09[acde]		36.97[abde]		32.38[abce]		41.29[abcd]	
Weekly Area Racism	43.24[bde]	(15.60)	42.07[acde]	(14.99)	43.03[bde]	(15.42)	41.57[abce]	(14.58)	42.03[abcd]	(15.12)
Weekly COVID-19 Case Rate	11.13[de]	(3.72)	11.2[cd]	(3.65)	11.08[bde]	(3.72)	11.36[abe]	(3.58)	11.08[ad]	(3.70)
Age	45.60[bcde]	(15.27)	43.82[acde]	(15.70)	42.20[abde]	(15.70)	49.30[abce]	(17.58)	42.20[abcd]	(16.25)
Female	55.34[bcd]		49.65[ade]		49.46[ade]		51.24[abce]		56.08[bcd]	
Less than high school	9.68[bc]		8.76[acd]		21.50[abde]		4.79[bce]		8.61[cd]	
High School/Some college	68.45[bcde]		38.63[acde]		61.99[abe]		62.13[abe]		66.55[abcd]	
Bachelor's degree	11.90[bcde]		27.16[acde]		10.28[abde]		18.82[abcd]		14.73[abce]	
Graduate degree	9.97[bcd]		25.46[acde]		6.23[abde]		14.25[abce]		10.11[bcd]	
Unweighted N	89,246		54,031		104,930		903,352		43,832	

Note.

[a] statistically different from non-Hispanic Black at $p<.05$.

[b] statistically different from non-Hispanic Asian at $p<.05$.

[c] statistically different from Hispanic at $p<.05$.

[d] statistically different from non-Hispanic White at $p<.05$.

[e] statistically different from non-Hispanic "other" race/ethnicity at $p<.05$.

Table 2

Average percentage of adults with symptoms of depression regressed on weekly area racism and COVID-19 case rates (Household Pulse Survey, April-October 2020; n=17 weeks).

	Non-Hispanic Black			Non-Hispanic Asian			Hispanic		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Weekly Area Racism	1.06 ***		1.03 ***	1.02 **		0.96 **	0.79 *		0.67 *
	(0.24)		(0.25)	(0.28)		(0.27)	(0.32)		(0.25)
Weekly COVID-19 Case Rate		0.10	0.06		0.14	0.10		0.23 **	0.21 **
		(0.09)	(0.06)		(0.09)	(0.07)		(0.08)	(0.07)
Constant	26.42 ***	25.49 ***	25.81 ***	19.76 ***	18.37 ***	18.67 ***	27.90 ***	25.46 ***	25.68 ***
	(0.25)	(1.03)	(0.72)	(0.28)	(1.04)	(0.79)	(0.32)	(0.87)	(0.74)
R-squared	0.56	0.07	0.58	0.47	0.13	0.54	0.29	0.39	0.59

	Non-Hispanic White			"Other" race/ethnicity		
	Model 10	Model 11	Model 12	Model 13	Model 14	Model 15
Weekly Area Racism	0.55 *		0.43 **	0.57		0.52
	(0.24)		(0.11)	(0.38)		(0.38)
Weekly COVID-19 Case Rate		0.23 ***	0.22 ***		0.12	0.10
		(0.04)	(0.03)		(0.10)	(0.10)
Constant	20.46 ***	18.00 ***	18.14 ***	29.87 ***	28.62 ***	28.79 ***
	(0.24)	(0.43)	(0.31)	(0.38)	(1.12)	(1.10)
R-squared	0.26	0.72	0.87	0.14	0.09	0.20

Note. Analyses use aggregated data from *n*=1,195,391 individuals; Standard errors in parentheses;

*** $p<0.001$,

** $p<0.01$,

* $p<0.05$,

+ $p<0.10$.

Table 3

Average percentage of adults with symptoms of anxiety regressed on weekly area racism and COVID-19 case rates (Household Pulse Survey, April-October 2020; n=17 weeks).

	Non-Hispanic Black			Non-Hispanic Asian			Hispanic		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Weekly Area Racism	1.35***		1.32***	1.38**		1.29**	1.56**		1.39**
	(0.29)		(0.30)	(0.38)		(0.36)	(0.45)		(0.36)
Weekly COVID-19 Case Rate		0.11	0.06		0.20	0.15		0.35*	0.29**
		(0.11)	(0.08)		(0.12)	(0.09)		(0.13)	(0.09)
Constant	33.56***	32.49***	32.91***	25.17***	23.12***	23.53***	37.17***	33.60***	34.04***
	(0.30)	(1.29)	(0.88)	(0.38)	(1.39)	(1.05)	(0.46)	(1.44)	(1.04)
R-squared	0.58	0.06	0.60	0.47	0.16	0.56	0.44	0.34	0.68

	Non-Hispanic White			"Other" race/ethnicity		
	Model 10	Model 11	Model 12	Model 13	Model 14	Model 15
Weekly Area Racism	1.09*		0.89***	1.19**		1.08**
	(0.38)		(0.16)	(0.36)		(0.31)
Weekly COVID-19 Case Rate		0.38***	0.34***		0.24*	0.20*
		(0.07)	(0.04)		(0.10)	(0.08)
Constant	29.72***	25.75***	26.04***	38.91***	36.39***	36.74***
	(0.38)	(0.80)	(0.46)	(0.37)	(1.18)	(0.91)
R-squared	0.36	0.66	0.90	0.42	0.27	0.61

Note. Analyses use aggregated data from n=1,196,286 individuals; Standard errors in parentheses;

***
p<0.001,

**
p<0.01,

*
p<0.05,

+
p<0.10.

Table 4

Logistic regression models regressing depression on weekly area racism and COVID-19 case rates (Household Pulse Survey; *n*=1,195,391).

	Non-Hispanic Black (*n*=89,246)			Non-Hispanic Asian (*n*=54,031)			Hispanic (*n*=104,930)		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Weekly area racism	0.04 *		0.04 **	0.05		0.05	−0.00		−0.00
	(0.02)		(0.01)	(0.04)		(0.03)	(0.02)		(0.01)
Weekly COVID-19 case rate		0.01 +	0.01 +		0.00	0.00		0.01 **	0.01 **
		(0.01)	(0.00)		(0.01)	(0.01)		(0.00)	(0.00)
Age	−0.02 ***	−0.02 ***	−0.02 ***	−0.02 ***	−0.02 ***	−0.02 ***	−0.01 ***	−0.01 ***	−0.01 ***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Female	0.17 ***	0.17 ***	0.17 ***	0.17 ***	0.17 ***	0.17 ***	0.22 ***	0.21 ***	0.21 ***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Less than high school (ref: HS/some college)	0.35 ***	0.36 ***	0.35 ***	−0.03	−0.03	−0.03	−0.01	−0.00	−0.00
	(0.07)	(0.07)	(0.07)	(0.15)	(0.15)	(0.15)	(0.05)	(0.05)	(0.05)
Bachelor's degree (ref: HS/some college)	−0.36 ***	−0.36 ***	−0.36 ***	−0.30 ***	−0.30 ***	−0.30 ***	−0.26 ***	−0.26 ***	−0.26 ***
	(0.03)	(0.03)	(0.03)	(0.05)	(0.05)	(0.05)	(0.03)	(0.03)	(0.03)
Graduate degree (ref: HS/some college)	−0.53 ***	−0.53 ***	−0.53 ***	−0.68 ***	−0.68 ***	−0.68 ***	−0.43 ***	−0.43 ***	−0.43 ***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.06)	(0.06)	(0.06)
Constant	−0.19 **	−0.29 ***	−0.29 ***	−0.40 ***	−0.45 *	−0.45 *	−0.56 ***	−0.68 ***	−0.68 ***
	(0.06)	(0.08)	(0.08)	(0.12)	(0.19)	(0.18)	(0.09)	(0.08)	(0.08)

	Non-Hispanic White (*n*=903,352)			"Other" race/ethnicity (*n*=43,832)		
	Model 10	Model 11	Model 12	Model 13	Model 14	Model 15
Weekly area racism	0.03 *		0.03 ***	0.05 *		0.05 **
	(0.01)		(0.01)	(0.02)		(0.02)
Weekly COVID-19 case rate		0.01 ***	0.01 ***		0.01 *	0.01 +
		(0.00)	(0.00)		(0.01)	(0.01)
Age	−0.02 ***	−0.02 ***	−0.02 ***	−0.02 ***	−0.02 ***	−0.02 ***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Female	0.26 ***	0.26 ***	0.26 ***	0.14 ***	0.14 ***	0.14 ***

| | Non-Hispanic White (n=903,352) | | | "Other" race/ethnicity (n=43,832) | | |
	Model 10	Model 11	Model 12	Model 13	Model 14	Model 15
	(0.01)	(0.01)	(0.01)	(0.03)	(0.03)	(0.03)
Less than high school (ref: HS/some college)	0.47 ***	0.47 ***	0.47 ***	0.40 **	0.40 **	0.40 **
	(0.04)	(0.04)	(0.04)	(0.13)	(0.13)	(0.13)
Bachelor's degree (ref: HS/some college)	−0.46 ***	−0.46 ***	−0.46 ***	−0.39 ***	−0.39 ***	−0.39 ***
	(0.02)	(0.02)	(0.02)	(0.05)	(0.05)	(0.05)
Graduate degree (ref: HS/some college)	−0.65 ***	−0.65 ***	−0.65 ***	−0.60 ***	−0.61 ***	−0.61 ***
	(0.02)	(0.02)	(0.02)	(0.06)	(0.06)	(0.06)
Constant	−0.08 *	−0.20 ***	−0.21 ***	−0.06	−0.19+	−0.19+
	(0.03)	(0.06)	(0.05)	(0.07)	(0.10)	(0.10)

Note. Robust standard errors in parentheses;

***
p<0.001,

**
p<0.01,

*
p<0.05,

+
p<0.10.

Table 5

Logistic regression models regressing anxiety on weekly area racism and COVID-19 case rates (Household Pulse Survey; n=1,196,286).

	Non-Hispanic Black (n=89,322)			Non-Hispanic Asian (n=54,120)			Hispanic (n=105,077)		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Weekly area racism	0.06 **	0.06 **	0.06 **	0.07		0.07 +	0.04 *		0.04 **
	(0.02)	(0.02)	(0.02)	(0.04)		(0.04)	(0.02)		(0.01)
Weekly COVID-19 case rate		0.00	0.00		0.01	0.01		0.01	0.01
		(0.01)	(0.00)		(0.01)	(0.01)		(0.01)	(0.01)
Age	−0.01 ***	−0.01 ***	−0.01 ***	−0.01 ***	−0.01 ***	−0.01 ***	−0.01 ***	−0.01 ***	−0.01 ***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Female	0.31 ***	0.31 ***	0.31 ***	0.37 ***	0.37 ***	0.37 ***	0.34 ***	0.34 ***	0.34 ***
	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)	(0.02)	(0.02)	(0.02)
Less than high school (ref: HS/some college)	0.24 ***	0.24 ***	0.24 ***	0.08	0.08	0.08	−0.06	−0.06	−0.06
	(0.07)	(0.07)	(0.07)	(0.11)	(0.11)	(0.11)	(0.04)	(0.04)	(0.04)
Bachelor's degree (ref: HS/some college)	−0.15 ***	−0.15 ***	−0.15 ***	−0.12 *	−0.13 **	−0.12 **	−0.04	−0.04	−0.04
	(0.03)	(0.03)	(0.03)	(0.05)	(0.05)	(0.05)	(0.03)	(0.03)	(0.03)
Graduate degree (ref: HS/some college)	−0.19 ***	−0.19 ***	−0.19 ***	−0.40 ***	−0.40 ***	−0.40 ***	−0.09 *	−0.09 **	−0.09 *
	(0.02)	(0.02)	(0.02)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Constant	−0.20 ***	−0.24 **	−0.25 ***	−0.61 ***	−0.71 ***	−0.71 ***	−0.40 ***	−0.48 ***	−0.48 ***
	(0.06)	(0.09)	(0.07)	(0.11)	(0.16)	(0.15)	(0.07)	(0.10)	(0.09)

	Non-Hispanic White (n=903,907)			"Other" race/ethnicity (n=43,860)		
	Model 10	Model 11	Model 12	Model 13	Model 14	Model 15
Weekly area racism	0.05 **	0.05 ***	0.05 ***	0.06 **		0.06 ***
	(0.02)	(0.01)	(0.01)	(0.02)		(0.02)
Weekly COVID-19 case rate		0.01 **	0.01 ***		0.01	0.01 +
		(0.00)	(0.00)		(0.01)	(0.01)
Age	−0.03 ***	−0.03 ***	−0.03 ***	−0.01 ***	−0.01 ***	−0.01 ***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Female	0.48 ***	0.48 ***	0.48 ***	0.39 ***	0.39 ***	0.39 ***

	Non-Hispanic White (*n*=903,907)			"Other" race/ethnicity (*n*=43,860)		
	Model 10	Model 11	Model 12	Model 13	Model 14	Model 15
	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
Less than high school (ref: HS/some college)	0.36 ***	0.36 ***	0.36 ***	0.47 ***	0.48 ***	0.48 ***
	(0.04)	(0.04)	(0.04)	(0.13)	(0.13)	(0.13)
Bachelor's degree (ref: HS/some college)	−0.21 ***	−0.21 ***	−0.21 ***	−0.15 ***	−0.16 ***	−0.15 ***
	(0.02)	(0.02)	(0.02)	(0.04)	(0.04)	(0.04)
Graduate degree (ref: HS/some college)	−0.23 ***	−0.24 ***	−0.24 ***	−0.19 **	−0.19 **	−0.19 **
	(0.02)	(0.02)	(0.02)	(0.06)	(0.07)	(0.07)
Constant	0.26 ***	0.12 +	0.12 *	0.02	−0.08	−0.08
	(0.03)	(0.07)	(0.05)	(0.09)	(0.09)	(0.08)

Note. Robust standard errors in parentheses;

***
p<0.001,

**
p<0.01,

*
p<0.05,

+
p<0.10.