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# Racial disparities in COVID-19 outcomes: Unwarranted statistical adjustments and the perpetuation of stereotypes

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Several studies have reported that African American and non-white Hispanic individuals experience higher rates of hospitalization for SARS-CoV-2 infection and COVID-19-related mortality compared with white non-Hispanic counterparts.<sup>1</sup> While those important studies increase awareness of racial health disparities during the COVID-19 pandemic, more careful consideration is necessary when designing and interpreting analyses that use race as a focal variable. By clarifying the hypothesized role of race in research investigations and employing appropriate statistical causal methodologies, researchers can avoid stigmatizing consequences and maintain the focus on the conditions and situations that may be the underlying causes of the observed disparities in SARS-CoV-2 infections and related outcomes. Identifying the underlying and modifiable factors that contribute to increased risk of SARS-CoV-2 infection among minoritized populations is essential for addressing disparities, dispelling long-lasting misconceptions and stereotypes, advancing health equity, and limiting the spread of infections.

Although it is common to use race as a focal variable in studies of health disparities, it is important to reflect on the construct of race and the application of proper research methodologies. Without a clear biologically plausible hypothesis for attributing an individual's risk of SARS-CoV-2 infection or outcomes to race, race should not be interpreted to have a "causal effect" on infections or related clinical outcomes.<sup>2</sup> As has been well-established, race is socially constructed, based on phenotypic characteristics or ancestry, and therefore should not be characterized as the driving factor that explains differences in infection risk and clinical outcomes among race groups. Studies comparing health

outcomes among racial groups should make explicit their working hypothesis and their interpretation of race up front, e.g., as a marker of socioeconomic status, as a social constructor as a different construct according to the investigator's perspective. If studies hypothesized that race itself is the actual cause of health disparities, it would be crucial to carefully examine the role that other commonly underrecognized socioeconomic, cultural and environmental factors may play in their analytical framework. These prespecified hypotheses and conceptual frameworks should inform the decision and need to adjust for factors that need to be accounted for, and preclude adjustment for variables that may not need to be included in the analysis (e.g., variables in the causal pathway). If studies are aiming to describe outcomes without an explicit attempt to establish a causal association with race, adjustment for other factors may be less relevant. Studies proposing to use race information as a surrogate marker of other constructs (e.g. socioeconomic status) should make this crucial shortcoming explicit upfront to avoid misinterpretation of results.

A plethora of studies call into action the need to examine ways in which racial discrimination, implicit and explicit biases, micro-aggressions, and stereotyping<sup>3</sup> at the individual, patient, provider, and institutional levels can contribute to the differential risk of infection with SARS-CoV-2 and related outcomes. Those efforts should also acknowledge the lasting consequences of such previous actions on the current socioeconomic and health status of minority populations, and these considerations should be consistently applied in research on health disparities.

Compared with Whites, African American and non-white Hispanic individuals are more likely to have low incomes, lack health insurance, live in dense, crowded, multigenerational homes, and disproportionately constitute the "essential" workforce, with jobs that often do not have the option of working from home.<sup>4</sup> In addition, other common denominators for individuals identified to be at high risk for SARS-CoV-2 infection are residents and staff members of long-term care facilities, incarcerated, homeless persons, and essential workers in high-density work-sites.<sup>5</sup> These socioeconomic difficulties put said minority populations at higher risk for

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infection and create major challenges for isolating when infected or quarantining when exposed, and are also associated with mistrust and low vaccination uptake.<sup>6,7</sup> Studies that compare outcomes among race groups commonly adjust for these socioeconomic factors, sometimes without recognizing that differences in the distribution of socioeconomic factors are, in fact, strongly associated with race, or more explicitly, a consequence of racism. From that perspective, those socioeconomic factors become variables in the causal pathway, and such unwarranted statistical analyses may inadvertently minimize or obscure real disparities while dismissing the cumulative influence of race-based discrimination on the current socioeconomic status of individuals.

In addition to socioeconomic factors, other major variables such as comorbidities may be implicated in racial disparities in SARS-CoV-2 infections and related outcomes. While the presence of poorly controlled comorbidities are often considered confounding variables and adjusted for in assessments of racial disparities, some of those conditions could also be seen as the result of limited access to healthcare, lack of trust in the healthcare system, racism and discrimination. As for socioeconomic factors, statistical adjustment for comorbidities and other variables considered to be in the causal pathway is unwarranted or requires more elaborate interpretation.

An alternative to the common practice of using race information as a surrogate for measurements of socioeconomic status or social vulnerability could be to consider publicly available information that compiles socioeconomic information at different levels of geographical aggregation. These tools include the Social Vulnerability Index (SVI) developed by the Centers for Disease Control and Prevention (CDC) – Agency for Toxic Substances and Disease Registry (ATSDR). The SVI produces an overall ranking for residence census tracts, geographic subdivisions of counties with Census collected statistical data, based on 15 social factor variables such as crowded housing, poverty, and lack of vehicle access. These variables reflect an area's social vulnerability, which refers to, "the potential negative effects on communities caused by external stresses on human health". Another publicly available tool is the Area Deprivation Index (ADI), developed by the Health and Resources and Services Administration (HRSA) and refined by the University of Wisconsin. The ADI ranks census block groups, which is a subdivision of a census tract and the closest approximation to "neighborhoods", by socioeconomic disadvantage including factors in the domains of income, employment, education, and housing quality. Additionally, the ADI is reported in national percentile rankings from 1 to 100, and a block group with a higher ranking indicating higher level of "disadvantage".

While these tools can provide socioeconomic information, are widely available and have been used extensively, they may not capture all the socioeconomic factors or effects of racism underpinning racial disparities in COVID-19-related outcomes. It is also important to note that socioeconomic factors are not perfectly correlated with race and that they represent related but distinct constructs. In fact, race groups should not be seen as monolithic structures but rather we should acknowledge diversity within and among race groups as well. Nevertheless, those tools do offer an initial means to complement the examination and understanding of observed racial health disparities and may be used to more directly represent the underlying hypothesis that socioeconomic differences are a cause of racial disparities. The practical approach recommended by Williams et al dictates that data analyses on racial differences in health outcomes should routinely stratify them by socioeconomic status within racial groups to reduce misspecifying complex health risks and the perpetuation of harmful social stereotypes.<sup>8</sup>

Furthermore, appropriate methodological frameworks are required to better understand the pathways through which the complex, multiple dimensions of race and ethnicity may be associated with different outcomes such as SARS-CoV-2 infections and related control measures. Katikireddi et al aptly introduced a novel framework for examining differences in health outcomes specifically related to the COVID-19 pandemic encompassing both individual proximate causes of disease and societal causes during various stages: 1) differences in exposure to the virus; 2) differences in vulnerability to infection and diseases once exposed; 3) differences in consequences of disease; 4) differences in social consequences; 5) differences in the effectiveness of control measures; and, 5) differences in adverse consequences of control measures.<sup>9</sup> Examination of disparities in health outcomes between racial groups at each stage of this thoughtful framework can help appreciate the complex interplay of underlying personal and societal factors, and potentially reveal targets for intervention.

In conclusion, while awareness of and research on racial disparities in COVID-19 outcomes has increased, limited conceptualization of research frameworks and inappropriate statistical adjustment remain common and problematic. Clarifying upfront the postulated role of race in research hypotheses and using well-designed conceptual frameworks will help avoid unsubstantiated research questions and unwarranted statistical adjustments that perpetuate the same stereotypes studies try to combat. There are publicly available tools measuring socioeconomic factors and conceptual frameworks on the pathways generating inequalities that can be used to expand our understanding of the complex relationship between race, or specifically racism, and the risk of SARS-CoV-2 infection and disease. These considerations can better inform public policies aiming to

advance health equity and improve population health beyond COVID-19.

### Contributors

S.P.M. and C.G.G. equally contributed to conceptualization, literature search and writing of original draft and iterations. V.M.B.M. provided review, commentary, and edits.

### Declaration of interests

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