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Minority Concentration and COVID-19 Mortality in the United States



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# MINORITY CONCENTRATION AND COVID-19 MORTALITY IN THE UNITED STATES

By

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## ABSTRACT

COVID-19 is a highly infectious respiratory disease that led to a global pandemic within three months of its first case. The first case began in Wuhan, China in December 2019, and the virus quickly spread worldwide. One of the most highly COVID-concentrated nations is the United States which has been consistently accumulating cases since late January 2020. On March 11 2020, the World Health Organization (WHO) declared the outbreak a pandemic of public health significance. Since then, numerous studies have been conducted with the aims of investigating factors that contribute to morbidity and mortality. However, such research has been mainly focused on medicine rather than aspects pertaining to sociology. The purpose of this study is to examine the association between minority status, minority concentration and COVID-19 mortality across U.S. states. The study also controls for state demographics to avoid drawing false conclusions. Data utilized were compiled from public sources including the Centers for Disease Control and Prevention and the Census Bureau. Findings showed significant correlation between minority populations and COVID-19 morbidity. However, the effect of African American race was stronger on COVID mortality than that of other race groups.

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I would like to thank Dr. Augustine Kposowa for his mentorship throughout the project, especially during the pandemic. Having only a biology background, I was unaware of the statistical tools used in sociological studies. Dr. Kposowa was extremely patient and helpful in assisting me with understanding how to use various programs and how to analyze the results obtained. Working with Dr. Kposowa has also taught me a great deal about the best ways in which one should conduct a study, whether it be the types of data needed to be collected or which variables are to be used in specific analysis methods. Because of the great progress we have made, we have decided on pursuing more research on other sociological aspects relating to COVID-19. I thank him for his patience and guidance thus far and look forward to conducting more research together in the near future to bring more attention to how COVID-19 affects the United States.

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# INTRODUCTION

Within months of its first (index) case in Wuhan, China in December 2019, the novel coronavirus quickly spread to other parts of the globe (World Health Organization, 2020). Since then, one of the virus's biggest targets was and continues to be the United States. The first case appeared in the state of Washington after a resident returned in January 2020 from a trip to Wuhan (AJMC Staff, 2021). During the initial stages of spread in the United States in early spring of 2020, New York was the primary epicenter as the state is heavily populated, and it reached over 100,000 cases of the 360,000 U.S. total cases at the time (Levenson, 2020). Eventually, the emergence and spread of the disease put the United States at a halt.

With the continuously increasing numbers of global cases and deaths, COVID-19 was characterized as a pandemic by the World Health Organization on March 11, 2020 (WHO, 2020). With the declaration, a multitude of orders took place to help prevent or slow down the quickly spreading virus. From March to May of 2020, forty-two states and territories mandated stay-at-home orders, and the levels of mask use increased (Centers for Disease Control and Prevention, 2020). Other social distancing and prevention measures were taken place to mitigate viral transmission. These include staying six feet apart from others, working from home, and limiting opening times of businesses. Though such measures have been put into place, the numbers of cases and deaths seem to disproportionately affect different population groups.

The progression of COVID-19 has led to the emergence of the idea that though the virus has targeted all populations, it may concentrate some more than others. This study observes how the disease was and continues to spread disproportionately amongst races in the United States. Through data collection from public sources and statistical analysis, the speculation of minority concentration being linked to COVID-19 mortality and to what degree is made clearer. Minority populations (African Americans, Asians, Hispanic or Latino, and American Indian and Alaska Native alone) had significant correlations with mortality rates.

The following hypotheses were specified:

$H_1$: Black/African American race has a significant effect on COVID-19 mortality.

$H_2$: Asian race has a significant effect on COVID-19 mortality.

$H_3$: Hispanic/Latino race/ethnicity has a significant effect on COVID-19 mortality.

$H_4$: Minority concentration has a significant effect on COVID-19 mortality.

## PAST RESEARCH

Multiple factors can be seen as contributing to the link between race and COVID-19 mortality in the United States. Unfortunately, racism and discrimination have been long standing attributes of the United States, and can be exemplified in any system, including the healthcare system (CDC, 2020). Discrimination has the ability to affect both social and economic factors which can thus increase the risk for minority populations to get infected. Because it is more likely for minorities than non-Hispanic whites to be uninsured, minority access to healthcare is limited (CDC, 2020). At the same time, the pandemic has led to the acknowledgment of the importance of essential businesses and workers, and its relationship with race and ethnicity. For example, data from Rogers et al. (2020) shows that African Americans were more likely than non-Hispanic whites to have essential occupations. This lends credibility to the recent concern of minority populations being at higher risk for contracting the virus.

Gross et al. (2020) discuss such racial disparities in detail. In their study, it was mentioned that many states have not reported COVID-19 mortality rates amongst different racial and ethnic groups. Those that did provide data lacked completeness and led the relationship of COVID-19 mortality and racial disparity to remain unclear (Gross et al., 2020).

To combat this, Gross et al. (2020) conducted a cross-sectional study using available, publicly reported data. They determined the relative risk (RR) of COVID-19 mortality across different age groups and applied the relative risks to the White population mortality rates in each state. By doing so, they were able to estimate the expected number of deaths for the Black and Latinx populations if they were to have the same age-based mortality rates as the White population.

Their results showed that twenty-eight states (and New York City) displayed a strong relationship between COVID-19 mortality and race and ethnicity. In twenty-two states (and New York City), the Black population was found to be at a much greater risk than the White population for mortality (Gross et al., 2020). Specifically, in the state of Wisconsin, the risk of mortality for the Black population was eighteen times higher than that of the White population (Gross et al., 2020).

Similar results can be found for the Latinx population. The Latinx population was 88% more at risk of COVID-19 mortality than the White population (Gross et al., 2020). Alongside this, it was determined that the Latinx population had a significantly greater risk of mortality than the White population in twelve states (and New York City) (Gross et al., 2020).

Indeed, the emergence of COVID-19 raises concern from other researchers about racial disparities in regard to the number of cases and deaths. Based on recent analysis, minority status is strongly linked to COVID-19 mortality in the United States. Wilder (2020) explores this idea and discusses significant statistics that highlight this view. Percentages of COVID-19 deaths were observed, and data shows that the percentages of non-Hispanic (NH) Black deaths were higher than the percentages of the NH Black population in certain states. In Wisconsin, NH Blacks make up 6.17% of the state's population and are attributed to 36.49% of Wisconsin's COVID-19 deaths (Wilder, 2020). In Michigan, NH Blacks account for 13.53% of the population and 40.00% of COVID-19 deaths (Wilder, 2020).

Wilder also examined occupational differences between race and ethnicity. NH Blacks were more likely than NH Whites to hold occupations deemed essential during the pandemic (Wilder, 2020). The greatest differences were seen in the fields of transportation, healthcare, the food industry, building, cleaning and maintenance, and personal care and service (Wilder, 2020). Specifically, 10.58% of NH Blacks hold jobs related to transportation while 5.33% of NH Whites do, and 5.46% of NH Blacks work in healthcare while 1.76% of NH Whites do (Wilder, 2020).

The differences in occupations and percentages of COVID-19 deaths for each race were observed to identify for any correlations. Based on analysis, results suggest that all occupations studied are positively correlated with COVID-19 deaths for all states and racial groups (Wilder, 2020). It was also found that stronger correlations with COVID-19 deaths were seen for essential occupations such as those relating to healthcare and transportation, while weaker correlations were seen for mathematical science, physical, and social science occupations (Wilder, 2020).

Like Wilder (2020), Almagro et al. (2021) also provide insight as to why such disparities may occur, and they focus on house crowding. Denoting the importance of crowding, they explain that individuals at the 90$^{th}$ percentile of home crowding have a hazard rate that is 2.2 times higher than individuals at the 10$^{th}$ percentile. Though mandates led to workplaces being shut down and public spaces not as accessible to the public as a means of preventing the infection of COVID-19, the spread of the disease could have easily continued in homes that are housing a greater number of people.

Almagro et al.'s study showed there to be a positive correlation between crowded areas and neighborhoods carrying higher numbers of minority populations. In addition, during the week of March 25$^{th}$ to March 31$^{st}$, it was found that a 10% increase in home crowding and time spent outside is correlated to a 15.5% increase in hospitalizations per unit (Almagro et al., 2021). By the week of April 8$^{th}$ to April 14$^{th}$ which was when the majority of time was spent indoors, the correlation remained. A 10% increase in home crowding was associated with a 12.4% increase in hospitalizations per unit (Almagro et al., 2021).

The combination of Wilder's, Gross et al. and Almagro et al.'s research sheds light on racial disparities that have become greatly evident during the COVID-19 pandemic. Their studies help to further validate the suggested connection of minority status and COVID-19 morbidity.

## METHODS

### *Data Collection*

Data were collected from various sources and compiled for the present study. Data collection began with manually calculating daily COVID-19 case and death counts retrieved for each month starting from March 1 2020 up until December 31 2020 from The Washington Post. This was done for all fifty states as well as the District of Columbia, and cumulative case and death rates were calculated for the ten-month period. Data concerning social determinants for each state were also collected from various sources such as the United States Census Bureau, Centers for Disease Control and Prevention (CDC), and others. Variables analyzed include the percent of the population for each race (White alone, African American alone, American Indian and Alaska Native alone, Asian alone, Hispanic or Latino, white alone and not Hispanic or Latino) (United States Census Bureau, 2019), median per capita income (Department of Numbers, 2018), percentage of essential workers (United Way of the National Capitol Area, 2020), percentage of the population that is sixty-five years and older (United States Census Bureau, 2016), number of primary care physicians per 100,000 population (Hing et al., 2014), healthcare expenditures ($USD) per capita (Kaiser Family Foundation, 2014), the state's Gini coefficient of income inequality (Statistica, 2021), the state's residential segregation index (County Health Rankings, 2020), 2015 unemployment rates (Bureau of Labor Statistics, 2016), and the state's overall population in 2010 (United States Census Bureau, 2010). To clarify, essential workers are defined by the U.S. Department of Homeland Security as being categorized into fourteen sectors of the economy. These include workers in the fields of healthcare and public health, law enforcement and public safety, education, food and agriculture, energy, waste and wastewater, transportation, public works, communications, community- or government-based operations, critical manufacturing, hazardous materials, financial services, chemicals, defense industrial base, commercial facilities, housing, and hygiene products and services (Cybersecurity and Infrastructure Security Agency, 2020).

*Statistical Technique*

Descriptive statistics, Spearman's correlation coefficients, and linear multivariate regression models were performed using SPSS Statistics Version 27 (IBM Inc., 2020). All variables were tested for normality using the EXAMINE procedure in SPSS. Descriptive statistics were also used to determine normality by calculating skewness statistics. Variables found to be skewed or non-normal were log transformed. For example, percentage of the state population that was African American was observed to be non-normal, and so was transformed.

Similarly, percentage Asian population had a skewness value of 4.626 and thus was log transformed. Log transformation of the variables was necessary to stay true to one of the assumptions of linear regression which states that independent variables should be normally distributed (Hanneman, Kposowa and Riddle, 2012). This is especially critical for calculating standard errors and hypothesis testing.

To determine bivariate associations, Spearman correlation coefficients were calculated. Although Pearson and Spearman may give relatively same results, Spearman has been described in literature as more appropriate for small samples and when variables depart from the normal distribution (Hanneman, Kposowa and Riddle, 2012).

## RESULTS

Descriptive statistics of all the variables are shown in Table 1. As may be seen, the mean COVID-19 mortality rate was 106.309 with a standard deviation of 48.078. The minimum value was 21.098 and this occurred in Hawaii. The maximum value (217.905) was observed in New Jersey. Examination of normality plots showed that the COVID-19 mortality rate was approximately normally distributed; the skewness value (0.271) also confirmed a normal distribution, so the variable was not log transformed. For the percentage African American population, the mean was 11.873 with a standard deviation of 10.704. The minimum percentage was 0.6% found in Montana and the maximum percentage was 46.0% in the District of Columbia. Based on normality plots, the percentage of the African American population was not normally distributed. Although its skewness value was 1.301, examination of normality plots showed that skewness could not be ignored as the variable departed from normality. The variable was thus log transformed. For the Asian population, the mean was 4.555 and the standard deviation was 5.518. The minimum percentage was 0.8% found in West Virginia and the maximum percentage was 37.6% in the Hawaii. Normality plots showed the percentage of the Asian population to not be normally distributed. Its skewness value of 4.626 further confirmed that the distribution was not normal and thus the variable was also log transformed. For the Hispanic or Latino population, the mean was 12.247 and the standard deviation was 10.349. The minimum percentage was 1.7% found in West Virginia and the maximum percentage was 49.3% in New Mexico. Normality plots showed the percentage of the Hispanic or Latino population to not be normally distributed. Therefore, though its skewness value was 1.844, the variable was also log transformed. The mean for the sixty-five years and older population was 15.527 with a standard deviation of 1.912. The minimum percentage observed was 10.1% in Alaska and the maximum percentage was 19.9% in Florida. The absolute skewness value was 0.567 and approximate normality was observed in normality plots. Therefore, the variable did not undergo a log transformation. The mean for residential segregation index was 46.04 with a standard deviation of 8.450. The minimum value examined was 28 in Oklahoma and the maximum value was 61 in New York. The absolute skewness value of 0.058 and normality plots showed an approximately normal distribution. Thus, the residential segregation index variable was not log transformed. For the Gini coefficient, the mean was 0.4680 and the standard deviation was 0.020. Its minimum value was 0.43 in Utah and its maximum value was 0.52 in the District of Columbia. The skewness value of 0.251 and observation of normality plots showed an approximately normal distribution, and the variable was not log transformed. The mean for median age was 38.598 with a standard deviation of 2.418. The minimum value observed was 31.0 in Utah and the maximum value was 45.1 in Maine. The absolute skewness value was 0.129 and approximate normality was observed in normality plots. Therefore, the variable did not undergo a log transformation.

**Table 1. Descriptive Statistics of the Variables**

| Variable | Mean | Std. Deviation | Minimum | Maximum | Skewness |
|---|---|---|---|---|---|
| Cumulative COVID-19 Death Rate | 106.309 | 48.078 | 21.098 | 217.905 | 0.271 |
| % Population African American | 11.873 | 10.704 | 0.6 | 46.0 | 1.301 |
| % of Population Asian | 4.555 | 5.518 | 0.8 | 37.6 | 4.626 |
| % Population Hispanic/Latino | 12.247 | 10.349 | 1.7 | 49.3 | 1.844 |
| % of Population Age 65+ | 15.527 | 1.912 | 10.1 | 19.9 | -0.567 |
| Unemployment Rate | 5.043 | 1.079 | 2.8 | 6.9 | -0.245 |
| Residential Segregation Index | 46.04 | 8.450 | 28 | 61 | -0.058 |
| Gini Coefficient | 0.4680 | 0.020 | 0.43 | 0.52 | 0.251 |
| Median Age | 38.598 | 2.418 | 31.0 | 45.1 | -0.129 |

Spearman's correlation coefficients of all variables are shown in Table 2. As may be observed, the cumulative COVID-19 mortality rate held a positive, significant association with the African American population, residential segregation index and the Gini coefficient. Other correlations between COVID-19 mortality and the independent variables had no significant associations.

Significant associations were also observed between independent variables. The African American population had positive, significant associations with the unemployment rate, the residential segregation index, and the Gini coefficient of income inequality. The residential segregation index and Gini coefficient had positive, significant associations with the Hispanic or Latino population. There was a positive, significant association between the Hispanic or Latino population and the Asian population.  There was another positive, significant association between the Hispanic or Latino population and the median age variable. There was also a negative, significant association between the sixty-five years and older population and the Asian population. A negative association was seen between the sixty-five years and older population and the Hispanic or Latino population. Lastly, there was a positive association between the unemployment rate and Gini coefficient variables.

**Table 2. Spearman's Correlation Coefficients of the Variables**

| Variable | Cumulative COVID-19 Rate | % Population African American (Logged) | % Population Asian (Logged) | % Population Hispanic/Latino (Logged) | % Population Age 65+ | Unemployment Rate | Residential Segregation Index | Gini Coefficient | Median Age |
|---|---|---|---|---|---|---|---|---|---|
| Cumulative COVID-19 Rate | 1.000 | | | | | | | | |
| % Population African American (Logged) | 0.453 ** | 1.000 | | | | | | | |
| % Population Asian (Logged) | 0.059 | 0.230 | 1.000 | | | | | | |
| % Population Hispanic/Latino (Logged) | 0.204 | 0.049 | 0.620 ** | 1.000 | | | | | |
| % Population Age 65+ | -0.048 | -0.227 | -0.307 * | -0.303 * | 1.000 | | | | |
| Unemployment Rate | 0.262 | 0.525 ** | 0.166 | 0.214 | -0.072 | 1.000 | | | |
| Residential Segregation Index | 0.464 ** | 0.456 ** | -0.077 | -0.337 * | 0.010 | 0.163 | 1.000 | | |
| Gini Coefficient | 0.391 ** | 0.673 ** | 0.177 | 0.313 * | -0.069 | 0.648 ** | 0.241 | 1.000 | |
| Median Age | -0.042 | 0.000 | -0.081 | 0.817 ** | 0.000 | 0.042 | 0.155 | 0.101 | 1.000 |

** p = 0.05; * p = 0.01

Linear multivariate regression models were specified, and results are shown in Tables 3, 4, and 5. Before performing the linear regression analysis, the multicollinearity assumption, which states that independent variables are not strongly associated with each other, had to be accounted for (Hanneman, Kposowa and Riddle, 2012). Observation of Spearman's correlation coefficients from Table 2 led to the elimination of variables with significant associations to be in the same linear multivariate regression model.

As may be seen in Table 3, the African American population had an unstandardized coefficient of 19.343. Thus, for each percentage increase in the percentage of the African American population in the state, the COVID-19 mortality rate increases by 19.343% on the log scale. For each percentage increase in the percentage of the Asian population in a given state, the mortality rate decreases by 18.897% on a log scale. For each percentage increase in the percentage of the Hispanic or Latino population in a state, the mortality rate increases by 21.479% on a log scale. Alongside this, the African American population was the only population of the four that shows significance at the 0.01 alpha level. This suggests that the African American population plays a greater predictive role than other populations for the cumulative COVID-19 mortality rate. Therefore, Table 3 rejects the null hypothesis that the African American population does not have an effect on the COVID-19 mortality rate in favor of the research hypothesis ($H_1$) that the African American population does have an effect on the COVID-19 mortality rate.

**Table 3 Effect of Race/Ethnicity on COVID-19 Mortality, U.S. States March 2020 to December 2020**

| Variable | β | Beta | t-value | Sig | VIF |
|---|---|---|---|---|---|
| % Population African American (Logged) | 19.343 | 0.427 | 3.340 ** | 0.002 | 1.042 |
| % Population Asian (Logged) | -18.987 | -0.298 | -1.931 | 0.060 | 1.515 |
| % Population Hispanic/Latino (Logged) | 21.479 | 0.349 | 2.294 * | 0.026 | 1.478 |
| F = 5.555 ** $df_{[3.47]}$ Sig. = 0.002 R Squared = 0.262 N = 51 | | | | | |

* p = 0.05; ** p = 0.01

The African American population was isolated and placed into a linear regression model with other non-population independent variables to observe its effect on the COVID-19 mortality rate which can be seen in Table 4a. The African American population did not show to be a significant predictor for COVID-19 mortality. The only variable that reached significance was the residential segregation index. Therefore, the results presented by Table 4a suggest there is insufficient evidence to reject the null hypothesis that the African American population does not have an effect on the COVID-19 mortality rate.

**Table 4a Effects of African American Race on COVID-19 Mortality, U.S. States March 2020 to December 2020**

| Variable | β | Beta | t-value | Sig | VIF |
|---|---|---|---|---|---|
| % Population African American (Logged) | 7.443 | 0.164 | 0.868 | 0.390 | 2.260 |
| % Population Age 65+ | 0.313 | 0.012 | 0.095 | 0.924 | 1.070 |
| Unemployment Rate | -5.883 | -0.132 | -0.785 | 0.437 | 1.778 |
| Residential Segregation Index | 1.706 | 0.300 | 2.102 * | 0.041 | 1.279 |
| Gini Coefficient | 689.587 | 0.284 | 1.505 | 0.139 | 2.239 |
| F = 3.581 ** $df_{[5,45]}$ Sig. = 0.008 R Squared = 0.285 N = 51 | | | | | |

** p = 0.05; * p = 0.01

The Asian population was also isolated, and a linear regression analysis was performed with other non-population variables in order to identify if it may predict the COVID-19 mortality rate as may be seen in Table 4b. Based on the results, the Asian population did not reach significance, while the residential segregation index and the Gini coefficient displayed significance. Thus, Table 4b fails to reject the null hypothesis, suggesting that the Asian population does not affect the COVID-19 mortality rate.

**Table 4b Effects of Asian Race on COVID-19 Mortality, U.S. States March 2020 to December 2020**

| Variable | β | Beta | t-value | Sig | VIF |
|---|---|---|---|---|---|
| % Population Asian (Logged) | -1.637 | -0.026 | -0.189 | 0.851 | 1.143 |
| % Population Age 65+ | -0.550 | -0.022 | -0.164 | 0.871 | 1.104 |
| Unemployment Rate | -4.480 | -0.101 | -0.608 | 0.546 | 1.694 |
| Residential Segregation Index | 1.955 | 0.344 | 2.558 * | 0.014 | 1.117 |
| Gini Coefficient | 881.244 | 0.363 | 2.112 * | 0.040 | 1.829 |
| F = 3.384 * $df_{[5,45]}$ Sig. = 0.011 R Squared = 0.273 N = 51 | | | | | |

** p = 0.05; * p = 0.01

The Hispanic or Latino population was then isolated and grouped with other non-population variables to examine its effect on the COVID-19 mortality rate and the results are seen on Table 4c. The Hispanic or Latino population and residential segregation index reached significance. Therefore, Table 4c allows for the rejection of the null hypothesis that the Hispanic or Latino population does not have an effect on the COVID-19 mortality rate and fails to reject the research hypothesis ($H_3$) that the Hispanic or Latino population does affect the COVID-19 mortality rate. It is suggested that the Hispanic or Latino population does predict COVID-19 mortality.

**Table 4c Effects of Hispanic or Latino Race/Ethnicity on COVID-19 Mortality, U.S. States March 2020 to December 2020**

| Variable | β | Beta | t-value | Sig | VIF |
|---|---|---|---|---|---|
| % Population Hispanic/Latino (Logged) | 24.134 | 0.393 | 2.609 * | 0.012 | 1.614 |
| % Population Age 65+ | 2.929 | 0.117 | 0.902 | 0.372 | 1.189 |
| Unemployment Rate | -4.564 | -0.102 | -0.664 | 0.510 | 1.694 |
| Residential Segregation Index | 2.930 | 0.515 | 3.697 ** | 0.001 | 1.381 |
| Gini Coefficient | 451.028 | 0.186 | 1.083 | 0.284 | 2.094 |
| F = 5.245 ** $df_{[5,45]}$ Sig. = 0.001 R Squared = 0.368 N = 51 | | | | | |

** p = 0.05; * p = 0.01

The final stage of the analysis involved the creation of a new variable named "Minority Concentration" which comprises of the sum of the log transformations of the three major minority populations (African American, Asian, and Hispanic or Latino). The new variable was involved in same linear regression analysis with other non-population variables to determine if it has an effect on COVID-19 mortality as observed in Table 5. The results imply that minority concentration does not significantly affect the COVID-19 mortality rate. The only variable that reached significance was the residential segregation index variable. Therefore, Table 5 fails to reject the null hypothesis that minority concentration does not have an effect on the COVID-19 mortality rate.

**Table 5 Effects of Minority Concentration on COVID-19 Mortality, U.S. States March 2020 to December 2020**

| Variable | β | Beta | t-value | Sig | VIF |
|---|---|---|---|---|---|
| Minority Concentration | 6.291 | 0.245 | 1.458 | 0.152 | 1.832 |
| % Population Age 65+ | 1.779 | 0.071 | 0.513 | 0.610 | 1.231 |
| Unemployment Rate | -5.619 | -0.126 | -0.775 | 0.442 | 1.714 |
| Residential Segregation Index | 2.084 | 0.366 | 2.812 ** | 0.007 | 1.099 |
| Gini Coefficient | 560.661 | 0.231 | 1.232 | 0.224 | 2.275 |
| F = 3.958 ** $df_{[5,45]}$ Sig. = 0.005 R Squared = 0.305 N = 51 | | | | | |

** p = 0.05; * p = 0.01

DISCUSSION

The rise of the novel coronavirus, and the disease it causes termed COVID-19, has led to the unavoidable increase in concern as to whether the illness disproportionately affects different racial and ethnic populations in the United States. Thus, this study aimed at identifying a relationship between minority concentration and COVID-19 mortality. Results showed that amongst all races, the percentage African American and Hispanic or Latino populations are significantly and positively correlated with COVID-19 mortality.

To control for multicollinearity, each racial group was isolated to confirm a correlation and estimate its unique effect. In doing so, it was found that the percentage African American population was not significantly associated with COVID-19 mortality. However, this contrasting result can be attributed to its strong correlation with the residential segregation index, unemployment rate, and Gini coefficient as can be seen in Table 2. Table 4a also showed the percentage African American population, unemployment rate, and Gini coefficient to have VIF values of approximately 2 (2.260, 1.778, and 2.239 respectively), which can be problematic when performing linear regression analysis. Conducting further linear regression analysis with the elimination of the residential segregation index, unemployment rate and the Gini coefficient brought the percentage African American population to significance.

The percentage Asian population did not reach significance in the linear regression analysis conducted with other population variables nor did it reach significance when the variable was isolated. However, this may be attributed to the large range of the percentage of population throughout the United States. The large gap can be depicted through observation of the makeup of the Asian population in the states where the percentage is insignificant such as in West Virginia (0.8%) and where the percentage is high like in Hawaii (37.6%). Insignificance may also be attributed to the VIF value (1.829) of the Gini coefficient. Repeat of linear regression analysis with the removal of the Gini coefficient brought the percentage Asian population closer to significance.

The minority concentration which was created by summing the top three minority groups showed no significance. Like the linear regression analyses performed for the isolated variables of the percentage African American population and percentage Asian population, analysis for minority concentration resulted in a high VIF value for the Gini coefficient (2.275). Removal of the Gini coefficient led to a strong, positive effect of minority concentration on COVID-19 mortality.

The ultimate strong, positive effect of minority concentration on COVID-19 mortality paints a dark picture of inequities in American society. Results from this study support prior research that highlights the disproportionate effects of COVID-19 on minority groups. It is likely that such disparities arise from social determinants that characterize minority populations such as their occupations and the positive correlation between these populations and crowded housing as suggested by Wilder (2020) and Almagro et al. (2021). In light of the present study, it is imperative to analyze the results on a deeper level. There lies the possibility that minority populations taking on more occupations deemed essential, being associated with crowded homes, and having less access to healthcare is no coincidence. Such inequities should not be alarming as such statistics have been well known long before the pandemic. What is more surprising however is how the pandemic captured the picture of racial disparity quite perfectly. Thus, more attention is being brought to the disproportionate effects that minority populations must tolerate.

Other studies have further confirmed the relationship between race and COVID-19 mortality. Hooper et al. (2020) presented data showing patterns of the differences in racial and ethnic groups. For instance, as of May 2020, COVID-19 contraction rates were highest for Latino, African American, and other racial groups in Chicago, Illinois (Hooper et al., 2020). To be specific, COVID-19 cases per 100,000 are dispersed as follows: 1,000 for the Latino population, 925 for the African American population, 865 for other racial groups, and 389 for the White population. Hooper et al. also observed mortality rates and found that rates were higher for the African American population than for the Latino or White population. Particularly, there was greater age-adjusted mortality seen for the Latino and African American population than for the White population in New York City as of May 2020 (Hooper et al., 2020).

Raifman et al. (2020) also presented estimated data that suggests a link between race and COVID-19 mortality. Using data from the 2018 Behavioral Risk Factor Surveillance System, Raifman et al. estimated the proportion of individuals that have at least one of the factors that suggest a risk for COVID-19 illness severity as listed by the CDC. Some include cancer, chronic kidney disease, and chronic lung diseases (CDC, 2020). Based on their results, 33% of African Americans and 42% of American Indians were at a higher risk compared to 27% of Whites among adults under sixty-five years old (Raifman et al., 2020). Among adults under sixty-five years old that had two or more risk factors, results showed 11% of African Americans, 18% of American Indians, and 8% of Whites to be at risk (Raifman et al., 2020).

Though many studies have suggested a probable link between race and COVID-19 mortality, some analysts stick to narrowing their research to health preconditions as the leading factor for differences in death rates. Flaherty et al. (2020) observed the various predisposed health conditions that lead to higher risk of COVID-19 in American adults. For example, cardiovascular disease was mentioned as one of the pre-existing conditions that could lead patients to be at an increased risk of COVID-19 fatality as a meta-analysis of six studies showed hypertension and cardiocerebrovascular disease to act as co-morbidities (Flaherty et al., 2020). The list also includes obesity, diabetes, cancer, and other various diseases (Flaherty et al., 2020).

Though such risk factors do lead to higher risk for COVID-19 severity, it is important for the professional medical community and the rest of the public to understand that there is a strong link between such health conditions and minority populations in the United States. Awareness should be brought to underlying causes like structural and systemic inequality and racism which predispose minority groups to these pre-existing health conditions. Minority populations are more likely to develop health issues that put them at higher risk due to lower income levels, poorer housing conditions, lack of access to healthcare, and dietary restrictions limited by lower income levels. As COVID-19 continues to affect American lives, it is important to keep in mind other risk factors minority populations are faced with such as crowded housing situations and minority groups holding essential occupations which require them to be at increased risk on a daily basis. Overall, such factors must be taken into consideration in future studies to bring awareness to the great disadvantage minority populations must tolerate as Americans fight against COVID-19.

There are some limitations to the present study that the reader should be aware. First, analyses were done at the state level, and findings may not be generalized to individuals as this might lead to the ecological fallacy (Robinson, 1950). The second limitation is that although the entire universe of U.S. states was used, the population size is too small and thus likely reduced statistical power. The third limitation involves controlling for the effect of essential workers. The broad spectrum of essential occupations, for example being a store clerk compared to being a physician, makes it difficult to render the variable a meaningful one. Despite these limitations, this study adds on to ongoing research on minority status and COVID-19 mortality in the United States. Like other studies, it calls on systemic change and seeks effective policy implementation. With minority populations consistently being at a disadvantage on multiple levels of the American system, it is hoped that such imbalance is eliminated in the future.

REFERENCES


Almagro, Milena et al., 2020. Racial Disparities in Frontline Workers and Housing Crowding during COVID-19: Evidence from Geolocation Data, Opportunity and Inclusive Growth Institute Working Papers 37, Federal Reserve Bank of Minneapolis.

AJMC Staff, 2021. A Timeline of COVID-19 Developments in 2020. The American Journal of Managed Care. Available online at www.ajmc.com/view/a-timeline-of-covid19-developments-in-2020.

Bureau of Labor Statistics, 2016. Local Area Unemployment Statistics. Available online at https://www.bls.gov/lau/.

Centers for Disease Control and Prevention, 2021. Health Equity Considerations and Racial and Ethnic Minority Groups. Available online at www.cdc.gov/coronavirus/2019-ncov/community/health-equity/race-ethnicity.html#fn17.

Centers for Disease Control and Prevention, 2021. People with Certain Medical Conditions. Available online at https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-with-medical-conditions.html.

County Health Rankings, 2020. Residential segregation - Black/White. Available online at https://www.countyhealthrankings.org/app/.

Department of Numbers. Income Overview. Available online at www.deptofnumbers.com/income/.

Flaherty, G.T. et al., 2020. COVID-19 in adult patients with pre-existing chronic cardiac, respiratory and metabolic disease: a critical literature review with clinical recommendations. *Trop Dis Travel Med Vaccines* 6, 16 (2020). https://doi.org/10.1186/s40794-020-00118-y.

Gross, C.P. et al., 2020. Racial and Ethnic Disparities in Population-Level Covid-19 Mortality. *J GEN INTERN MED* 35, 3097-3099. doi: 10.1007/s11606-020-06081-w.

Hanneman, Robert A., et al., 2012. *Basic Statistics for Social Research*. John Wiley & Sons.

Hing E, Hsiao CJ. State variability in supply of office-based primary care providers: United States, 2012. NCHS data brief, no 151. Hyattsville, MD: National Center for Health Statistics. 2014.

Kaiser Family Foundation, 2014. Health Care Expenditures per Capita by State of Residence. Available online at https://www.kff.org/other/state-indicator/health-spending-per-capita/?currentTimeframe=0&sortModel=%7B%22colId%22:%22Location%22,%22sort%22:%22asc%22%7D.

Levenson, Eric, 2020. Why New York Is the Epicenter of the American Coronavirus Outbreak. *CNN*, Cable News Network. Available online at www.cnn.com/2020/03/26/us/new-york-coronavirus-explainer/index.html.

Moreland, Amanda, et al., 2020. Timing of State and Territorial COVID-19 Stay-at-Home Orders and Changes in Population Movement - United States, March 1–May 31, 2020. Available online at www.cdc.gov/mmwr/volumes/69/wr/mm6935a2.htm#:~:text=The%20first%20territorial%20order%20was,stay%2Dat%2Dhome%20orders.

Raifman M.A. et al., 2020. Disparities in the Population at Risk of Severe Illness From COVID-19 by Race/Ethnicity and Income. Am J Prev Med. 2020 Jul;59(1):137-139. doi: 10.1016/j.amepre.2020.04.003. PMID: 32430225; PMCID: PMC7183932.

Robinson, W. S., 1950. Ecological Correlations and the Behavior of Individuals. *American Sociological Review*, vol. 15, no. 3, pp. 351–357. *JSTOR*, www.jstor.org/stable/2087176.

Rogers, Tiana N et al., 2020. Racial Disparities in COVID-19 Mortality Among Essential Workers in the United States. *World medical & health policy*, 10.1002/wmh3.358. doi: 10.1002/wmh3.358.

Statistica, 2020. Gini coefficient as a measure for household income distribution inequality for U.S. states in 2019. Available online at https://www.statista.com/statistics/227249/greatest-gap-between-rich-and-poor-by-us-state/.

United States Census Bureau, 2021. National Population Totals and Components of Change: 2010-2019. Available online at https://www.census.gov/data/tables/time-series/demo/popest/2010s-national-total.html.

United States Census Bureau, 2019. QuickFacts United States. Available online at www.census.gov/quickfacts/fact/table/US/PST045219.

United States Census Bureau, 2018. The Population 65 Years and Older: 2016. Available online at www.census.gov/library/visualizations/interactive/population-65-years.html.

United Way of the National Capital Area, 2020. US States with the Most Essential Workers. Available online at unitedwaynca.org/stories/us-states-essential-workers/.

Wales, Brandon, 2020. Advisory Memorandum on Ensuring Essential Critical Infrastructure Workers' Ability to Work During the COVID-19 Response. *Cybersecurity and Infrastructure Security Agency*.

Webb Hooper M. et al. COVID-19 and Racial/Ethnic Disparities. *JAMA*. 2020;323(24):2466–2467. doi:10.1001/jama.2020.8598.

Wilder, J.M., 2021. The Disproportionate Impact of COVID-19 on Racial and Ethnic Minorities in the United States. Clin Infect Dis. 72(4):707-709. doi: 10.1093/cid/ciaa959. PMID: 32648581; PMCID: PMC7454466.

World Health Organization, 2020. Listings of WHO's Response to COVID-19. Available online at www.who.int/news/item/29-06-2020-covidtimeline.