

## Racial Disparities in COVID-19 Mortality Among Essential Workers in the United States

Tiana N. Rogers, Charles R. Rogers , Elizabeth VanSant-Webb, Lily Y. Gu, Bin Yan, and Fares Qeadan

---

*Racial disparities are apparent in the impact of coronavirus disease 2019 (COVID-19) in the United States, yet the factors contributing to racial inequities in COVID-19 mortality remain controversial. To better understand these factors, we investigated racial disparities in COVID-19 mortality among America's essential workers. Data from the American Community Survey and Current Population Survey was used to examine the correlation between the prevalence of COVID-19 deaths and occupational differences across racial/ethnic groups and states. COVID-19 mortality was higher among non-Hispanic (NH) Blacks compared with NH Whites, due to more NH Blacks holding essential-worker positions. Vulnerability to coronavirus exposure was increased among NH Blacks, who disproportionately occupied the top nine essential occupations. As COVID-19 death rates continue to rise, existing structural inequalities continue to shape racial disparities in this pandemic. Policies mandating the disaggregation of state-level data by race/ethnicity are vital to ensure equitable and evidence-based response and recovery efforts.*

---

**KEY WORDS:** coronavirus, health status disparities, infectious diseases, occupational health, race factors, viral transmission

### Introduction

The World Health Organization (2020) reported 3,018,952 confirmed cases and 207,973 deaths from the coronavirus disease 2019 (COVID-19) worldwide on April 29, 2020. With 1,005,147 (33.29% of all) cases and 57,505 (27.65% of all) deaths, the United States is the epicenter of the pandemic (Centers for Disease Control and Prevention [CDC], 2020a). As national-level data disaggregation by race continues to lag, released data and articles from states, cities, and news outlets provide glimpses into COVID-19's disproportionate impact. As of April 6, 2020, the Alabama Department of Public Health reported disproportionate rates of infection and death between non-Hispanic (NH) Black and NH White patients (Zanolli, 2020). On April 16, 2020, Louisiana reported that although NH Blacks comprise 33% of the state's population, they represented 60% of the state's deaths from the virus (Louisiana Department of Health, 2020). COVID-19-specific inequities continue to surface in disease hotspots such as New York City, where NH Black residents account for 22% of the city's population but 28% of deaths, while Hispanic residents account for 29% of the population and 34% of deaths (New York State Department

of Health, 2020). As death rates continue to climb, better data-driven understanding of the disproportionate racial impact of the pandemic is warranted to enable officials to best direct state-level mitigation, testing, treatment, and funding efforts.

It is no surprise to some that COVID-19 is exposing health disparities in the United States, which is outranked only by Portugal and Chile on income-based health inequities (Hero, Zaslavsky, & Blendon, 2017). The “weathering hypothesis”—defined as “chronic exposure to social and economic disadvantage [that] leads to accelerated decline in physical health outcomes and could partially explain racial disparities in a wide array of health conditions” (Forde, Crookes, Suglia, & Demmer, 2019)—provides a possible framework for better understanding these disparities (Forde et al., 2019; Geronimus, Hicken, Keene, & Bound, 2006). This phenomenon manifests in higher rates of chronic medical conditions, including asthma, chronic obstructive pulmonary disease, heart disease, and diabetes among people of color compared with NH Whites (CDC, 2018; Maxwell, 2020). Critics have argued that the weathering hypothesis fails to consider allostatic load—that is, the wear and tear the body experiences as it strives to achieve stability in disruptive environments (Thomas, 2006). Nonetheless, the disproportionate health effects of the COVID-19 pandemic are consistent with the unequal presentation of chronic medical conditions among communities of color that result from a historical legacy of structural inequities.

Strong ties among health insurance coverage, care, and outcomes are well established in the literature (Committee on the Consequences of Uninsurance, 2002; Hoffman & Paradise, 2008); individuals without health insurance coverage have been found to be less likely to receive medical care and more likely to experience worse health outcomes (Bovbjerg & Hadley, 2007). In 2018, the U.S. Census Bureau (2019c) found that, compared with those who identify as NH White, Hispanics were three times more likely and NH Blacks nearly twice as likely to be uninsured. While the Affordable Care Act has substantially increased insurance rates for all races and ethnicities over the past 10 years (Artiga, Orgera, & Damico, 2020), health outcomes for uninsured patients of color remain a major concern during the COVID-19 pandemic.

Although many states have implemented stay-at-home orders in an attempt to contain COVID-19's rapid spread, many individuals employed by “essential” businesses are unable to remain at home. U.S. Bureau of Labor Statistics (2020) data reveal that, in general, 19.7% of NH Black and 16.2% of Hispanic workers report being able to work from home versus 29.9% of NH White workers (U.S. Bureau of Labor Statistics, 2019). This gap highlights systemic and racial injustices that may be perpetuated by COVID-19 exposure. Our current study aimed to investigate racial disparities in COVID-19 mortality among essential workers in the United States to establish a deeper understanding of the compounding factors and indicators contributing to the inequalities permeating the novel coronavirus. Our central hypothesis was that COVID-19 mortality was higher among NH Blacks compared with NH Whites because NH Blacks hold more essential-worker positions.

## Materials and Methods

### *Data Sources*

Population data by race/ethnicity in each U.S. state and in the entire United States were collected from the U.S. Census Bureau's (2019) 2018 American Community Survey (ACS). We collected the frequency of COVID-19 total deaths in addition to death counts by race/ethnicity from state health department websites (please see the References section for those citations marked as [dataset] references). Most states ( $n = 35$ ; 70%) and the District of Columbia (DC) had available COVID-19 death data by race/ethnicity at the time of data collection; the exceptions were Alaska, Delaware, Hawaii, Iowa, Maine, Montana, Nebraska, Nevada, New Hampshire, New Mexico, North Dakota, Oregon, South Dakota, West Virginia, and Wyoming, which were excluded from our study. We aggregated the individual death data from all available states and DC to create an overall death prevalence. For New York state, population and COVID-19 data were collected from the CDC's National Vital Statistics System (CDC, 2020b) due to the limited availability of data from the New York State Department of Health.

Using the reported total number of COVID-19 deaths in each state, we calculated the percentage of deaths in each racial/ethnic group. All COVID-19 death data were up to date as of April 9 to April 24, 2020, depending on the state. We obtained current occupational statistics by race/ethnicity and state from the 2019 Annual Social and Economic supplement to the Current Population Survey (CPS; U.S. Census Bureau, 2019b) and linked COVID-19 death data to the CPS by race/ethnicity and state.

### *Data Measures*

In all analyses, we defined race/ethnicity groups as NH White, NH Black, Hispanic, NH Asian (including Native Hawaiians and Pacific Islanders), and NH Other (including American Indians/Alaska Natives and multiracial individuals). COVID-19 deaths included both confirmed and probable deaths. A confirmed death was defined as that of an individual with a positive COVID-19 laboratory test. A probable death was defined as that of an individual without a known positive COVID-19 laboratory test whose death certificate gave the cause of death as "COVID-19" or an equivalent. Individuals who before death displayed symptoms characteristic of COVID-19 infection were therefore counted as COVID-19 deaths using clinical judgment.

We examined 22 CPS occupational categories: (i) management operations; (ii) business and financial operations; (iii) computer and mathematical science; (iv) architecture and engineering; (v) life, physical, and social science; (vi) community and social service; (vii) legal; (viii) education, training, and library; (ix) arts, design, entertainment, sports, and media; (x) health care practitioner and technical; (xi) health care support; (xii) protective service; (xiii) food preparation and serving; (xiv) building and grounds cleaning and maintenance; (xv) personal care and

service; (xvi) sales; (xvii) office and administrative support; (xviii) farming, fishing, and forestry; (xix) construction and extraction; (xx) installation, maintenance, and repair; (xxi) production; and (xxii) transportation and material moving. We excluded the armed forces due to extremely limited sample size.

### *Statistical Analyses*

We weighted CPS data according to survey methodology (Cheng, 2012). Using CPS data, we calculated the weighted prevalence of each occupation within each racial/ethnic group and examined the difference in prevalence between NH Whites and NH Blacks for each occupation. The percentage of NH Black COVID-19 deaths were divided by the percentage of NH Black population in each state, DC, and all states combined. Using Spearman rank-order correlations, we examined the correlation between the prevalence of COVID-19 deaths and the prevalence of each occupation across racial/ethnic groups and states. All data and statistical analyses were conducted using SAS 9.4 (SAS Institute, Cary, NC) at a significance level of 0.05.

## **Results**

### *COVID-19 Deaths by Race/Ethnicity*

Overall, among combined states, the prevalence of NH Black deaths from COVID-19 (20.76%) was disproportionately higher than the NH Black unweighted U.S. population (12.14%; Table 1). This trend was also seen within 26 states and DC, with the discrepancy between mortality and population highest in Wisconsin and Kansas. In particular, whereas NH Blacks comprised 6.17% of Wisconsin's population, they comprised 36.49% of the state's COVID-19 deaths. In Michigan and New York, NH Blacks comprised 40.00% and 14.90%, respectively, of COVID-19 deaths while representing 13.53% and 8.80%, respectively, of the state's population.

### *Occupational Differences by Race/Ethnicity*

The CPS data revealed differences in occupation prevalence within each racial/ethnic group (Table 2). Compared with NH Whites, NH Blacks were more likely to work in jobs considered essential during the COVID-19 pandemic. Among all 35 states and DC, the five occupations with the highest disparities in the proportion of NH White and NH Black workers were transportation and material moving, health-care support, food preparation and serving, building and grounds cleaning and maintenance, and personal care and service. In particular, 10.58% of NH Blacks worked in transportation and material moving, compared with 5.33% of NH Whites; 5.46% of NH Blacks worked in health-care support, compared with 1.76% of NH Whites.

**Table 1.** Percentage of COVID-19 Deaths and Percentage of Population by Race/Ethnicity

State	Percent COVID-19 deaths <sup>a</sup>   Percent population <sup>b</sup>						Ratio <sup>c</sup>	Date <sup>d</sup>
	White	Black	Hispanic	Asian	Other			
United States <sup>e</sup>	55.31   60.32	21.46   12.14	9.65   18.36	3.85   5.77	2.58   3.42	1.77	–	
Wisconsin	58.77   81.21	36.49   6.17	0.00   6.95	2.37   2.85	0.94   2.83	5.91	4/18/2020	
Kansas	55.81   75.95	31.40   5.35	0.00   11.96	0.00   2.80	1.16   3.80	5.87	4/18/2020	
Missouri	41.00   79.52	38.00   11.30	0.00   4.05	0.00   2.16	3.00   2.97	3.36	4/17/2020	
Michigan	43.00   75.00	40.00   13.53	0.00   5.15	1.00   3.23	5.00   3.07	2.96	4/20/2020	
Illinois	38.36   61.01	39.87   13.55	10.48   17.48	4.13   5.66	1.35   2.30	2.94	4/18/2020	
Arkansas	62.50   72.24	35.00   14.96	0.00   7.70	0.00   1.79	0.00   3.31	2.34	4/19/2020	
California	36.00   36.67	12.00   5.36	31.00   39.39	17.00   14.96	4.00   3.63	2.24	4/17/2020	
South Carolina	42.00   63.83	57.00   26.33	0.00   5.76	0.00   1.56	1.00   2.45	2.16	4/18/2020	
Colorado	70.21   67.95	8.24   3.82	16.49   21.62	3.99   3.27	1.07   3.34	2.16	4/18/2020	
Tennessee	57.80   73.79	33.70   16.51	0.00   5.49	2.40   1.73	1.20   2.41	2.04	4/22/2020	
Indiana	66.70   78.95	18.90   9.26	0.00   7.10	0.40   2.27	8.50   2.37	2.04	4/17/2020	
Louisiana	30.24   58.82	59.29   31.64	0.00   5.08	1.05   1.61	0.71   2.84	1.87	4/18/2020	
North Carolina	58.00   62.86	38.00   20.86	0.00   9.58	1.00   3.00	3.00   3.69	1.82	4/18/2020	
Alabama	46.90   65.56	47.80   26.45	0.00   4.31	2.70   1.34	0.90   2.31	1.81	4/18/2020	
New Jersey	49.30   54.73	22.00   12.61	17.2   20.76	5.40   9.65	6.10   2.23	1.74	4/22/2020	
Virginia	51.16   61.53	32.17   18.57	0.00   9.53	0.00   6.61	7.75   3.76	1.73	4/18/2020	
Georgia	37.81   52.46	53.16   30.92	0.00   9.74	1.42   4.25	1.29   2.63	1.72	4/20/2020	
District of Columbia	12.00   36.65	77.00   44.90	9.00   11.32	2.00   3.55	0.00   3.37	1.71	4/16/2020	
Mississippi	36.00   56.73	64.00   37.67	0.00   2.82	0.00   0.88	0.00   1.85	1.70	4/18/2020	
New York <sup>f</sup>	67.30   73.00	14.90   8.80	12.50   11.70	4.60   4.30	0.70   2.10	1.69	4/25/2020	
Kentucky	86.00   84.82	12.00   7.60	0.00   3.59	1.75   1.46	0.00   2.47	1.58	4/9/2020	
Connecticut	70.98   66.30	14.89   9.90	9.00   16.63	0.97   4.65	0.84   2.52	1.50	4/22/2020	
Florida	66.00   53.26	22.00   15.07	0.00   26.33	0.00   2.79	6.00   2.55	1.46	4/23/2020	
Maryland	35.08   50.31	40.12   29.30	5.04   10.46	4.26   6.38	3.10   3.52	1.37	4/20/2020	
Rhode Island	79.00   71.54	7.00   5.62	11.00   16.05	0.00   3.42	0.00   3.12	1.25	4/23/2020	
Ohio	70.00   78.79	14.00   12.12	0.00   3.83	0.00   2.29	5.00   2.94	1.16	4/18/2020	
Pennsylvania	32.81   76.27	11.05   10.29	0.00   7.59	1.25   3.51	0.08   2.32	1.07	4/20/2020	
Texas	33.60   41.42	10.90   11.60	15.50   39.84	0.80   5.03	0.00   2.11	0.94	4/22/2020	

(Continued)

Table 1. (Continued)

State	Percent COVID-19 deaths <sup>a</sup>   Percent population <sup>b</sup>						Ratio <sup>c</sup>	Date <sup>d</sup>
	White	Black	Hispanic	Asian	Other			
Minnesota	75.00   79.62	6.00   6.49	0.00   5.39	1.00   4.73	3.00   3.73	0.92	4/22/2020	
Oklahoma	77.70   65.31	6.20   7.02	2.20   10.85	0.60   2.10	11.70   14.72	0.88	4/23/2020	
Washington	74.00   67.95	3.00   3.65	8.00   12.89	11.00   9.46	4.00   6.06	0.82	4/22/2020	
Arizona	40.00   54.47	3.00   4.24	10.00   31.60	2.00   3.42	18.00   6.27	0.71	4/18/2020	
Massachusetts	30.00   70.83	4.00   6.99	5.00   12.38	2.00   6.68	2.00   3.09	0.57	4/18/2020	
Idaho	94.44   81.86	0.00   0.54	0.00   12.65	5.56   1.59	0.00   3.21	0.00	4/18/2020	
Utah	73.70   77.96	0.00   1.15	10.50   14.11	10.50   3.20	0.00   3.58	0.00	4/14/2020	
Vermont	88.10   92.89	0.00   1.10	0.00   1.83	4.76   1.95	7.14   2.23	0.00	4/24/2020	

*Note:* All races are non-Hispanic, unless otherwise noted. Asian includes Native Hawaiians and Pacific Islanders. Other includes American Indian/Alaska Natives and multiracial individuals. Data includes all states except Alaska, Delaware, Hawaii, Iowa, Maine, Montana, Nebraska, Nevada, New Hampshire, New Mexico, North Dakota, Oregon, South Dakota, West Virginia, and Wyoming.

<sup>a</sup>Of the total number of deaths, the prevalence of deaths belonging to a racial/ethnic group.

<sup>b</sup>Of the total state or U.S. population, the prevalence of individuals belonging to a racial/ethnic group.

<sup>c</sup>Percent COVID-19 deaths divided by percent unweighted population among Black non-Hispanics, sorted in descending order, with the exception of first row.

<sup>d</sup>Date at which COVID-19 death data was collected.

<sup>e</sup>Death data aggregated from state health departments. Population data from 2018 American Community Survey.

<sup>f</sup>Death and population data from CDC, National Vital Statistics System.

**Table 2.** Weighted Prevalence of Occupations Within Different Racial/Ethnic Groups

Occupation category	Weighted % occupation within racial/ethnic group <sup>a</sup>					% Difference <sup>b</sup>
	White	Black	Hispanic	Asian	Other	
Transportation and material moving	5.33	10.58	8.65	4.74	7.32	5.25
Health-care support	1.76	5.46	2.41	1.95	2.10	3.70
Food preparation and serving	4.53	6.63	7.92	5.70	8.31	2.10
Building and grounds cleaning and maintenance	2.62	4.36	8.16	1.47	3.66	1.74
Personal care and service	3.28	4.84	4.15	6.14	4.75	1.56
Office and administrative support	11.22	12.76	10.75	8.36	12.69	1.54
Protective service	1.92	3.25	1.49	0.58	1.97	1.33
Production	4.98	6.27	7.25	5.42	5.54	1.29
Community and social service	1.65	2.80	1.39	1.01	2.29	1.15
Farming, fishing, and forestry	0.51	0.27	2.35	0.19	0.91	-0.24
Life, physical, and social science	1.03	0.61	0.41	2.27	0.58	-0.42
Health-care practitioner and technical	6.43	5.75	2.98	9.17	5.42	-0.68
Legal	1.46	0.74	0.48	1.02	0.95	-0.72
Installation, maintenance, and repair	3.04	2.32	3.45	1.68	1.23	-0.72
Computer and mathematical science	3.22	2.26	1.15	11.59	2.79	-0.96
Arts, design, entertainment, sports, and media	2.51	1.51	1.38	1.89	2.78	-1.00
Architecture and engineering	2.46	1.32	0.97	4.56	1.33	-1.14
Sales and related	10.58	8.84	9.57	7.93	12.02	-1.74
Business and financial operations	5.84	4.06	2.81	7.20	3.70	-1.78
Construction and extraction	4.48	2.61	11.50	1.34	4.72	-1.87
Education, training, and library	7.38	5.27	3.78	4.76	6.09	-2.11
Management operations	13.76	7.43	6.97	11.02	8.86	-6.33
Total	100	100	100	100	100	-

*Note:* Data includes all states and the District of Columbia except Alaska, Delaware, Hawaii, Iowa, Maine, Montana, Nebraska, Nevada, New Hampshire, New Mexico, North Dakota, Oregon, South Dakota, West Virginia, and Wyoming. Armed forces occupation was excluded due to limited sample sizes.

<sup>a</sup>All races are non-Hispanic, unless otherwise noted. Asian includes Native Hawaiians and Pacific Islanders. Other includes American Indian/Alaska Natives and multiracial individuals.

<sup>b</sup>Percent difference in occupation prevalence between Blacks and Whites (i.e., Black % minus White % for each occupation), sorted in descending order.

*State-Specific Occupational Differences by Race/Ethnicity*

Within each state, we found mostly consistent patterns, with more substantial contrasts seen in states with denser NH Black populations (Supplemental Table 1). Most notably, in New York, more NH Blacks (10.02%) than NH Whites (1.73%) worked in health-care support. In Texas, 13.97% of NH Blacks worked in transportation and material moving versus 5.61% of NH Whites. In DC, 6.50% of NH Blacks versus 0.58% of NH Whites worked in protective services. In South Carolina, NH Blacks outnumbered NH Whites working in cleaning and maintenance of building and grounds (7.88% vs. 1.98%). In Michigan, NH Blacks (13.06%) were more likely than NH Whites (7.01%) to work in production occupations.

In Maryland, more NH Blacks (8.44%) than NH Whites (2.48%) worked in food preparation and serving. Finally, in Mississippi, more NH Blacks (5.50%) than NH Whites (1.88%) worked in personal care and service.

### *Correlation Between Occupation and COVID-19 Deaths*

All occupational categories were significantly positively correlated with the percentage of COVID-19 deaths across all states and racial/ethnic groups (all  $p < .0001$ ; Table 3). Spearman correlation coefficients ranged from a minimum of 0.52 in farming, fishing, and forestry occupations to a maximum of 0.90 in protective-service occupations. Other occupations with strong correlations to COVID-19 deaths included healthcare support ( $\rho = 0.87$ ) and transportation and material moving ( $\rho = 0.87$ ). By contrast, both computer and mathematical science occupations ( $\rho = 0.62$ ) and life, physical, and social science occupations ( $\rho = 0.65$ ) saw weaker correlations with COVID-19 deaths.

**Table 3.** Spearman Correlations between Weighted Occupation Percentages and COVID-19 Death Percentages Across All States and Racial/Ethnic Groups

Occupation category	% COVID-19 deaths	
	<i>n</i>	$\rho^*$
Protective service	97	0.90
Healthcare support	118	0.87
Transportation and material moving	133	0.87
Office and administrative support	142	0.87
Personal care and service	132	0.85
Food preparation and serving	136	0.84
Education, training, and library	133	0.84
Community and social service	115	0.83
Sales	141	0.82
Management operations	139	0.82
Installation, maintenance, and repair	116	0.81
Health-care practitioner and other technical	134	0.81
Building and grounds cleaning and maintenance	125	0.81
Production	138	0.81
Arts, design, entertainment, sports, and media	108	0.80
Legal	97	0.79
Business and financial operations	129	0.77
Construction and extraction	120	0.77
Architecture and engineering	116	0.70
Life, physical, and social science	101	0.65
Computer and mathematical science	128	0.62
Farming, fishing, and forestry	71	0.52

*Note:* Data includes all states and the District of Columbia except Alaska, Delaware, Hawaii, Iowa, Maine, Montana, Nebraska, Nevada, New Hampshire, New Mexico, North Dakota, Oregon, South Dakota, West Virginia, and Wyoming. Armed forces occupation was excluded due to limited sample sizes.

\*Correlation coefficient  $\rho$  sorted in descending order by coefficient size;  $p < .0001$  for all correlations.



## Discussion

In one of the first descriptive studies to examine racial disparities in COVID-19 mortality among essential workers in the United States, we identified a disproportionate number of deaths among NH Blacks relative to their distribution in state populations. For example, NH Blacks comprised 36.49% of COVID-19 deaths in Wisconsin despite making up only 6.17% of the state's population. With similar trends observed nationwide, our findings contribute to the existing knowledge base concerning health status and outcome inequalities in the United States for NH Blacks compared with NH Whites (Farmer & Ferraro, 2005; Hatzenbuehler, Phelan, & Link, 2013).

NH Blacks were more likely than NH Whites to hold occupations considered essential (e.g., in transportation, health care, food preparation, and cleaning services). NH Blacks disproportionately occupied the top nine occupations that placed them at high risk for contracting COVID-19 and for potentially infecting their households. In March 2020, disaggregated occupational data from Amazon emerged that corroborate our findings, revealing that workers at 10 Amazon warehouses nationwide tested positive for COVID-19 (Greene, 2020). December 2019 workforce data showed that 26.5% of Amazon workers identified as NH Black and 18.5% as Hispanic (About Amazon Staff, 2019). This compares with an overall representation in the U.S. population of 13.4% for NH Blacks and 18.3% for Hispanics (U.S. Census Bureau, 2019d).

Our findings confirmed our central hypothesis that COVID-19 mortality was highest among NH Blacks compared with NH Whites due to NH Blacks holding more essential-worker positions. Although our findings revealed state-specific occupational differences in states with denser NH Black populations, they consistently showed that disparities in NH Black–White mortality were high not only in COVID-19 hotspots but also nearly everywhere across the United States.

Chambers (2020) and Schumaker (2020) report that varied COVID-19 exposure and transmission levels in communities of color stem from a lack of personal protective equipment (PPE) and inability to fully practice social distancing. Nearly half of all urban NH Blacks in the United States live under conditions of hypersegregation and concentrated poverty (Massey, 2004). NH Black essential workers living in high-density housing may be unable to practice social distancing at home, rendering those they live with disproportionately vulnerable to COVID-19 exposure.

We found that NH Blacks residing in the Midwest—specifically, Wisconsin, Kansas, Missouri, Michigan, and Illinois—have been the hardest hit by COVID-19, with mortality rates ranging from nearly three to six times higher than those of NH Whites. While many Midwestern cities are often designated among the “best places to live” in America (Mishkin, Bhardwaj, Raimonde, & Wilt, 2019; US News & World Report, 2020), for NH Blacks they are among the worst places to call home due to well-documented racial disparities in education, incarceration, employment, income, health, medical care, homeownership, voting access, wages, and numerous

other socioeconomic factors (Boen, 2016; Council on Ethical and Judicial Affairs, 1990; Geruso, 2012; Stebbins & Comen, 2018; Williams & Jackson, 2005).

Despite historical pandemics such as HIV and H1N1 serving as potential guides for early intervention and improved response (Andrulis, Siddiqui, Purtle, & Cooper, 2012; Denning & DiNenno, 2010; Quinn et al., 2011), our findings reveal a lack of progress toward health equity in pandemic response efforts in the United States. The 1985 Heckler report highlighted how NH Black Americans experienced significantly worse health outcomes than their NH White counterparts (Nickens, 1986). Over three decades later, our study magnifies how occupational disparities contribute to the persistence of racialized health inequities. Existing structural injustices will continue to shape racial disparities in this pandemic if essential workers are treated as expendable, and unless companies and governmental leaders prioritize workplace safety and protection as a matter of public health.

A central moral dilemma of the COVID-19 pandemic revolves around “restarting America” to save the economy. We suggest that policymakers must first recognize the economic harms that structural racism has caused for NH Black families across the country. Historical evidence confirms that reallocating medical expenditures to social programs and public health interventions can be of greater benefit to the nation's economy and health than cutting public health budgets (Correia, Luck, & Verner, 2020; Masters, Anwar, Collins, Cookson, & Capewell, 2017; Tran, Zimmerman, & Fielding, 2017). Delays in implementing pandemic mitigation interventions (e.g., stay-at-home orders, ramp-up of domestic PPE production) interacting with structural racism may explain the high COVID-19 mortality among NH Blacks in the Midwest, but ethical questions surrounding structural inequities in the health-care system require additional interrogation as data on racial disparities in cases and deaths continue to emerge.

### **Conclusions and Policy Implications**

While it is evident that COVID-19 does not discriminate, the same cannot be said about the U.S. health-care system. Although we were unable to confirm this for the current study due to a lack of COVID-19-specific provider-level data, overwhelming evidence exists that racial/ethnic minority patients continue to receive worse health care than NH White patients (Agency for Healthcare Research and Quality, 2020; Satcher et al., 2005; Smedley, Stith, & Nelson, 2003). Moreover, when accounting for patient-level factors, health-care providers have been found to exhibit significant implicit bias against NH Blacks (Maina, Belton, Ginzberg, Singh, & Johnson, 2018). The need for policy addressing mandatory provider implicit bias training married to rapid progress toward universal health coverage has been amplified due to COVID-19. Future research should consider modeling the cost-effectiveness role of universal health coverage and public health interventions in overcoming COVID-19.

We conclude from our study that structural disparities, not biology, continue to increase COVID-19-related racial inequalities. In agreement with the findings of

Laster Pirtle (2020) and Milam et al. (2020), our study reveals the need for interventions to address social inequality among groups most at risk for unfair or unequal treatment. The racial disparities among essential workers in the United States that we highlight are a byproduct of longstanding systemic racism and structural inequalities, combined with a lack of public policy aimed at protecting the lives of essential workers who risk their lives daily to protect and/or provide for others. Complementing recommendations by Gross et al. (2020), increased vigilance around policy development and comprehensive strategies requiring the timely collection and public dispersal of state- and county-level data disaggregated by race and ethnicity are critical to enable timely adjustments to response practices during public health crises.

### *Limitations and Bias*

This investigation is not without limitations. First, we used unweighted population distributions of racial/ethnic groups without adjusting for regional or county-level geographical differences in race/ethnicity. Accordingly, disproportionate trends in reported COVID-19 mortality among NH Blacks may not reflect local differences in race/ethnicity. However, we employed this technique explicitly to examine state-level disparities in COVID-19 mortality by race/ethnicity. Next, COVID-19 deaths in the United States are undercounted and incomplete due to lengthy national data-gathering strategies and inconsistent counting methods between states. We did not account for these complex coding discrepancies as doing so may have biased our findings. Third, this study was purely descriptive, as we did not directly test for the causal association between increased essential occupations among NH Blacks and their increased COVID-19 mortality. Yet, it was beyond the scope of this study to account for or investigate the connections between race/ethnicity and other health conditions and how these associations may interact with the impact of occupation on COVID-19 mortality. Fourth, although the CDC provided guidance in April 2020 for certifying deaths due to COVID-19 (National Center for Health Statistics, 2020), many states and the CDC recently confirmed they conflated the results of two different types of test (viral and antibody) for coronavirus. Although testing of active cases was not the focus of our investigation, this compromising practice limits the ability of the United States to precisely determine how testing for this infectious disease has improved, and the COVID-19 incidence we report from the CDC in our introduction should be digested with caution. Last, the impact of COVID-19 on different states at different times results from the rapid evolution of the novel virus as well as from states adopting different social distancing policies at various times. Although success in “flattening the curve” was not necessary for the aim of this study, future research should determine the effects of physical distancing policies on COVID-19 mortality.

**Tiana N. Rogers, PhD, MA, MA**, is passionate about connecting research to practice and building the capacity of nonprofits, governments, and communities to solve complicated social problems as program manager for Sorenson Impact Center's Data, Policy, and Performance Innovation team in the University of Utah's David Eccles School of Business.

**Charles R. Rogers, PhD, MPH, MS, CHES<sup>®</sup>**, is committed to serving medically underserved and minority populations as an assistant professor of public health at the University of Utah School of Medicine and associate member of Huntsman Cancer Institute and the University of Michigan-Mixed Methods Program.

**Elizabeth VanSant-Webb, MAT, MEd**, is a senior associate at Sorenson Impact Center in the University of Utah's David Eccles School of Business who has a passion for examining education, housing, social services, and women's empowerment among underserved communities.

**Lily Y. Gu** serves as biostatistics staff in the Department of Family & Preventive Medicine at the University of Utah School of Medicine.

**Bin Yan** is a graduate research assistant in the Division of Public Health at the University of Utah School of Medicine.

**Fares Qeadan, PhD**, is an assistant professor of biostatistics in the Public Health Division at the University of Utah School of Medicine who examines tribal health, clinical and translational science, as well as health disparities.

### Notes

The authors acknowledge Eleanor Mayfield, ELS, who provided editorial assistance, and Data for Black Lives (<http://d4bl.org/>) who indirectly supported our investigation as one of the first organizations to compile a list of states that publicly shared COVID-19 incidence and mortality data.

Conflicts of interest: This research was partially supported by grant K01CA234319 from the National Cancer Institute of the National Institutes of Health (NIH). The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH or the University of Utah.

**Corresponding author:** Tiana N. Rogers, [tiana.rogers@sorensonimpact.com](mailto:tiana.rogers@sorensonimpact.com)

### References

- About Amazon Staff. 2019. "Our Workforce Data." *Day One: The Amazon Blog* (December 31). <https://www.aboutamazon.com/working-at-amazon/diversity-and-inclusion/our-workforce-data>. Accessed April 17, 2020.
- Agency for Healthcare Research and Quality. 2020. "2018 National Health Care Quality and Disparities Report," April. [dataset] <https://www.ahrq.gov/research/findings/nhqdr/nhqdr18/index.html>. Accessed April 17, 2020.

- Andrulis, Dennis P., Nadia J. Siddiqui, Jonathan Purtle, and Maria R. Cooper. 2012. "H1N1 Influenza Pandemic and Racially and Ethnically Diverse Communities in the United States: Assessing the Evidence and Charting Opportunities for Advancing Health Equity." September. [https://www.texashealthinstitute.org/uploads/1/3/5/3/13535548/thi\\_pandemic\\_influenza\\_\\_equity\\_report\\_2012.pdf](https://www.texashealthinstitute.org/uploads/1/3/5/3/13535548/thi_pandemic_influenza__equity_report_2012.pdf). Accessed April 29, 2020.
- Alabama Department of Health. 2020. "Alabama's COVID-19 Data and Surveillance Dashboard: Death Demographics." <https://alpublichealth.maps.arcgis.com/apps/opsdashboard/index.html#/6d2771faa9da4a2786a509d82c8cf0f7>. Accessed April 18, 2020.
- Arizona Department of Health Services. 2020. "Data Dashboard COVID-19 Deaths." [dataset] <https://www.azdhs.gov/preparedness/epidemiology-disease-control/infectious-disease-epidemiology/index.php#novel-coronavirus-home>. Accessed April 18, 2020.
- Arkansas Department of Health. 2020. "ADH COVID-19 Demographic Slide Deck." [dataset] [https://www.healthy.arkansas.gov/images/uploads/pdf/Presentation\\_-\\_Demographics\\_PPT.pdf](https://www.healthy.arkansas.gov/images/uploads/pdf/Presentation_-_Demographics_PPT.pdf). Accessed April 19, 2020.
- Artiga, Samantha, Kendal Orgera, and Anthony Damico. 2020. "Changes in Health Coverage by Race and Ethnicity Since the ACA, 2010-2018." *Kaiser Family Foundation* (March 5). <https://www.kff.org/disparities-policy/issue-brief/changes-in-health-coverage-by-race-and-ethnicity-since-the-aca-2010-2018/>. Accessed April 17, 2020.
- Boen, Courtney. 2016. "The Role of Socioeconomic Factors in Black-White Health Inequities Across the Life Course: Point-in-Time Measures, Long-Term Exposures, and Differential Health Returns." *Social Science and Medicine* 170: 63–76. <https://doi.org/10.1016/j.socscimed.2016.10.008>
- Bovbjerg, Randall R., and Hadley, Jack. 2007. "Health Policy Brief: Why Health Insurance Is Important." *The Urban Institute* (November). <https://www.urban.org/sites/default/files/publication/46826/411569-Why-Health-Insurance-Is-Important.PDF>. Accessed April 17, 2020.
- California Department of Public Health. 2020. "COVID-19 Race and Ethnicity Data, Cases and Deaths associated with COVID-19 by Race and Ethnicity." April 25. [dataset] <https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/COVID-19/Race-Ethnicity.aspx>. Accessed April 18, 2020.
- Centers for Disease Control and Prevention. 2018. *2018 BRFSS Survey Data and Documentation*. [https://www.cdc.gov/brfss/annual\\_data/annual\\_2018.html](https://www.cdc.gov/brfss/annual_data/annual_2018.html). Accessed April 17, 2020.
- Centers for Disease Control and Prevention. 2019. *2018 BRFSS Survey Data and Documentation*. [https://www.cdc.gov/brfss/annual\\_data/annual\\_2018.html](https://www.cdc.gov/brfss/annual_data/annual_2018.html). Accessed April 17, 2020.
- Centers for Disease Control and Prevention. 2020a. *Cases of Coronavirus Disease (COVID-19) in the U.S.* <https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/cases-in-us.html>. Accessed April 29, 2020.
- Centers for Disease Control and Prevention. 2020b. *Provisional Death Counts for Coronavirus Disease (COVID-19): Data Updates by Select Demographic and Geographic Characteristics*. [https://www.cdc.gov/nchs/nvss/vsrr/covid\\_weekly/](https://www.cdc.gov/nchs/nvss/vsrr/covid_weekly/). Accessed April 24, 2020.
- Chambers, Lauren. 2020. "Data Show Covid-19 Is Hitting Essential Workers and People of Color Hardest." *Data for Justice Project: American Civil Liberties Union Massachusetts* (April 8). [https://data.aclum.org/2020/04/07/covid-19-disproportionately-affects-vulnerable-populations-in-boston/?ms\\_aff=MA&initms\\_aff=MA&ms\\_chan=tw&initms\\_chan=tw](https://data.aclum.org/2020/04/07/covid-19-disproportionately-affects-vulnerable-populations-in-boston/?ms_aff=MA&initms_aff=MA&ms_chan=tw&initms_chan=tw). Accessed April 17, 2020.
- Cheng, Yang. 2012. "Overview of Current Population Survey Methodology." Proceedings of the Survey Research Methods Section. Washington, DC: American Statistical Association, 3963–3979.
- Colorado Department of Public Health & Environment. 2020. "COVID-19 Colorado Case Summary." [dataset] <https://covid19.colorado.gov/case-data>. Accessed April 18, 2020.
- Committee on the Consequences of Uninsurance. 2002. "Effects of Health Insurance on Health". In *Care Without Coverage: Too Little, Too Late*. Washington DC: National Academy Press, 47–88.
- Connecticut's Official State. 2020. "Test Date in Connecticut: COVID-19 Update April 26, 2020." [dataset] <https://portal.ct.gov/Coronavirus> Accessed April 22, 2020.
- Correia, Sergio, Stephan Luck, and Emil Verner. 2020. *Pandemics Depress the Economy, Public Health Interventions Do Not: Evidence from the 1918 Flu*. [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3561560](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3561560). Accessed April 20, 2020.

- Council on Ethical and Judicial Affairs. 1990. "Black-White Disparities in Health Care." *Journal of the American Medical Association* 263 (17): 2344–46. <https://doi.org/10.1001/jama.1990.03440170066038>
- Denning, Paul, and Elizabeth DiNenno. 2010. "Communities in Crisis: Is There a Generalized HIV Epidemic in Impoverished Urban Areas of the United States." *XVIII International Aids Conference*, 1. [https://www.law.berkeley.edu/files/bccj/Denning\\_and\\_DiNenno\\_XXXX-1.pdf](https://www.law.berkeley.edu/files/bccj/Denning_and_DiNenno_XXXX-1.pdf). Accessed April 29, 2020.
- Farmer, Melissa M., and Kenneth F. Ferraro. 2005. "Are Racial Disparities in Health Conditional on Socioeconomic Status?" *Social Science & Medicine* 60 (1): 191–204. <https://doi.org/10.1016/j.socscimed.2004.04.026>
- Florida Department of Health. 2020. "Coronavirus: Summary of Persons Being Monitored, Persons Under Investigation, and Cases." [dataset] <http://www.floridahealth.gov/newsroom/2020/04/042320-1100-covid19.pr.html>. Accessed April 23, 2020.
- Forde, Allana T., Danielle M. Crookes, Shakira F. Suglia, and Ryan T. Demmer. 2019. "The Weathering Hypothesis as an Explanation for Racial Disparities in Health: A Systematic Review." *Annals of Epidemiology* 33: 1–18.e3. <https://doi.org/10.1016/j.annepidem.2019.02.011>
- Georgia Department of Public Health. 2020. "Georgia Department of Public Health COVID-19 Daily Status Report." April 26. [dataset] <https://dph.georgia.gov/covid-19-daily-status-report>. Accessed April 20, 2020.
- Geronimus, Arline T., Margaret Hicken, Danya Keene, and John Bound. 2006. "'Weathering' and Age Patterns of Allostatic Load Scores Among Blacks and Whites in the United States." *American Journal of Public Health* 96 (5): 826–33. <https://doi.org/10.2105/AJPH.2004.060749>
- Geruso, Michael. 2012. "Black-White Disparities in Life Expectancy: How Much Can the Standard SES Variables Explain?" *Demography* 49 (2): 553–74. <https://doi.org/10.1007/s13524-011-0089-1>
- Greene, Jay. 2020. "Amazon Workers Test Positive for Covid-19 at 10 U.S. Warehouses." *The Washington Post* (March 25). <https://www.washingtonpost.com/technology/2020/03/24/amazon-warehouse-workers-coronavirus-positive/>. Accessed April 17, 2020.
- Gross, Cary P., Utibe R. Essien, Saamir Pasha, Jacob R. Gross, Shi-yi Wang, and Marcella Nunez-Smith. 2020. "Racial and Ethnic Disparities in Population Level Covid-19 Mortality." *medRxiv*. <https://doi.org/10.1101/2020.05.07.20094250>
- Hatzenbuehler, Mark L., Jo C. Phelan, and Bruce G. Link. 2013. "Stigma as a Fundamental Cause of Population Health Inequalities." *American Journal of Public Health* 103 (5): 813–21. <https://doi.org/10.2105/AJPH.2012.301069>
- Hero, Joachim O., Alan Zaslavsky, and Robert J. Blendon. 2017. "The United States Leads Other Nations in Differences by Income in Perceptions of Health and Health Care." *Health Affairs* 36 (6): 1032–40. <https://doi.org/10.1377/hlthaff.2017.0006>
- Hoffman, Catherine, and Julia Paradise. 2008. "Health Insurance and Access to Health Care in the United States." *Annals of the New York Academy of Sciences* 1136 (1): 149–60. <https://doi.org/10.1196/annals.1425.007>
- Idaho Division of Public Health. 2020. "COVID-19 in Idaho". [dataset] [https://public.tableau.com/profile/idaho.division.of.public.health#!/vizhome/DPHIdahoCOVID-19Dashboard\\_V2/Story1](https://public.tableau.com/profile/idaho.division.of.public.health#!/vizhome/DPHIdahoCOVID-19Dashboard_V2/Story1). Accessed April 18, 2020.
- Illinois Department of Public Health. 2020. "COVID-19 Statistics." [dataset] <https://www.dph.illinois.gov/covid19/covid19-statistics>. Accessed April 18, 2020.
- Indiana Department of Health. 2020. "Indiana COVID-19 Data Report." [dataset] <https://www.coronavirus.in.gov/2393.htm>. Accessed April 18, 2020.
- Kansas Department of Health and Environment. 2020. "KS Coronavirus Disease 2019 (COVID-19) Case Summary." [dataset] [https://public.tableau.com/profile/kdhe.epidemiology#!/vizhome/COVID-19Data\\_15851817634470/KSCoVID-19CaseData](https://public.tableau.com/profile/kdhe.epidemiology#!/vizhome/COVID-19Data_15851817634470/KSCoVID-19CaseData). Accessed April 18, 2020.
- Laster Pirtle, Whitney N. 2020. "Racial Capitalism: A Fundamental Cause of Novel Coronavirus (COVID-19) Pandemic Inequities in the United States." *Health Education & Behavior* 47: 504–508. <https://doi.org/10.1177/1090198120922942>

- Lindstrom, Michon. 2020. "A Look at the Demographics of Coronavirus Deaths in Kentucky." *Spectrum News1* (April 9). [dataset] <https://spectrumnews1.com/ky/lexington/news/2020/04/09/a-look-at-coronavirus-deaths-in-kentucky>. Accessed April 9, 2020.
- Louisiana Department of Health. 2020. "Coronavirus (COVID-19)." [dataset] <http://ldh.la.gov/Coronavirus/>. Accessed April 18, 2020.
- Maina, Ivy W., Tanisha D. Belton, Sara Ginzberg, Ajit Singh, and Tiffani J. Johnson. 2018. "A Decade of Studying Implicit Racial/Ethnic Bias in Healthcare Providers Using the Implicit Association Test." *Social Science & Medicine* 199: 219–29. <https://doi.org/10.1016/j.socscimed.2017.05.009>
- Maryland Department of Health. 2020. "Maryland COVID-19 Data Dashboard." [dataset] <https://coronavirus.maryland.gov/>. Accessed April 20, 2020.
- Massachusetts Department of Health. 2020. "COVID-19 Dashboard Overview." April 26. [dataset] <https://www.mass.gov/info-details/covid-19-cases-quarantine-and-monitoring>. Accessed April 18, 2020.
- Massey, Douglas S. 2004. "Segregation and Stratification: A Biosocial Perspective." *The DuBois Review: Social Science Research on Race* 1 (1): 7–25. <https://doi.org/10.1017/S1742058X04040032>
- Masters, Rebecca, Elspeth Anwar, Brendan Collins, Richard Cookson, and Simon Capewell. 2017. "Return on Investment of Public Health Interventions: A Systematic Review." *Journal of Epidemiology and Community Health* 71 (8): 827–34. <https://doi.org/10.1136/jech-2016-208141>
- Maxwell, Conner. 2020. "Coronavirus Compounds Inequality and Endangers Communities of Color." *Center for American Progress* (March 27). <https://www.americanprogress.org/issues/race/news/2020/03/27/482337/coronavirus-compounds-inequality-endangers-communities-color/>. Accessed April 17, 2020.
- Michigan Government. 2020. "Coronavirus Michigan Data." [dataset] [https://www.michigan.gov/coronavirus/0,9753,7-406-98163\\_98173--,00.html](https://www.michigan.gov/coronavirus/0,9753,7-406-98163_98173--,00.html). Accessed April 20, 2020.
- Milam, Adam J., Debra Furr-Holden, Jennifer Edwards-Johnson, Birgete Webb, John W. Patton III, III, Nnayerugo C. Ezekwemba, Lakiesha Porter, TomMario Davis, Marius Chukwurah, Antonio J. Webb, Kevin Simon, Geden Franck, Joshua Anthony, Gerald Onuoha II, Italo M. Brown, James T. Carson, & Stephens, Brent C. 2020. "Are Clinicians Contributing to Excess African American COVID-19 Deaths? Unbeknownst to Them, They May Be." *Health Equity* 4 (1): 139–41, <https://doi.org/10.1089/heq.2020.0015>
- Minnesota Department of Health. 2020. "Situation Update for Coronavirus Disease 2019 (COVID-19): Race and Ethnicity Data Table." [dataset] <https://www.health.state.mn.us/diseases/coronavirus/situation.html#raceeth1>. Accessed April 22, 2020.
- Mississippi State Department of Health. 2020. *Coronavirus Disease 2019 Trends and Summary Data*. [dataset] [https://msdh.ms.gov/msdhsite/\\_static/14,0420.html](https://msdh.ms.gov/msdhsite/_static/14,0420.html). Accessed April 18, 2020.
- Missouri Department of Health & Senior Services. 2020. "COVID-19 Outbreak: Missouri Coronavirus GIS Hub Deaths by Race/Ethnicity." [dataset] <https://health.mo.gov/living/healthcondiseases/communicable/novel-coronavirus/results.php>. Accessed April 18, 2020.
- Mishkin, Shaina, Prachi, Bhardwaj, Olivia, Raimonde, and Chloe, Wilt. 2019. "The Best Places to Live in America." *Money* (September 18). <https://money.com/collection/best-places-to-live-2019/>. Accessed April 29, 2020.
- National Center for Health Statistics. 2020. "Guidance for Certifying Deaths Due to COVID-19." Hyattsville, MD. <https://www.cdc.gov/nchs/data/nvss/vsrg/vsrg03-508.pdf>. Accessed May 27, 2020.
- New York City Health. 2020. "Rates of Cases, Hospitalizations and Deaths by Race/Ethnicity Group." [dataset] <https://www1.nyc.gov/assets/doh/downloads/pdf/imm/covid-19-deaths-race-ethnicity-04242020-1.pdf>. Accessed April 25, 2020.
- New York State Department of Health. 2020. "Fatalities by Race/Ethnicity." [dataset] <https://covid19tracker.health.ny.gov/views/NYS-COVID19-Tracker/NYSDOHCOVID-19Tracker-FatalityDetail?%3Aembed=yes&%3Atoolbar=no&%3Atabs=n>. Accessed April 25, 2020.
- New York State Department of Health. 2020. "Fatalities," April 23. [dataset] <https://covid19tracker.health.ny.gov/views/NYS-COVID19-Tracker/NYSDOHCOVID-19Tracker-Fatalities?%3Aembed=yes&%3Atoolbar=no&%3Atabs=n#/views/NYS%2dCOVID19%2dTracker/NYSDOHCOVID%2d19Tracker%2dMap?%253Aembed=yes&%253Atoolbar=no>. Accessed April 24, 2020.

- Nickens, Herbert. 1986. "Report of the Secretary's Task Force on Black and Minority Health: A Summary and a Presentation of Health Data with Regard to Blacks." *Journal of the National Medical Association* 78 (6): 577–80.
- North Carolina Department of Health and Human Services. 2020. "COVID-19 North Carolina Dashboard." [dataset] <https://www.ncdhhs.gov/divisions/public-health/covid19/covid-19-nc-case-count#by-race-ethnicity>. Accessed April 18, 2020.
- Ohio Department of Health. 2020. *COVID-19 Dashboard Key Metrics on Mortality*. [dataset] <https://coronavirus.ohio.gov/wps/portal/gov/covid-19/dashboards/key-metrics/mortality>. Accessed April 18, 2020.
- Oklahoma State Department of Health. 2020. "Executive Order Report COVID-19 Report." [dataset] <https://coronavirus.health.ok.gov/executive-order-reports>. Accessed April 23, 2020.
- Pennsylvania Department of Health. 2020. "COVID-19 Data for Pennsylvania." [dataset] <https://www.health.pa.gov/topics/disease/coronavirus/Pages/Cases.aspx>. Accessed April 20, 2020.
- Quinn, Sandra, Supriya Crouse, Vicki S. Kumar, Donald Freimuth, Nestor Musa, Casteneda-Angarita, and Kelley Kidwell. 2011. "Racial Disparities in Exposures, Susceptibility, and Access to Health Care in the US H1N1 Influenza Pandemic." *American Journal of Public Health* 101 (2): 285–93. <https://doi.org/10.2105/AJPH.2009.188029>
- Rhode Island Department of Health. 2020. "COVID-19 Data Tracker." [dataset] <https://ri-department-of-health-covid-19-data-rihealth.hub.arcgis.com/>. Accessed April 23, 2020.
- Satcher, David, George E. Fryer, Jr, Adewale Troutman, Jessica McCann, Steven H. Woolf, & Rust, George. 2005. "What If We Were Equal? A Comparison of the Black-White Mortality Gap in 1960 and 2000." *Health Affairs* 24 (2): 459–64. <https://doi.org/10.1377/hlthaff.24.2.459>
- Schumaker, Erin. 2020. "In NYC, 'Stark Contrast' in Covid-19 Infection Rates Based on Education and Race." *ABC News* (April 10). <https://abcnews.go.com/Health/nyc-stark-contrast-covid-19-infection-rates-based/story?id=69920706>. Accessed April 17, 2020.
- Smedley, Brian D., Adrienne Y. Stith, and Alan R. Nelson, eds. 2003. *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care*. Washington, DC: National Academies Press, 2002.
- South Carolina Department of Health and Environmental Control. 2020. "SC Demographic Data (COVID-19)." [dataset] <https://www.scdhec.gov/infectious-diseases/viruses/coronavirus-disease-2019-covid-19/sc-demographic-data-covid-19>. Accessed April 18, 2020.
- State of New Jersey Department of Health. 2020. "New Jersey COVID-19 Demographics." [dataset] [https://nj.gov/health/cd/topics/covid2019\\_dashboard.shtml](https://nj.gov/health/cd/topics/covid2019_dashboard.shtml). Accessed April 22, 2020.
- Stebbins, Samuel, and Evan Comen. 2018. "The Worst Cities for Black Americans." *24/7 Wall Street* (November 9). <https://247wallst.com/special-report/2018/11/09/the-worst-cities-for-black-americans-4/2/>. Accessed April 29, 2020.
- Tennessee Department of Health. 2020. "Tennessee COVID-19 Epidemiology and Surveillance Data." [dataset] <https://www.tn.gov/health/cedep/ncov.html>. Accessed April 22, 2020.
- Texas Health and Human Services. 2020. "Coronavirus Disease (COVID-19)." [dataset] <https://txdshs.maps.arcgis.com/apps/opsdashboard/index.html#/ed483ecd702b4298ab01e8b9cafc8b83>. Accessed April 22, 2020.
- Thomas, Nigel Mark. 2006. "What's Missing from the Weathering Hypothesis?" *American Journal of Public Health* 96 (6): 955. <https://doi.org/10.2105/AJPH.2006.085514>
- Tran, Linda Diem, Frederick J. Zimmerman, and Jonathan E. Fielding. 2017. "Public Health and the Economy Could be Served by Reallocating Medical Expenditures to Social Programs." *SSM—Population Health* 3: 185–91. <https://doi.org/10.1016/j.ssmph.2017.01.004>
- United States Bureau of Labor Statistics. 2019. *Economic News Release: Table 1. Workers Who Could Work at Home, Did Work at Home, and Were Paid for Work at Home, by Selected Characteristics, Averages for the Period 2017-2018*. <https://www.bls.gov/news.release/flex2.t01.htm>. Accessed April 17, 2020.
- United States Bureau of Labor Statistics. 2020. *Labor Force Statistics from the Current Population Survey: Household Data: Annual Averages: 11. Employed Persons by Detailed Occupation, Race, Sex, and Hispanic or Latino Ethnicity*. <https://www.bls.gov/cps/cpsaat11.htm>. Accessed April 17, 2020.



- United States Census Bureau. 2019a. *American Community Survey*. <https://www.census.gov/programs-surveys/acs/news/data-releases.2019.html>. Accessed April 29, 2020.
- United States Census Bureau. 2019b. *Current Population Survey: Annual Social and Economic Supplements*. <https://www.census.gov/data/datasets/time-series/demo/cps/cps-asec.html>. Accessed April 22, 2020.
- United States Census Bureau. 2019c. *Health Insurance Coverage in the United States: 2018: Current Population Reports*, Washington DC: U.S. Government Printing Office. <https://www.census.gov/content/dam/Census/library/publications/2019/demo/p60-267.pdf>. Accessed April 17, 2020.
- United States Census Bureau. 2019d. "Population Estimates, July 1, 2018, (V2018)—United States." *Quick Facts*. <https://www.census.gov/quickfacts/fact/table/US/PST045218#qf-headnote-a>. Accessed April 17, 2020.
- U.S. News and World Report. 2020. *125 Best Places to Live in the U.S.* <https://realestate.usnews.com/places/rankings/best-places-to-live>. Accessed April 29, 2020.
- Utah Department of Health (@UtahDepOfHealth). 2020. ".@DrAngelaCDunn will share some new #COVID19 data today on race/ethnicity. This information will be added to our daily case count report in the coming days." Twitter. April 14. [dataset] <https://twitter.com/UtahDepOfHealth/status/1250144983228665856?s=20>. Accessed April 18, 2020.
- Vermont Department of Health. 2020. "VT COVID-19 Dashboard Deaths by Sex, Ethnicity and Race." [dataset] <https://vcgi.maps.arcgis.com/apps/opsdashboard/index.html#/6128a0bc9ae14e98a686b635001ef7a7>. Accessed April 24, 2020.
- Virginia Department of Health. 2020. "Testing and Public Health Monitoring Data." [dataset] <https://www.virginia.gov/coronavirus/>. Accessed April 18, 2020.
- Washington, DC Department of Health. 2020. "Press Releases Coronavirus Data". [dataset] <https://coronavirus.dc.gov/>. Accessed April 18, 2020.
- Washington State Department of Health. 2020. "2019 Novel Coronavirus Outbreak (COVID-19)." [dataset] <https://www.doh.wa.gov/Emergencies/Coronavirus>. Accessed April 22, 2020.
- Williams, David R., and Pamela Braboy Jackson. 2005. "Social Sources of Racial Disparities in Health." *Health Affairs* 24 (2): 325–34. <https://doi.org/10.1377/hlthaff.24.2.325>
- Wisconsin Department of Health Services. 2020. "COVID-19: Wisconsin Summary Data." [dataset] <https://www.dhs.wisconsin.gov/covid-19/data.htm>. Accessed April 18, 2020.
- World Health Organization. 2020. *Coronavirus disease 2019 (COVID-19) Situation Report-100*. [https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200429-sitrep-100-covid-19.pdf?sfvrsn=bbfbf3d1\\_2](https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200429-sitrep-100-covid-19.pdf?sfvrsn=bbfbf3d1_2). Accessed April 29, 2020.
- Zanolli, Lauren. 2020. "Data from U.S. South Shows African Americans Hit Hardest by Covid-19." *The Guardian* (April 18). <https://www.theguardian.com/world/2020/apr/08/black-americans-coronavirus-us-south-data>. Accessed April 17, 2020.