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Race/Socioeconomic Status and COVID-19: A Narrative Review

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Abstract

Background: COVID-19 infection has resulted in more than 620 million infections and 6.6 million deaths. Since the pandemic, many articles have been published on socioeconomic and racial disparities in COVID-19 infection and its outcomes. This article aims to review the impact of race and socioeconomic status on COVID-19 infection and vice versa.

Findings: Most studies showed an increase in COVID infections and hospitalizations in communities of color, with some showing higher mortality rates while others did not. Social determinants, including insurance and care access, food security, housing security appear to have worsened over the same period for these communities. Our review also showed social determinants accentuated morbidity and mortality of COVID-19 infections and the pandemic also made the disparities in social determinants of health more pronounced.

Conclusion: Socioeconomic factors are associated with poorer health outcomes, and these were exacerbated during the COVID pandemic. Many of these social determinants of health are believed to be modifiable. More research is needed to identify interventions that can positively impact social determinants and have downstream effects on health.

Keywords

COVID-19, pandemic, race, SES, Socioeconomic status

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Conflict of Interest Statement

The authors declare no conflict of interest

REVIEW

Race/socioeconomic Status and COVID-19: A Narrative Review

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Abstract

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Conclusion: Socioeconomic factors are associated with poorer health outcomes, and these were exacerbated during the COVID pandemic. Many of these social determinants of health are believed to be modifiable. More research is needed to identify interventions that can positively impact social determinants and have downstream effects on health.

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1. Background

COVID-19 infection caused by severe acute respiratory syndrome coronavirus 2 (SARS-COV-2) has resulted in more than 620 million infections and 6.6 million deaths worldwide.¹ The virus had the potential of affecting many organs in the body and the symptoms of the disease varied widely from asymptomatic to severe.² Several factors including pre-existing medical conditions and race/ethnicity were associated with increased morbidity and mortality from COVID-19 infection in the published literature.³

Since the pandemic, many articles have been published on socioeconomic and racial disparities in COVID-19 infection and its outcomes. Some studies

have shown that patients from ethnic minorities in the United States had increased risk of infection from COVID-19,³ increased rates of subsequent hospitalization^{4–6} as well as higher mortality rates from COVID-19^{6–10} when compared to non-Hispanic white patients. However, there are inconsistencies with these findings. This article aims to review the potential bidirectional impact of race and socioeconomic status on COVID-19 infection.

2. History of COVID-19 infection

COVID-19 infection caused by severe acute respiratory syndrome coronavirus 2 (SARS-COV-2), was a global pandemic that has had devastating rates of morbidity and mortality.¹ The symptoms of

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the disease ranged from asymptomatic to severe, disabling disease. Symptoms included fever, cough, fatigue, nausea, vomiting, diarrhea, headache, ageusia/hypogeusia, anosmia/hyposmia, sore throat, and shortness of breath.²

SARS-COV-2 invades its target host receptors through a cell surface receptor called angiotensin-converting enzyme-2 (ACE2).¹¹ The virus then binds to the receptor-binding domain of this virus. ACE2 is expressed in the respiratory epithelium,¹² cardiac muscle cells, endothelium of coronary vessels,¹³ renal tubules¹⁴ and gastrointestinal tissues.¹⁵ Studies also showed expression of ACE2 in the calls of olfactory and other neurovascular endothelium.¹⁶ Multiple areas of viral entry are believed to explain the multisystemic symptoms of the disease.

It was also believed that COVID-19 patients produced high levels of Interleukin 6 (IL-6), which is a cytokine secreted by several types of cells in the body which controls immune response and cell proliferation and differentiation.¹⁷ The resulting “cytokine storm” from high level of inflammatory cytokines which can be seen in some severe COVID-19 infection then became a target of COVID-19 therapeutics.¹⁸

Several treatments for COVID-19 infection have been developed or implemented since the onset of the pandemic. These include remdesivir, convalescent plasma, tocilizumab and corticosteroids for those who were hospitalized with severe disease.¹⁹ Other monoclonal antibodies (bamlanivumab, sotrovimab and others) were also developed for infected patients at high risk for hospitalization or death. Oral antivirals including nirmatrelvir/ritonavir (Paxlovid) and molnupiravir (Lagevrio) were also approved for treatment of mild cases of higher-risk COVID-19 infected patients who met eligibility criteria. In December 2020, FDA issued an EUA for the Pfizer-BioNTech COVID-19 vaccine and Moderna COVID-19 vaccine.

3. COVID-19 and race

Since the pandemic, many articles have been published on racial disparities in COVID-19 infection and its outcomes. However, there are inconsistencies in the findings. Some studies have shown that patients from ethnic minorities in the United States had increased risk of infection from COVID-19³, as well as subsequent hospitalization^{4–6} and mortality from COVID-19^{6–10,20,21} when compared to non-Hispanic white patients. A systematic review performed by Mude et al. and another by Magesh et al. showed African American and Hispanic patients experienced higher rates of

COVID-19 infection, hospitalization ratio and mortality rate when compared with white patients.^{22,23} Romano et al. also reported that patients from racial and ethnic minority groups had increased risk for COVID-19 infection, hospitalization, and death in the early phase of the pandemic but that these differences became less pronounced as the pandemic continued.²⁴ On the contrary, other studies did not show any association between COVID-19 outcomes and race^{25–29} (Table 1).

Given these inconsistencies, and the fact that African Americans are disproportionately affected by social determinants of health, it becomes important for studies to control for social determinants of health which may influence the outcomes of COVID-19 and also possibly explain COVID-19 racial disparities.^{30,31}

4. COVID-19 and social determinants of health

Social determinants of health are the situations in which people are born, live and work.^{35,36} It is an umbrella construct encompassing education and literacy, neighborhood and physical environment, social support networks, food access, socioeconomic factors, access to healthcare and occupational status that may affect a patient's overall health.^{37,38} These factors are thought to be critical to understanding identified racial and ethnic differences in health status. Social determinants of health impact outcomes of many chronic diseases including hypertension, chronic kidney diseases, obesity, diabetes.^{36,39–41} Unfortunately, these diseases also increased the risk for severe COVID-19 infection.⁴² Social determinants of health are believed to impact the incidence, spread and mortality of COVID-19 in different regions of the world. Most of the differences in social determinants of health were present before the outbreak of COVID-19. However, social determinants are believed to have both accentuated morbidity and mortality of COVID-19 infections as well as were widened by the pandemic itself.⁴³ In this section, we shall focus on how social determinants might have affected the outcome of COVID-19 in the United States, and how the COVID-19 pandemic may have worsened these preexisting disparities.

5. Healthcare access, employment, and income

In the United States, employment is tightly tied to healthcare for the working age population.⁴⁴ One ecological study by Hawkins et al. showed that communities with lower income, lack of health

Table 1. Race/Socioeconomic determinants of health and COVID-19 infection, hospitalization, and mortality.

Reference	Title	Covid-19 infection risk	COVID-19 hospitalization	COVID-19 mortality
Webb Hooper et al., 2020 ³	COVID-19 and Racial/Ethnic Disparities	Rates of infection highest among Latin and African American/Black in Chicago		Mortality rate higher in African American/Black compared with Latino and White residents.
Garg, S et al., 2020 ⁴	Hospitalization Rates and Characteristics of Patients Hospitalized with Laboratory-Confirmed Coronavirus Disease 2019 — COVID-NET, 14 States, March 1 —30, 2020		Hospitalization rates: 45% were white, 33% were black, and 8% were Hispanic in a population with approximately 59% of residents are white, 18% are black, and 14% are Hispanic.	
Gold, JA et al., 2020 ⁵	Characteristics and Clinical Outcomes of Adult Patients Hospitalized with COVID-19 — Georgia, March 2020		Proportion of hospitalized patients who were black was higher than expected based on overall hospital admissions	Black patients were not more likely than were nonblack patients to die during hospitalization
Rubin-Miller L et al., 2020 ⁶	COVID-19 Racial Disparities in Testing, Infection, Hospitalization, and Death: Analysis of Epic Patient Data	Black, Hispanic, and Asian patients had significantly higher rates of infection compared to White patients	Black, Hispanic, and Asian patients had significantly higher rates of hospitalization compared to White patients	Black, Hispanic, and Asian patients had significantly higher rates of death compared to White patients.
Adegunsoye A et al., 2020 ¹⁰	Association of Black Race with outcomes in COVID-19 disease: a retrospective cohort study	Risk of Covid-19 infection in Black race was 3.3 times higher compared to whites	Risk of Covid-19 hospitalization was 3.8 times higher for Black race compared to whites	There were no observed racial differences in mortality among all SARS-CoV-2—positive patients in the entire cohort.
Ioannou GN et al., 2020 ²⁰	Risk factors for hospitalization, mechanical ventilation, or death among 10 131 US veterans with SARS-CoV-2 infection		Compared with White patients, Black patients were 13% more likely to be hospitalized	Compared with White patients, Black patients were 52% more likely to receive mechanical ventilation but no more likely to die from COVID-19.
Ogedegbe, G et al., 2020 ²⁶	Assessment of racial ethnic disparities in hospitalization and mortality in patients with COVID-19 in York city	African Americans were more likely to test positive.	There was no difference in hospitalization rate after they controlled for comorbidities.	There was no difference in mortality after they controlled for comorbidities
Price- Haywood, E et al., 2020 ²⁷	Hospitalization and Mortality among Black Patients and White Patients with Covid-19		African American/Blacks had increased odds of hospitalization	Black race was not independently associated with higher mortality
Raharja, A. et al., 2021 ²⁸	Association Between Ethnicity and Severe COVID-19 Disease: A Systematic Review and Meta-analysis			Unadjusted all-cause mortality was similar in Black but reduced in Hispanic ethnicity when compared with non-Hispanic White
Yehia, BR et al., 2020 ²⁹	Association of Race With Mortality Among Patients Hospitalized With Coronavirus Disease 2019 (COVID-19) at 92 US Hospitals			Race was not associated with in-hospital mortality after adjusting for sociodemographic and clinical factors

(continued on next page)

Table 1. (continued)

Reference	Title	Covid-19 infection risk	COVID-19 hospitalization	COVID-19 mortality
Hawkins, D, 2020 ³²	Social Determinants of COVID-19 in Massachusetts, United States: An Ecological Study	Communities with lower income, lower insurance coverage, higher poverty rate, higher unemployment rate and higher percentage of essential workers had higher rates of COVID-19 infection.		
Arceo-Gomez, EO et al., 2022 ³³	The income gradient in COVID-19 mortality and hospitalisation: An observational study with social security administrative records in Mexico			Persons in the lowest income decile had higher odds of mortality
Choi, SL, et al., 2021 ³⁴	Food insecurity associated with higher COVID-19 infection in households with older adults	There was higher COVID-19 infection rate among households with food insecurity that those there were food secure		

insurance coverage and higher unemployment rates were associated with higher COVID-19 infection rates.³² Another study reported that persons in lowest income bracket had an increased risk of death.³³ Conversely, a study performed in South Korea, a country with universal healthcare coverage,⁴⁵ low income was associated with increased COVID-19 infection but there was no relationship to COVID-19 mortality.⁴⁶ Prior to the pandemic, disparities existed in the United States in healthcare coverage among different races and income levels. In 2018, the risk of being uninsured by race were 5.4 percent among the non-Hispanic white patients (NHW), 6.8 percent in Asian patients, 9.7 percent among African American patients and 17.8 percent among the Hispanic patients.⁴⁷ In addition, income level correlated with having health insurance. Among people earning less than \$25,000 USD per year, 13.8 percent do not have health insurance while only 3.2 percent of people that earn above \$150,000 USD per year lack health insurance⁴⁷.

Employer-sponsored Health Insurance (ESI) is the most popular means of assessing healthcare in the United States.⁴⁷ The population of the United States that depends on ESI in 2018 was estimated to be 67.3 percent of the population, totaling to about 178 million people. Healthcare access needs in the United States were more apparent with the incidence and mortality associated with COVID-19 infection. During the height of the pandemic in June, 2020, 16.9 million Americans were out of work, and 57% reported that they were unable to work because their employer had closed or lost business due to the pandemic.⁴⁸ Many of those patients had their personal healthcare coverage tied to their employment. Unemployment during the pandemic was said to be at the highest since World War II.⁴⁹ This did not only impact the outcomes of COVID-19 infections, but it also impacted patients with other pre-existing medical conditions. Their sudden inability to access healthcare and the loss of employment was believed to have negatively impacted these health care.

6. Housing and COVID- 19

Housing density is believed to be a factor in the spread of viruses. Living in densely populated areas increases risk of respiratory infections.^{50,51} Therefore, COVID-19 may spread faster in the densely populated neighborhood. Data on size of households showed that ethnic minorities had a higher percentage of five-person or more households.⁵² African Americans were more likely to live in

densely populated, high-poverty neighborhoods.⁵³ Housing density is postulated to be a causative factor in the increased risk of infection among this population.⁵⁴ A lack of stable, safe, and affordable housing is termed housing insecurity. People that have housing insecurity are at risk of homelessness and its associated problems.

African Americans account for about 40% of the homeless population in the United States and this population often lived in shelters with especially high housing density.⁵⁵ Housing insecurity is associated with increased risk of depression and chronic diseases.^{56,57} The increased housing insecurity during the pandemic had a toll on health and chronic disease. For people in dense housing environments, the ability to comply with the health department measures to mitigate spread of COVID-19 such as quarantining, or limitation of the number of close contacts was limited by their housing insecurity.

In addition, living in environments with poor air quality can contribute to increased risk of infection and African American households are also have a higher probability of being exposed to poor air quality.⁵⁸ These could also have contributed to the higher risk of infection among the African American population.

COVID-19 has also impacted housing, as there was an increase in the number of people that became delinquent in their mortgage or rent payment with their loss of employment.^{59,60} The number of people who reported to have been late in their mortgage or rent payment for at least three months doubled by December of 2020. The struggle with mortgage and rent payment during the pandemic were related to loss of employment, reduced hours at work or illness or sudden death of family members.⁶⁰ Households that earn less than \$75,000 USD annually were found to be twice more likely to be behind in their housing payments when compared with households that earn more than \$75,000.⁶⁰ However, across all income groups, African American and Hispanic populations were more likely than white homeowners to report delay in mortgage payments.⁶¹

7. Essential workforce

According to the U.S. Department of Homeland Security, an essential worker is any person who provides goods and services that are essential to critical infrastructure operations. These include energy, agriculture, food service, healthcare fields.⁶² The essential workforce in the United States was estimated in fall of 2021 to be between 31 and 97 million people.⁶³ With the COVID -19 pandemic,

these workers were still required to work despite the risk of person to person spread of disease. This group was termed Essential, Frontline, High-Risk due to COVID-19 workers (EFHR-C) [55]. In 2019, non-food manufacturing facilities and food and beverage stores had the highest EFHR-C work force. When stratified by race, EFHR-C workers were more likely to be African American or Hispanic than non-Hispanic whites.⁶⁴ Of all the EFHR-C workers, COVID-19 diagnosis was highest among the workers in the nursing/residential healthcare facilities and correctional facilities.⁶⁴ EFHR-C workers also reported higher rates of anxiety and depression in the fall of 2021 when compared to other workers in the United States.⁶⁴

8. Food insecurity

Food insecurity is defined as a limited or uncertain access to sufficient, nutritious food for an active, healthy life.⁶⁵ In the US, greater than 34 million people experience food insecurity.⁶⁵ Many studies reported an impact of COVID-19 on food insecurity, but there are a few that describe the impact of food insecurity on COVID-19 outcomes including increased likelihood of death from weakened immunity.^{34,66,67} On the other hand, the problem of food insecurity was aggravated by widespread job loss and reduced economic functions during the pandemic.⁶⁸ Among the EFHR-C in the fall of 2021, workers in the nursing and residential facilities and the workers in food and beverage stores were more likely to report food insecurity than the national average.⁶⁴ In the years before the pandemic, food insecurity had averaged 11 percent of all US household.⁶⁹ This tripled to 38 percent by the March of 2020.⁷⁰ Food insecurity has both short- and long-term deleterious effects on physical and mental health.⁷¹ The measures that were implemented to slow down the spread of COVID-19 caused many disruptions in daily activities, loss of employment or reduced hours worked. All these culminated in food insecurity for low-income Americans and the communities of color.⁷²

9. Conclusions and prospects

It is critical to understand the role of race and social determinants of health within the context of interpreting COVID-19 infection outcomes and vice versa. Although, low socioeconomic factors may have impacted COVID-19 outcomes negatively, the effect of the pandemic also did make disparities in social determinants of health more pronounced in high-risk groups. Many of these social determinants

of health are believed to be modifiable. Therefore, the diverse factors in our communities that affect health need to be considered in health policy decisions to create lasting changes to prevent undesired health outcomes. We support calls for research and better measurement of these disparities, hopefully teasing apart those related directly to poverty from those that seem to be associated with race that may better inform future interventions and help develop effective interventions targeted to those most needing interventions that may offset future high healthcare utilization.⁷³

10. Take-home points

There is a complex interplay between socioeconomic status and COVID-19 clinical outcomes were associated with socioeconomic status. COVID-19 pandemic magnified existing disparities in social determinants of health.

Diverse factors in our communities that affect health should be considered in health policy decisions to create lasting changes to prevent undesired health outcomes.

Author contributions

Conceptualization, O.O.; literature review, O.O, A.A, L.L, A.O, A.D.; writing—original draft preparation, O.O, A.A.; writing—review and editing, O.O., A.O, L.L, A.D.; supervision, A.D. All authors have read and agreed to the published version of the manuscript.

Conflicts of interest

The authors declare no conflict of interest.

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