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November 2022

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### Recommended Citation

Weaver, Elizabeth (2022) "Disparities in COVID-19 Case Counts and Incidence in Florida by Race and Ethnicity at the County and State Level," *Florida Public Health Review*: Vol. 19, Article 8.

Available at: <https://digitalcommons.unf.edu/fphr/vol19/iss1/8>

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# DISPARITIES IN COVID-19 CASE COUNTS AND INCIDENCE IN FLORIDA BY RACE AND ETHNICITY AT THE COUNTY AND STATE LEVEL

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Florida Public Health Review  
Volume 19  
Published November 1, 2022

*Background: In 2020, as COVID-19 spread across the United States, reports of disparities in COVID-19 incidence and mortality by race and ethnicity soon followed. This study assessed COVID-19 case counts and incidence by race and ethnicity at county and state levels focusing on Florida.*

*Methods: Counts of COVID-19 were collected from June through December 2020. Chi square analyses assessed disparities in case distribution and linear regressions assessed disparities in incidence and potential interaction between predictors.*

*Results: Race and ethnicity were significant predictors of COVID-19 incidence. Mean incidence was 4.9, 6.6, and 14.3 per 1,000 people among White, Black, and Other populations and 10.9 and 5.0 per 1,000 people among Hispanic and non-Hispanic populations. Incidence was greatest among the Other population (PP=0.3825), and greater among Hispanic than non-Hispanic populations (P=0.0057).*

*Conclusion: This study illustrates the disproportionate impact of COVID-19 upon racial and ethnic minorities and highlights the need to improve race and ethnicity data collection in disease reporting.*

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**Background** | In early 2020, after the SARS-CoV-2 virus that causes COVID-19 arrived in the United States, disparities in morbidity and mortality rates by race and ethnicity began to be reported. Rates of morbidity and mortality among racial and ethnic minority populations were reportedly exceeding those of White residents of the same cities and states. This trend was not an isolated event but was observed in communities and cities across the United States. In April of 2020, in Chicago, where the Black population comprises less than 33% of the total population, it was reported that more than 50% of COVID-19 infections and almost 75% of all COVID-19 deaths were among the Black population.<sup>1</sup> Though Black residents of Illinois comprise only 15% of the total state population, reports at that time estimated 42% of confirmed cases in the state were among the state's Black residents.<sup>1</sup> In Milwaukee County, where the city of Milwaukee is located and where 26% of the population is Black, 70% of fatalities reportedly occurred among the Black population.<sup>2</sup> Black residents of Michigan, who account for 14% of the state population, also reportedly accounted for 33% of cases and 40% of fatalities at that time.<sup>2</sup>

By June 2020, the Centers for Disease Control and Prevention (CDC) reported that 21.8% of cases in the

United States were among the Black population and 33.8% were among the Hispanic population.<sup>3</sup> This is despite only 13% of the United States population being Black and 18% being Hispanic.<sup>4</sup> In New York City, age-adjusted COVID-19 fatality rates were 220 and 236 per 100,000 people for Black and Hispanic populations, respectively. This is twice the rate of 110 and 102 per 100,000 people for White and Asian populations.<sup>5</sup>

From May through August of 2020, the CDC reported 115,000 COVID-19 associated deaths.<sup>6</sup> During that time, the percentage of Hispanic deaths increased from 16.3% to 26.4%, White deaths decreased from 56.9% to 51.5%, and Black deaths decreased from 20.3% to 17.4%. Despite the decrease in the proportion of deaths among the Black population, the overall proportion of Black deaths was 18.7%, still exceeding the 12.5% of the proportion of the total US population that this group accounts for.<sup>6</sup> By October 2020, the pandemic had caused approximately 7,900,000 reported cases and 216,000 deaths in the United States.<sup>6</sup> The CDC reported that from January through October 2020, across race and ethnic groups, increases in deaths were observed.<sup>7</sup> These were 11.9% and 53.6% among the White and Hispanic populations and increases from 28.9% to 36.6% among American

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Indians/Alaska Natives, Black, and Asian populations.<sup>7</sup> All racial and ethnic groups experienced excess death attributable to COVID-19, though there are distinct differences in the percent of increase in excess death by race and ethnicity.

In November 2020, a study found that incidence of COVID-19 in Miami was higher among the Black and Hispanic populations than among the White population though economic disadvantage and stress were more highly associated with higher incidence than race or ethnicity.<sup>8</sup> Another study from Florida reported higher incidence for Black and Hispanic populations compared to their proportion of the population. The study also reported a standardized mortality ratio of 3.57 when comparing Black adults to White adults and 1.88 when comparing Hispanic adults to White adults.<sup>9</sup> These findings demonstrate a trend of disparities in COVID-19 incidence and mortality by race and ethnicity within the state of Florida and the United States collectively.

**Methods** | This analysis utilizes a dataset of cumulative case counts from June through December 2020 by race and ethnicity compiled by BroadStreet, a community-centered software company. BroadStreet aimed to address a lack in centralized COVID-19 case count reporting on the county level by utilizing interns who collected daily COVID-19 case counts from over 3,000 counties in the United States reporting cases by race and ethnicity. This analysis focused on Florida as Florida reported cases of COVID-19 by race and ethnicity throughout the study period. With a more diverse population, larger sample sizes among minority populations lent greater power to the analyses. Case counts from Florida's 67 counties were compiled, cleaned, and reformatted for analysis. The expected number of cases in each county by race and ethnicity was calculated using census estimates to find the proportion that each race or ethnicity comprises of a county's population.<sup>10</sup> Multiplied by the cumulative total cases, this percentage provided the expected cases by county by race or ethnicity for each calendar month.

Cases of COVID-19 were classified using a case definition from the Florida Department of Health based on clinical, laboratory, epidemiological, and vital records criteria with both confirmed and probable cases comprising the total case count.<sup>11</sup> In accordance with reporting methods used by Florida for reporting cases of COVID-19, cases were reported belonging to one of four race groups including: White, Black, Other, or Unknown. Ethnicities included Hispanic, non-Hispanic, or Unspecified. White includes a person from any of the original peoples of Europe, the Middle East, or North Africa and Black includes a person originating in any of the Black racial groups of Africa.<sup>12</sup> Other includes those of any other race or those who identify with more than one race and

Unknown includes those from whom race information was not gathered. Hispanic is defined as someone of "Cuban, Mexican, Puerto Rican, Central or South America, or other Spanish culture or origin regardless of race".<sup>13</sup> Non-Hispanic includes any person that does not identify with any of these origins and Unspecified includes those from whom ethnicity information was not gathered. Unknown and Unspecified categories were excluded from the assessments and total case counts and, for this reason, the total case counts may differ from other state-reported case counts.

A chi square test assessed the significance of disparities in case counts on the county level with separate analyses for each county and month comparing observed and expected cases counts in each race and ethnicity group. *P* values were calculated with a significance level of 0.05. To prevent bias due to unreported race or ethnicity, when the Unknown or Unspecified cases exceeded 25% of a county's monthly total case count, these counties were excluded from analyses for that month. To compare disparities in case counts between race and ethnic groups, a statewide analysis of COVID-19 incidence was conducted. Statewide monthly incidence was calculated to have one total statewide monthly incidence for each race and ethnicity. Case counts were reported as a cumulative count and thus incidence was calculated as the cumulative case count for each month subtracting the cumulative case count from the previous month. This value was then divided by the estimated population of a given race or ethnic group. Linear regression was used to compare COVID-19 incidence by race or ethnicity adjusting for calendar month.

Finally, temporal trends in COVID-19 incidence over time were assessed through an additional linear regression. This analysis was conducted at the state level taking the number of new cases per race or ethnicity at the end of each month to assess trends over time. A linear regression model was also used to assess changes in COVID-19 incidence by calendar month, adjusting for race or ethnicity. An interaction term between calendar month and race or ethnicity was included in the model to assess whether the temporal trends in COVID-19 incidence varied by race or ethnicity. SAS version 9.4 was utilized in all statistical analyses.

**Results** | As of June 2020, a total of 136,602 total cases of COVID-19 had been reported in Florida. By race, there were 59,555 White cases, 19,601 Black cases, 12,999 Other cases, and 44,447 cases with Unknown race. By ethnicity there were 40,642 Hispanic cases, 45,277 non-Hispanic cases, and 49,405 cases where ethnicity was Unspecified. By December 2020, a total of 1,146,914 cases of COVID-19 had been reported. By race, there were 591,143 White cases, 154,498 Black cases, 157,666 Other cases, and 232,499 cases with Unknown race. By

ethnicity, there were 365,206 Hispanic cases, 518,636 non-Hispanic cases, and 263,072 cases with Unspecified ethnicity.

In June 2020, 45 counties were included in analyses by race and 36 counties by ethnicity. Significant disparities were observed in 90.3% of all counties included by race and 61.1% of counties included by ethnicity. Included counties had a proportion of cases with Unknown or Unspecified race or ethnicity that did not exceed 25% of the total cases for a calendar month. At no point were all 67 counties included. For July 2020, 37 counties were included in analyses by race and 32 counties by ethnicity. Significant disparities were observed for 100.0% of included counties by race and 96.9% of counties by ethnicity. From August through December 2020, a significant difference was observed in all included counties by both race and ethnicity. From June through December 2020, the average disparity between observed and expected White and non-Hispanic cases was consistently negative. Apart from December 2020 among Black cases, the average disparity among Black, Other, and Hispanic cases was consistently positive.

The linear regression model comparing incidence of COVID-19 on the state level by race and calendar month produced an F statistic of 13.43 ( $P < 0.0001$ ). Mean incidence was 4.9 ( $SD = 0.0015$ ), 6.6 ( $SD = 0.0037$ ), and 14.3 ( $SD = 0.0053$ ) per 1,000 people among the White, Black, and Other populations. As predictors of incidence, month produced an F statistic of 6.46 ( $P = 0.0031$ ) and race produced an F statistic of 34.33 ( $P < 0.0001$ ). Figure 1 displays incidence of COVID-19 over time and displays a consistent trend of incidence being highest among the Other population and lowest among the White population (Figure 1). Post hoc testing evaluated the difference in incidence between each race and produced a P value of 0.3825 comparing White and Black populations and  $< 0.0001$  when comparing Other to White or Black populations.

The linear regression model comparing incidence of COVID-19 on a state-level by ethnicity and month produced an F statistic of 3.98 ( $P = 0.0565$ ). Mean incidence was 10.9 ( $SD = 0.0040$ ) and 5.0 ( $SD = 0.0016$ ) per 1,000 people among the Hispanic and non-Hispanic populations. As predictors of incidence, month produced an F statistic of 1.69 ( $P = 0.2688$ ) and ethnicity produced an F statistic of 17.67 ( $P = 0.0057$ ). As month was not a significant predictor, the model was rerun including only ethnicity as a predictor producing an F statistic of 13.12 ( $P = 0.0035$ ). Post hoc testing produced a P value of 0.0057 for the difference in incidence between the Hispanic and non-Hispanic populations. The linear regression model also generated a figure displaying incidence of COVID-19 by ethnicity over time which notably displays that the incidence among the Hispanic population is

consistently higher than the non-Hispanic population (Figure 2).

Finally, an interaction term was added to the models to test for interaction producing an F statistic of 5.00 ( $P = 0.0068$ ) from the race model (Figure 3) and from the ethnicity model an F statistic of 9.56 ( $P = 0.0028$ ) (Figure 4).

**Discussion** | Consistent with observations from across the United States that people of racial and ethnic minorities have been disproportionately affected by the COVID-19 epidemic, these analyses seem to add evidence that the COVID-19 epidemic has affected Florida similarly from June through December 2020. The distribution of cases by race and ethnicity on the county level differed significantly from what was expected based on the relative population size of each race and ethnicity. Fewer White and non-Hispanic cases were observed than expected but among Black, Other, and Hispanic populations more cases were observed than expected given the respective population sizes. This pattern of people of racial and ethnic minorities experiencing a disproportionate share of COVID-19 infections was seen in all counties across the state of Florida according to this analysis. Incidence of COVID-19 varied significantly by race and month though post hoc testing revealed that only incidence among the Other population was significantly different from the other races. Incidence of COVID-19 varied significantly by ethnicity with incidence among the Hispanic population being higher than among the non-Hispanic population, but it did not vary significantly by calendar month. Finally, a significant interaction effect between both race and month and ethnicity and month was observed.

The relative population size of each race or ethnic group may have impacted the ability to detect a significant difference in expected versus observed case counts. Comprising a smaller proportion of the total state population, the size of the Black population in Florida may have been too small to detect a significant difference in case counts. Incidence in the Other group could have been high due to the large Hispanic population in Florida who often fall into the Other group in case reporting. A large proportion of the population in Florida is Hispanic which lends more power to the study and a greater ability to detect differences in expected and observed case counts. Other possible reasons for these results could be data collection that was lacking, decreased testing availability to certain populations, or even that counties with greater than 25% of race or ethnicity data unreported were excluded which may have caused the appearance of lower incidence among these populations if these were counties largely populated by people of racial or ethnic minorities.

These results indicate that race and ethnicity in particular serve as predictors of COVID-19 incidence. Certain comorbidities such as diabetes, heart disease, and obesity are correlated with increased risk of severe illness due to COVID-19.<sup>14</sup> The greatest prevalence of diabetes in the United States has been observed among Hispanic and Black populations.<sup>15</sup> Prevalence of obesity is also higher among Black (38.4%) and Hispanic adults (32.6%) than among non-Hispanic White adults (28.6%).<sup>16</sup> Differences in prevalence of chronic disease by race and ethnicity are generally attributed to social and economic impediments to better health.<sup>17</sup> Not to mention, there is also growing evidence that increased exposure to stressful stimuli may trigger “a cascade of immunological, neuroendocrine, and cardiovascular responses that can disrupt biologic pathways such as the hypothalamic pituitary adrenal–cortisol axis. These disruptions may lead to chronic disease and inflammation and make people more susceptible to infections”.<sup>8</sup>

This disproportionate burden of chronic disease is further compounded by reduced access to health care among some racial and ethnic minority populations.<sup>18</sup> Rates of those lacking health insurance are higher among minority populations: 22%, 19%, and 12% among Native American, Hispanic, and Black populations, compared to 8% among the White population. Minority populations are more likely to live in areas of poorer quality or decreased access to medical care.<sup>18</sup> These factors could result in minority populations having more limited access to or poorer quality medical care for COVID-19, leading to worse outcomes or to poorer reporting of COVID-19 incidence.

To better understand why minority populations in the United States experience greater incidence and mortality due to COVID-19, it is necessary to understand social determinants of health defined in Healthy People 2020 as “conditions in the places where people live, learn, work, and play that affect a wide range of health risks and outcomes”.<sup>19</sup> Before the economic impact of the pandemic, 24% of Native Americans, 22% of the Black population, 19% of the Hispanic population, and 9% of the White population were living in poverty.<sup>3</sup> Racial and ethnic minority workers have represented a large percentage of essential workers who have continued to work in

person throughout the pandemic or to rely on public transportation to travel to work.<sup>20</sup>

Communities with higher proportions of racial and ethnic minority populations have increased housing density, housing insecurity, and multigenerational households which can increase risk of COVID-19 transmission.<sup>21</sup> In these communities, there is often reduced access to healthy foods and increased targeting of alcohol, tobacco products, and fast food which can contribute to development of chronic disease.<sup>22</sup> Racial and ethnic minority populations are also more likely to suffer from gaps in health communication resulting from lower health literacy, lower socioeconomic status, and limitations in English proficiency.<sup>23</sup> There is also more mistrust of health institutions among some minority populations which results in less access to credible COVID-19 information and increases risk of COVID-19 transmission.<sup>24</sup> Furthermore, the disproportionate impact of COVID-19 experienced by these populations further exacerbates the vulnerabilities faced by these communities.

This analysis is limited by incomplete reporting of race and ethnicity data by the Florida Department of Health. At the time of data collection, nationwide case reporting was limited by massive underreporting of race and ethnicity. In the early months of the pandemic, in only 47% of cases was race reported and in only 43% percent of cases was ethnicity reported.<sup>3</sup> Uncollected or unreported race and ethnicity data may have introduced bias to the analysis. These categories accounted for a substantial number of the overall reported cases and excluding these cases from the study hinders our ability to assess the true distribution of cases of COVID-19 by race and ethnicity. Another consideration is the issue of multiple comparisons. With many tests run in these analyses, there is the risk of incorrectly concluding that the distribution of cases of COVID-19 was different from expected when, in a small number of these tests, the number of COVID-19 cases may not have truly been different from expected. Finally, a unique challenge in studying COVID-19 is the magnitude of asymptomatic cases as a substantial proportion of cases are asymptomatic. Accurately measuring the full breadth of COVID-19 infection becomes challenging as asymptomatic cases often go undetected or unreported.<sup>25-26</sup>

Figure 1. Incidence of COVID-19 in Florida by Race from June-Dec. 2020

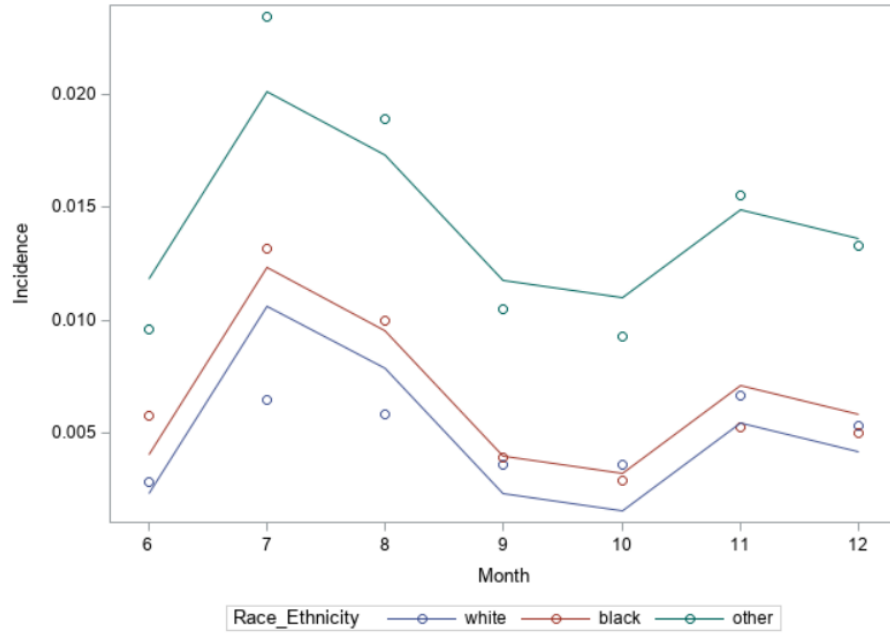
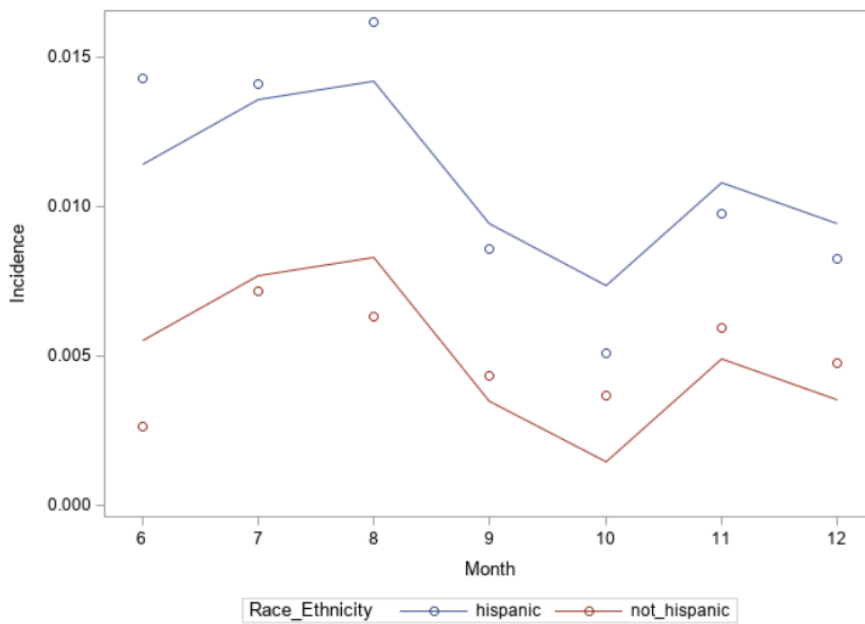
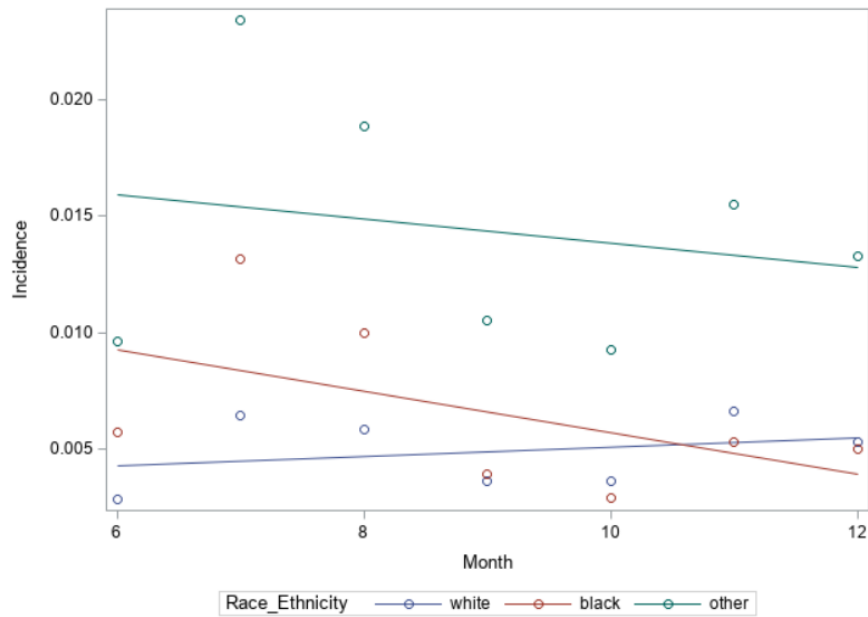


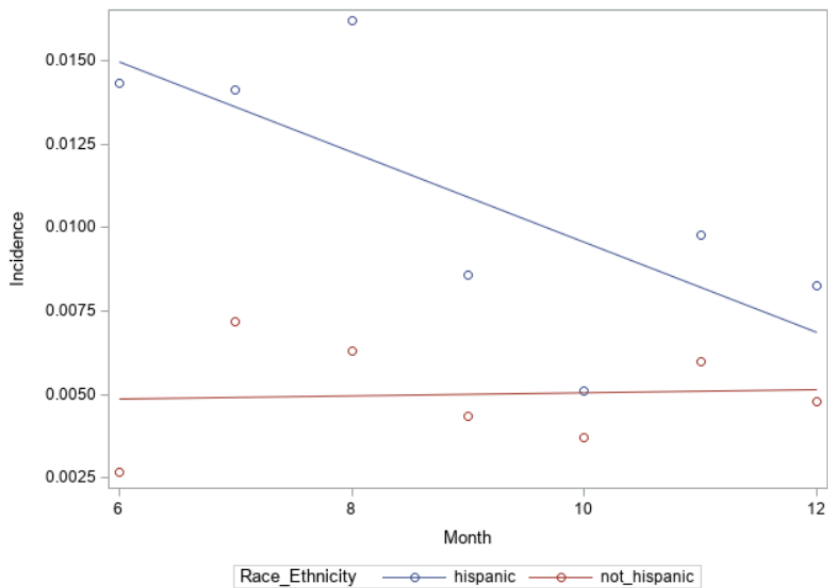
Figure 2. Incidence of COVID-19 in Florida by Ethnicity from June-Dec. 2020



**Figure 3. Incidence of COVID-19 in Florida by Race from June-Dec. 2020 with Interaction Term**



**Figure 4. Incidence of COVID-19 in Florida by Ethnicity from June-Dec. 2020 with Interaction Term**



**Conclusions** | Increased evidence of the disproportionate impact of COVID-19 upon people of racial and ethnic minorities illustrates the need to alleviate the burden of COVID-19 particularly upon these populations and to address the root causes of this disproportionate burden of disease. One starting point is with consistent and reliable reporting of race and ethnicity in disease reporting to enhance our understanding of the impact of COVID-19. Improved race and ethnicity data collection would help

researchers and public health personnel better understand the impact of COVID-19 within their communities and assess the presence and significance of disparities in these measurements. Through improvements in race and ethnicity data collection in disease reporting, stakeholders can better understand which communities are most affected by COVID-19, work to understand why these communities may experience a greater burden of disease, and take action to address health disparities in their communities to

make healthy living more attainable for all regardless of race or ethnicity.

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