

THE RELATIONSHIP BETWEEN SYSTEMIC RACISM, RESIDENTIAL SEGREGATION, AND RACIAL/ETHNIC DISPARITIES IN COVID-19 DEATHS IN THE UNITED STATES

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Introduction: Although Black Americans are not substantially more likely to be diagnosed with COVID-19, hospitalization rates and death rates are considerably higher than for White Americans. The aim of this study was to assess the relationship between systemic racism generally, and residential segregation in particular, and racial/ethnic disparities in deaths due to COVID-19.

Methods: To assess racial disparities in COVID-19 and systemic racism in US states, we calculated descriptive statistics and bivariate Pearson correlations. Using data on deaths through December 2020, we developed a weighted logistic mixed model to assess whether state-level systemic racism generally and residential segregation, in particular, predicted the probability of COVID-19 deaths among Americans, considering key sociodemographic factors.

Results: Residential segregation is a stronger predictor of COVID-19 deaths among Black Americans, as compared to systemic racism more generally. Looking at the interaction between residential segregation and COVID-19 death rates by race, residential segregation is associated with negative outcomes for Black and White Americans, but disproportionately impacts Black state residents ($P < .001$), who have 2.14 times higher odds of dying from COVID-19 when residential segregation is increased.

Conclusion: To understand and address disparities in infectious disease, researchers and public health practitioners should acknowledge how different forms of systemic racism shape health outcomes in the United States. More attention should be given to the mechanisms by which infectious disease pandemics exacerbate health disparities in areas of high residential segregation and should inform more targeted health policies. Such policy changes stand to make

INTRODUCTION

The COVID-19 pandemic has brought increased attention to disparities in health outcomes and life expectancy by race in the United States. Although Black Americans are not substantially more likely to be diagnosed with COVID-19, hospitalization rates are 2.9 times higher and death rates are 1.9 times higher for Black Americans compared to their White counterparts.¹ These racial disparities also extend to Black children with higher rates of infection and death.² Researchers point to a variety of social factors such as socioeconomic status (SES), racial discrimination, health care access, and exposure to high risk occupations as possible explanations for COVID-19 disparities.^{3,4} Given what we know about the nature of persistent racial health dis-

parities in the United States, examining social determinants of health, including racial discrimination, can help us understand differential health outcomes in COVID-19 as well as broader patterns of health and illness.

Although COVID-19 has brought attention to racial health disparities, health inequalities are not new, but reflect a consistent trend in the United States. Black Americans have higher rates of all-cause mortality⁵ and have higher rates of premature death due to specific diseases. Black Americans are 30% more likely to die from cardiovascular disease and have twice the odds of dying of stroke than White Americans.^{6,7} Infant mortality, a telling indicator of overall public health, is more than twice as high among Black Americans and this disparity is considerably greater in some US communities.⁸ Life ex-

all American communities more resilient in the face of new and emerging infectious diseases. *Ethn Dis.* 2022;32(1):31-38; doi:10.18865/ed.32.1.31

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pectancy too is unequal with White Americans, who live more than three years longer on average than their Black counterparts.⁹ This gap also varies greatly across different settings in the United States, with evidence of racial differences in life expectancy by as much as 25 years in some cities.¹⁰

There is compelling evidence that a broad range of social determinants of health, rather than genetic differences, shape these persistent and troubling trends in racial health disparities. These findings are so consistent that researchers have begun using the catch phrase, “zip codes, not genetic codes,” to emphasize the pow-

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erful influence of the social environment in shaping health outcomes.¹¹ For example, longitudinal studies like the Coronary Artery Risk Development in Young Adults (CARDIA) study have demonstrated that exposure to certain social factors, such as residential segregation are linked with racial disparities in health.¹² Although social factors such as access to health care, economic resources, and education are important in determining health outcomes for all races, these

factors are disproportionately likely to serve as barriers in communities where Black Americans live and work suggesting that specific types of racism can help explain persistent racial/ethnic disparities in health.¹³

Although most Americans associate racism with overt, old-fashioned racial discrimination that occurs at the individual level, racism takes many forms, all of which relate to racial/ethnic health disparities. One specific type of racism hypothesized to impact racial/ethnic COVID-19 disparities is systemic racism. Systemic racism is defined as macro-level, covert, institutional justifications, and policies that maintain White people’s social dominance.^{14,15} Examples include racial inequality that currently exists within criminal justice, education, employment, and other systems that are upheld by institutional policies and procedures that exist to preserve the racial hierarchy. The systemic racism perspective provides an important macro-level framework for understanding prejudice and discrimination, especially because White people benefit from the invisibility of systemic racism. That is to say that in addition to negative outcomes resulting from individual-level discrimination, such as those occurring in health care settings, racism that results in poorer educational, economic, and legal outcomes also contributes to poorer health outcomes for Black Americans and is easier for White Americans to ignore since they do not share the same experiences when interacting with similar institutions.¹⁶ As one example, researchers have focused on the education gap in which Black and White Americans gradu-

ate from college at different rates. Known commonly as the achievement gap, British scholars have advocated using the term, awarding gap, to indicate the powerful role that institutional policies and practices, applied differently to individuals of different racial groups, play in shaping education outcomes regardless of individual characteristics.¹⁷

One explanation for why systemic racism translates to poor health outcomes is that living in environments shaped by unequal opportunity creates chronic stress that impairs health. In fact, a growing body of research has shown that exposure to racism produces physiological effects similar to other types of traumatic stress, including potential impairment of the prefrontal cortex.¹⁸ Other research has demonstrated that exposure to racism during adolescence is associated with increased cortisol levels as adults, independent of known confounders and particularly for Black persons.¹⁹ Still other researchers have demonstrated a connection between racism, red blood cell oxidative stress (stress that damages cellular components including DNA and is implicated in insulin resistance, hypertension, and cognitive aging).²⁰ In 2019, Williams and colleagues reviewed research demonstrating links between racism and health, noting how systemic racism, such as segregation, negatively impacts the health of minority groups.²¹

Despite growing evidence that racial discrimination is an important determinant of racial/ethnic health disparities in the United States, there is limited evidence available to link COVID-19 disparities specifically to systemic racism in the

broader social environment. The aim of this study, accordingly, was to assess the relationship between state-level systemic racism and disparities in COVID-19 deaths. We anticipate that high levels of systemic racism in general, and residential segregation as one example, will be associated with COVID-19-related mortality among Black Americans.

METHODS

Data

Data for this research come from multiple sources. Data on COVID-19 cases and deaths come from the Kaiser Family Foundation as part of their COVID Tracking Project and COVID Racial Data Tracker.²² They extracted data from state websites that reflect deaths and cases as of December 2, 2020. State health and demographic characteristics come from the US Census Bureau, the Pew Forum, and America's Health Rankings.^{23,24} A validated systemic racism index and individual indicators come from a published study on the impact of residential segregation in the United States.²⁵ These data were collected between 2012-2015 and there is existing evidence to suggest that levels of racial disadvantage are very stable over time.²⁶

Measures

Our dependent variable measures the per capita death rates, or the probability of dying, among Black and White Americans. We control for the total number of COVID-19 cases in the state, as well a variety of state-level demographic factors, in-

cluding the percent of residents in a state with a high school diploma by race, the percent of residents who are unemployed by race, the percent of residents who are uninsured by race, and the median age by race.

In addition to demographic factors, our focal independent variables include a systemic racism index of various measures for different dimensions of systemic racism: education, incarceration, economic outcomes, unemployment, and segregation. Individual measures include the ratio of Black and White incarceration rates and the ratio of Black and White residents without college degrees in a state. To measure the economic gap, three indicators are used that assess the ratio of Black and White state residents who live under the poverty line, live in rental housing, and the ratio of Black relative to White median income. The employment gap includes two indicators measuring the ratio between Black and White residents who are out of the labor force and who are unemployed. Also included in the systemic racism index is a measure of residential segregation in each state; the measure is composed of two indicators measuring the dissimilarity index and isolation index in each state. Using US Census data, the dissimilarity index measures the percentage of Black residents who would have to move to achieve an equal geospatial distribution of Black and White residents within a state and the isolation index measures the probability that a Black resident does not share a block with a White person or member of a different race. More complete information on the systemic racism index and

variable coding can be found in Mesic and colleagues' original publication.²⁵

Because not all states provided race/ethnicity data for COVID-19 cases and deaths, we omitted these states from the study. In total, 47 states and 88 total observations were included in the analytic model. We had fewer total observations since some states, presumably because of low racial diversity, did not report racial death data for Black Americans.

Statistical Analysis

To assess racial disparities in COVID-19 and systemic racism in US states, we first calculated descriptive statistics and bivariate Pearson correlations. We then developed a weighted logistic mixed model to assess whether systemic racism, generally, and residential segregation specifically, in a state predicted the probability of COVID-19 deaths among Americans, taking into account the other demographic factors. In other words, our models try to control for differences between the states as well as differences in demographic factors to isolate the association between death rates in a state and systemic racism. In this model, we accounted for differences between states by a mixed effect, in particular that the probability of dying in each state is normally distributed with mean zero and fixed variance. By analyzing the probability of COVID-19 deaths separately for Black and White Americans, we attempt to separate demographic factors, difference between states, and systemic racism from any inherent differences in death rates between racial groups. Data are weighted by the

Table 1. Descriptive statistics for states

Variable	N	Mean	SD
% Black deaths	47	16%	15%
% White deaths	50	66%	22%
% with HS education- White	51	89%	4%
% with HS education- Black	51	78%	6%
% Unemployed - White	51	4%	1%
% Unemployed - Black	46	8%	2%
% Uninsured - White	51	8%	3%
% Uninsured - Black	42	11%	4%
Median age, yrs - White	51	43	3.23
Median age, yrs - Black	51	32	3.53
Segregation index	50	58.17	11.70
Racism index	50	46.39	11.05

population of each racial group within a state. To allow the mixed model to converge, variables were analyzed on a standard normal scale, with the mean US state for each variable given a value of zero, and the standard deviation of the variable among the states being 1. Figures presented for odds ratios are on this scale, so the odds ratio presents the increased odds of dying when each variable is one standard deviation above the mean.

RESULTS

The average per capita COVID-19 death rate nationally during this period was 85.5 per 100,000 residents.

Looking across states, we find that the death rate varied considerably by race with 102.1 of every 100,000 Black residents dying of COVID-19 and 73.1 of every 100,000 White residents dying of COVID-19. Figure 1 demonstrates the racial death disparities by state. Levels of systemic racism were moderate on average but varied considerably across states (mean = 46.39; SD = 11.05). The most common forms of systemic racism across all states were the education gap (mean = 52.90; SD = 21.49) and the segregation index (mean = 58.17; SD = 11.70). The median age between Black (mean = 32 yrs) and White (mean = 43 yrs) Americans varied substantially. Black

Americans were also overrepresented among individuals who were unemployed, uninsured, and without a high school degree (Table 1).

Bivariate correlations reveal that the racism index is positively and significantly correlated with the percentage of deaths among Americans ($r=.448$; $P<.001$) and that a higher unemployment rate for Americans in a state is associated with a higher percentage of deaths among Americans ($r=.391$; $P<.001$) (Table 2).

Regression results (Table 3) report odds ratios for covariates and the percentage of race-specific deaths after adjusting for the systemic racism index at the state level. Based on a post-hoc analysis of the systemic racism index, we found that a single item from this index, residential segregation, was a stronger predictor of deaths than the composite measure. In a second model, accordingly, we assessed the relationship between covariates and the percentage of race-specific deaths adjusting only for the measure of residential segregation.

Model 1, which examines the association between covariates, the racism index, and the percentage of race-specific deaths among residents, demonstrates that residents of states with higher levels of systemic racism have significantly higher odds (OR:1.43; 95% CI: 1.39-1.47) of dying from COVID-19. All demographic covariates are also significant predictors of COVID-19 deaths. As the percentage of high school graduates by race increases, the odds of dying from COVID-19 decrease (OR:.74; 95%CI:.73-.76), as uninsured rates increase by race (OR:.88; 95%CI:.85-.90) the odds of dying

Table 2. Bivariate correlations for study variables

Variable	1	2	3	4	5
1 % Deaths					
2 % Uninsured	-.098				
3 % with HS education	-.112	-.284 ^a			
4 % Unemployed	.391 ^b	.301 ^a	-.622 ^b		
5 Median age, yrs	-.033	-.434 ^b	.666 ^b	-.563 ^b	
6 Racism index	.448 ^b	-.311 ^a	.030	.112	.014

a. $P<.01$.

b. $P<.001$.

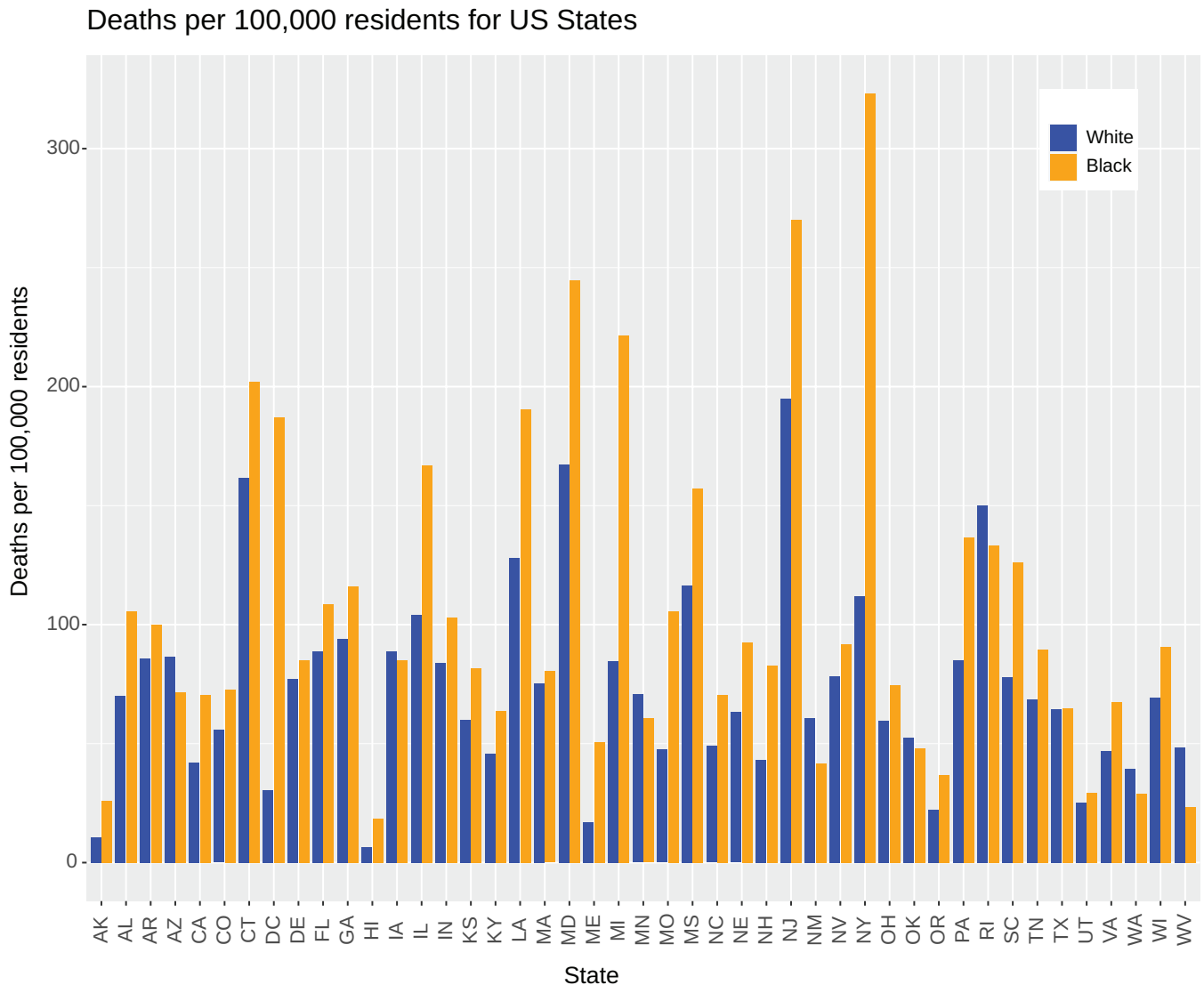


Figure 1. Racial death disparities by state

from COVID-19 also decrease. Similarly, as the percentage unemployed by race increases, the odds of dying from COVID-19 are lower. (OR: .95; 95%CI: .93-.97). When the median age of residents in a state is higher, the odds of dying from COVID-19 also increase (OR: 1.43; 95%CI: 1.39-1.47).

In Model 2, we focus specifically on the relationship between residen-

tial segregation and the odds of dying from COVID-19. Again, we find that in states with greater residential segregation, White residents have significantly higher odds of dying (OR: 1.63; 95%CI: 1.41-1.90). Importantly, Black residents have 1.5 times odds of dying, even after taking into account systemic racism and other demographic factors. Looking

at the interaction between residential segregation and COVID-19 death rates by race, we also find that residential segregation has a disproportionately negative impact on Black compared to White state residents ($P < .001$). Although residential segregation is also a significant predictor of White deaths, the odds of dying in a state that is one standard

Table 3. Mixed logistic regression results

Variable	Model 1			Model 2		
	OR	95% CI		OR	95% CI	
Median age	1.431	1.391	1.471	1.214	1.177	1.252
% with HS education	.747	.734	.761	.785	.771	.800
% Unemployed	.948	.928	.967	.886	.867	.905
% Uninsured	.875	.848	.903	.862	.835	.891
Racism index	1.351	1.109	1.645			
Segregation index				1.632	1.406	1.895
Race=Black	2.029	1.917	2.147	1.494	1.403	1.591
Segregation index x race=Black				1.310	1.282	1.339

deviation above the mean in levels of residential segregation are 1.63 times higher for White Americans and 2.14 times higher for Black Americans.

DISCUSSION

The aim of this study was to assess whether systemic racism, measured at the state level, is associated with racial disparities in deaths due to COVID-19. Our analyses reaffirm existing reports that Black Americans have had a higher probability of dying due to COVID-19 despite having a much lower median age, one of the strongest risk factors for severe COVID-19 infection and death.²⁷ As health disparities researchers have proposed numerous social factors that likely shape inequality in both morbidity and mortality in the United States, we tested whether systemic racism in particular is associated with deaths due to COVID-19. Although many explanations of health disparities have focused on social inequality more generally,²⁸ emphasizing a social gradient that exists across the socioeconomic spectrum,²⁹ our study provides further support that systemic

racism is independently related to patterns of poor health, including in the context of the COVID-19 pandemic.

Our findings reveal that while indicators of SES are significantly associated with COVID-19 death disparities, systemic racism, and residential segregation in particular, are critical factors to consider. Importantly, we find that even after controlling for variation between states and various socioeconomic and demographic factors, racism remains an important predictor of disparities in COVID-19 deaths. This lends further support to studies that show that different forms of racism are operative in shaping health disparities in the United States. Although we did not include measures of the extent to which cultural racism or overt racial discrimination exist in a state, our findings reaffirm the relationship between systemic racism in general along with specific forms of systemic racism and negative health outcomes.

Past studies have demonstrated that residential segregation shapes social and economic opportunities, exposure to environmental contaminants and chronic stressors, and poor housing quality—all of

which are associated with deleterious health effects.³⁰ In fact, some researchers consider it to be a fundamental cause of health disparities insofar as it impacts socioeconomic status and by extension both health care access, utilization, and health behaviors.^{31,32} Further supporting the importance of residential segregation for understanding racial/ethnic health disparities, a recent study found a clear gradient linking increasing levels of Black-White segregation to disparities across the life course.³³

In the context of the COVID-19 pandemic, it is plausible that residential segregation further exacerbated risk of infection and death above and beyond existing disparities in many chronic illnesses that have been shown to increase COVID-19 disease severity. For example, studies have documented that testing and health care services were disproportionately located in White communities^{34,35} and more recently efforts have been made to ensure that vaccination sites are fairly distributed across communities of color.³⁶ Residential segregation is also strongly linked to employment patterns that may shape risk of exposure to COVID-19.

Our findings related to employment suggest that at the bivariate level, higher unemployment is associated with a higher percentage of deaths among Black residents. In the full model controlling for demographic factors, however, we find the opposite to be true. The odds of dying are lower when people are out of the labor force. One plausible explanation is that unemployment may result in fewer opportunities to be exposed to COVID-19 and that

Black Americans are disproportionately likely to be employed as essential workers who carried considerable COVID-19 risks during the pandemic. This may also explain the surprising, although not significant, finding that as uninsured rates increased, the death rate slightly increased.

Clear from these findings is that systemic racism and residential segregation are strongly associated with disparities in deaths from COVID-19. It is worth reiterating, however, that systemic racism has a

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disproportionately negative impact on the health of Black Americans but appears to be bad for White Americans' health as well. States that foster inequality, may promote environments that result in negative health outcomes across the board. Insofar as deleterious effects for all residents' health helps encourage policies that specifically aim to redress systemic racism, this finding is important to emphasize. Most importantly, residential segregation remains an impor-

tant mechanism for understanding health disparities in the United States and also appears to have exacerbated existing disparities in the context of a major infectious disease pandemic.

Study Limitations

Our study has limitations that are important to consider. Because race/ethnicity data for COVID-19 deaths are only available at the state level, we are unable to measure individual-level disparities in COVID-19 risk. Nonetheless, our findings demonstrate that state-level environments are important predictors for the racial disparities documented in the context of COVID-19. We included data up until December 2020, which constituted the middle of the third wave in the United States just before the first vaccines were employed. As a result, we cannot assess whether these patterns have changed in more recent months as the vaccination campaign expanded to include all Americans. Finally, our use of cross-sectional data does not allow for causal interpretations of factors that shape COVID-19 deaths in states.

CONCLUSIONS

To understand and address disparities related to COVID-19 and likely future infectious disease epidemics, researchers and public health practitioners must acknowledge the underlying causes of disparities and their relationship to systemic racism that shape economic opportunity and by extension good health. Our findings suggest that specific forms of systemic racism, such as residen-

tial segregation, may be particularly important for understanding disparities. Future research should elucidate the mechanisms by which infectious disease pandemics exacerbate health disparities in areas of high residential segregation and consider how social policies that reduce institutional-level discrimination would also serve as good health policies. The COVID-19 pandemic represents an opportunity to increase awareness of the magnitude and persistence of racial/ethnic health disparities and develop policies aimed at addressing systemic racism. Such policy changes stand to make all American communities more resilient in the face of new and emerging infectious diseases.

CONFLICT OF INTEREST

No conflicts of interest to report.

AUTHOR CONTRIBUTIONS

Research concept and design: Franz, Milner, Braddock; Data analysis and interpretation: Franz, Parker, Milner, Braddock; Manuscript draft: Franz, Parker, Milner, Braddock; Statistical expertise: Franz, Parker, Milner, Braddock; Administrative: Franz, Milner, Braddock

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