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## Recommendations for the responsible use and communication of race and ethnicity in neuroimaging research

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### Abstract

The growing availability of large-population human biomedical datasets provides researchers with unique opportunities to conduct rigorous and impactful studies on brain and behavioral development, allowing for a more comprehensive understanding of neurodevelopment in diverse populations. However, the patterns observed in these datasets are more likely to be influenced by upstream structural inequities (that is, structural racism), which can lead to health disparities based on race, ethnicity and social class. This paper addresses the need for guidance and self-reflection in biomedical research on conceptualizing, contextualizing and communicating issues related to race and ethnicity. We provide recommendations as a starting point for researchers to rethink race and ethnicity choices in study design, model specification, statistical analysis and communication of results, implement practices to avoid the further stigmatization of historically minoritized groups, and engage in research practices that counteract existing harmful biases.

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The widespread availability of large-population, open-source datasets in biomedical research, particularly neuroscience, is revolutionizing scientific discovery, heralding an age of great possibility and responsibility in science<sup>1</sup>. Large neuroimaging datasets, especially datasets with more sociodemographically diverse populations, provide an opportunity to create more nuanced models linking brain structure and function to human behavior, as measured by magnetic resonance imaging. However, existing conventional neuroscience and biomedical methodological approaches to analyzing these datasets risk perpetuating systemic racism and reinforcing barriers to achieving equity, particularly in how race and ethnicity are conceptualized, used and discussed during the research process (see Box 1 for a discussion of definitions of race and ethnicity and Box 2 for key terms). While recent events in society have illuminated existing racial inequities as critical contributors to health disparities and social inequities in the USA<sup>2</sup>, there has not always been a strong

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focus on understanding the particular structural, societal and social factors that drive health disparities and may result in ‘race and ethnicity effects’ within behavioral and biomedical research. Systemic racism in the USA has created a false correlation between people’s experiences and genetic or ancestral similarity, thereby conflating the separation of genetics from environmental influences on brain development and behavior<sup>3</sup>. Associations between genetic ancestry, cultural experiences and brain structure and function, therefore, create confounds that can generate spurious brain–behavior associations if not carefully considered and modeled. Thus, answering the call of recent publications to advance an equitable vision of population neuroscience that actively counters years of exclusion of diverse populations and the dismissal of diverse perspectives<sup>4,5</sup>, we must identify and acknowledge the elements that have contributed to stigmatization and systemic bias in neuroscience and actively adopt practices to eradicate their adverse effects.

## Responsible reporting of race and ethnicity in research studies

This paper aims to guide neuroscientists and other biomedical researchers, especially users of large-population datasets (such as the Adolescent Brain Cognitive Development (ABCD) Study; Box 3), in responsibly conceptualizing, using and reporting race and ethnicity. Specifically, we encourage researchers to rethink choices in study design, model specification, statistical analysis and communication of results, implement practices to avoid the further stigmatization of historically minoritized groups, and engage in research practices that counteract existing hurtful biases related to race and ethnicity. The considerations presented here are not exhaustive and are part of an ongoing learning process. Furthermore, the recommendations aim to complement other critical works that challenge structural and systemic racism within biomedical research, including psychology, neuroscience and neuroimaging<sup>6-12</sup>.

The recommendations in this paper align with an antiracist approach, deconstructing the presumed racial hierarchy that is rooted in white supremacy culture (that is, a perspective that prioritizes the white population and asserts the inferiority of minoritized groups)<sup>13</sup>. As such, this paper adopts a view of population health that not only views social conditions as inextricable from health but also considers structures of racism and oppression as fundamental causes of health disparities<sup>14</sup>. The recommendations provided here, although centered on the US sociopolitical context, acknowledge that structures of oppression will vary globally, involving different racial and ethnic groups or other social categories, such as social class, migrant status, religion, caste or indigeneity<sup>15</sup>.

We structure this Perspective into five domains in which biomedical researchers can evaluate and interrupt conventional methodological practices that contribute to stigmatization and systemic bias against minoritized communities. These five research domains are (1) conceptualization and study design, (2) analysis and implementation, (3) application and interpretation, (4) communication and dissemination and (5) research culture and practices. Responsible use and communication of race and ethnicity span multiple levels of the research process. Importantly, intentional progress in dismantling structural and systemic racism, the processes that create racial inequity, will require contributions across several domains. We summarize the 11 recommendations within these five domains in Box 6.

## Conceptualization and study design

At the conceptualization and study design stage, researchers decide what and how research questions will be tested, presenting a natural opportunity for researchers to evaluate the use of race and ethnicity. While all domains of the research process are related (see the figure in Box 6), we believe that decisions made by researchers at this initial stage and how they conceptualize and understand race and ethnicity, including any potential biases, substantially influence downstream analyses and communication in studies.

### **Recommendation 1: Define race and ethnicity as socially constructed concepts whose meaning originates in and is dependent on social, political and historical forces**

Scholars across many fields agree that race and ethnicity are socially constructed concepts—that is, they are constructs whose meaning emerges from historical and current social and political forces (Box 1). Individuals can be assigned or self-assigned to a racial or ethnic social category, although there is no evidence of a biological basis for these categories<sup>3,16</sup>. However, health disparities and psychological outcomes in racial and ethnic minoritized communities (that is, Black, Latinx, American Indian and Pacific Islander communities in the USA) have been misattributed to innate biological differences, that is, biosocial determinism<sup>17</sup> (see ref. 18 for a historical review of racism and human development research). Similarly, any differences between biological features derived from comparing race or ethnicity variables should not be attributed to a ‘race effect’, a difference because of their race. Instead, differences should be attributed to the underlying social and political forces (that is, systemic and structural racism) that give those social categories meaning and uphold racialization. When writing about race and ethnicity in biomedical research, it is essential to mitigate any risk of conflating race and ethnicity with biological features by (1) explicitly communicating that race and ethnicity are social and political categories and (2) acknowledging the social, historical and political forces giving them meaning.

As race and ethnicity are dependent on historical, social and political context, they will be different for each study and population, as structural and systemic racism has played out through differing mechanisms (see Figure 1 in ref. 19 for a detailed timeline of how structural racism has manifested differently for American Indian/Alaska Native, white, Black, Latinx, Asian and Native Hawaiian/Pacific Islander people in the USA). Researchers should particularly refrain from assuming that race and ethnicity categories have identical meanings globally.

### **Recommendation 2: Provide clear categorization and coding rationale for race and ethnicity variables and include race and ethnicity information about study populations**

Recent studies show that only about 20% of NeuroImage and Cerebral Cortex studies reported race and ethnicity information for the populations studied<sup>20,21</sup>. Documenting the sociodemographics of study populations is critical for generalizability, reproducibility and the development of appropriate interventions, especially given the historical propensity to use affluent white Americans as study participants<sup>7,8,22</sup>.

Changes in the US census categories across time (see the Pew Research Center Graphic on changing census categories 1790–present; <https://www.pewresearch.org/interactives/what-census-calls-us/>) illustrate just how social and political shifts drive definitions of race and ethnicity. Further, racial terms have been created to categorize and separate those who should be at the top or bottom of the social ladder<sup>16,23</sup>.

In US biomedical and psychological research, racial and ethnic classifications follow the US Census Bureau, the US Office of Management and Budget (OMB) Directive 15, and the National Institute of Health’s Minimum Reporting Requirements (see Box 4 for an example of how racial and ethnic information is collected and categorized). Globally, harmonizing these categories can be complex, as countries differ in how they measure the diversity of their population. A review of diversity data collection practices across 35 countries from the OECD (Organisation for Economic Co-operation and Development) showed that while all countries collected information on country of birth, only 16 collected information on race and ethnicity, with some countries not being legally allowed to collect data based on race or ethnicity (for example, France)<sup>24</sup>.

Despite these complexities, we encourage researchers to collect and report as detailed population characteristics as possible, using labels and descriptors informed by the terms used by the research population (without compromising participant identifiability). We also recommend that researchers report how race and ethnicity information was collected (that is, self-reported, ascribed) and whether they collapsed multiple categories, describing the rationale for doing so. While no categorical definition of race and ethnicity is exhaustive and without limitations, researchers should be intentional, equitable and responsible for their selected operationalization of race and ethnicity. Resources such as the American Medical Association and American Psychological Association style guides<sup>25,26</sup>, and journal and research organization reporting guidelines, may provide additional, more practical insights on the most appropriate coding and reporting scheme for race and ethnicity for a given study<sup>5,26,27</sup> (see Box 7 for a checklist of recommendations for readers).

### **Recommendation 3: Avoid using race and ethnicity as proxies for social and environmental forces and directly measure those variables instead**

When discussing race and ethnicity in research, there is always a risk that these categories will be misconstrued as innate characteristics rather than outcomes of structural racism and racialization, a dilemma described by Nancy Krieger as the ‘two-edged sword of data’<sup>28</sup>. For example, regression models of brain volume showing a negative coefficient for Black or Latinx individuals may be publicly misinterpreted by racist agents as demonstrating ‘inferior brains’ (see ref. 29 for more examples of modern-day ‘race science’). Research may inadvertently harm minoritized groups without contextualizing these terms with relevant socioeconomic and environmental factors. Race should not be a stand-in for variables such as income, education or neighborhood conditions. Race is not a proxy for environmental factors. While race and ethnicity may help to document the sociodemographic makeup of a research sample, their utility and meaning are limited when introduced into a statistical model because race and ethnicity are complex dynamic constructs that do not directly map onto a set of observable measures.

Race and ethnicity reflect many upstream forms of oppression and sociopolitical forces<sup>30</sup> and thus are highly related to other socially constructed proxies that reflect socioeconomic status (SES) or position, such as educational attainment, household income and occupational prestige. Thus, researchers should not treat race and ethnicity as separate from SES variables and automatically control for when investigating socioeconomic circumstances, nor should they be seen as synonymous with SES (that is, assuming minority racial and ethnic membership is equivalent to having low SES). Research on SES and social determinants of health should not control for race and ethnicity and obscure the specific impacts of systemic racism on minoritized communities. Instead, acknowledging the sociopolitical backdrop in which these constructs operate is essential.

Research exploring social, environmental and structural determinants of health has identified a wide range of variables that may be useful in exploring the underlying constructs contributing to racial and ethnic health disparities. For example, the ABCD Study leverages linked external data to geocoded residential information to provide detailed insights into neighborhood and environmental conditions beyond what SES can capture<sup>31,32</sup>. Yet it is vital to recognize that these ‘objective’ environmental measures are still affected by systemic racism and should be interpreted accordingly<sup>12</sup>. The ABCD Study also collects self-reported measures behind racial and ethnic health disparities, such as perceived discrimination, resource scarcity, perceived neighborhood safety and school dynamics, among many others (for examples, see refs. 33-37). Using these specific variables allows for more accurate modeling that reduces the risk of reinforcing harmful stereotypes compared to using race and ethnicity as proxies.

## Analysis and implementation

### **Recommendation 4: Justify the inclusion of race and/or ethnicity in statistical models, and avoid including them by default**

Another challenge is the inclusion of race and ethnicity as a ‘covariate of no interest,’ ‘control variables’ or ‘nuisance variables’ without providing the appropriate rationale. While the default decision to ‘control for race and ethnicity’ may be tempting because of standard practice or statistical considerations, researchers should consider what is being ‘controlled for’ when including race and ethnicity as covariates. Using race and ethnicity as proxies for various constructs, however, creates ambiguity and inadvertent support for harmful stereotypes (that is, that individuals from minoritized groups are ‘biologically different’). Race and ethnicity are often included as confounder variables by authors, despite not providing a definition or operationalization of these variables in their papers, and without evaluating whether race and ethnicity fulfill or violate the assumptions of their causal framework (for example, a potential outcomes framework)<sup>38</sup>. In the case where reviewers or editors require researchers to control for race and ethnicity (see recommendation 11), researchers can acknowledge the shortcomings and additional assumptions now baked into their models, and use alternative methods, such as effects coding or mean effects coding, which do not require selecting an explicit reference category<sup>39</sup>. To further explore statistical research assumptions and practices that may contribute to systemic racism, we encourage readers to explore frameworks such as QuantCrit (Box 5).

Given that race and ethnicity are socially constructed concepts (see recommendation 1), the assumption that white people, often the majority group in the sample, should be the reference group can add additional complications in sociodemographically diverse samples when investigating constructs associated with racialization, and structural and systemic racism (that is, SES, neighborhood disadvantage and most environmental exposures). While authors may justify the inclusion of race and ethnicity variables as variables representing long-standing effects of systemic racism and historical segregation, race and ethnicity do not directly equate or map entirely onto these societal and historical factors.

### **Recommendation 5: Race and ethnicity should not be equated with genetic ancestry**

Historically, race was adopted as a means to categorize and classify individuals within the social hierarchy. Efforts throughout history, which we will call ‘race science’, have attempted to search for biological differences between racial groups to reinforce and justify the social hierarchy (see refs. 29 and 16 for in-depth discussions). Despite the Human Genome Project’s 2005 findings and overwhelming recommendation to move away from race categories in genetics research, race continues to be used as a biological variable in many studies today<sup>40</sup>. The National Academies of Science, Engineering, and Medicine (NASEM) recently issued a report reviewing and assessing existing genomics research and provided several recommendations on using race, ethnicity, ancestry and other population descriptors<sup>41</sup>. In addition to asserting that race does not have any biological basis, the NASEM report warns against the use of broad continental labels (that is, African, European, Asian, Native American and Oceanian ancestry) or socially constructed racial and ethnic categories in genetics studies, as they may reinforce typological views of human genetic ancestry that mischaracterize the complex nature of genetic ancestry and imply hierarchies, homogeneity and stability over time of groups. Although genetic similarity, a quantitative measure of the genetic resemblance between individuals that reflects the extent of shared genetic ancestry, is important for genetic studies, assigning ancestry group labels based on geography, ethnicity or race is often scientifically unnecessary. Specifically, the report suggests strong skepticism regarding claims of genetic causation of disease differentials (that avoid discussion of gene–environment interactions) among socially defined groups in the USA since, to quote Joseph Graves Jr, "Racially subordinated populations (such as Amerindians, Latinx, and African Americans) have never lived in environments that are equivalent to the socially dominant European population"<sup>3</sup>.

Instead of using geographic or continental labels, the NASEM report suggests using measures of genetic similarity (for example, principal component analysis (PCA)) instead of those dependent on continental or racial/ethnic labels. When the goal is to conduct the study on a set of individuals who are more genetically similar, researchers can characterize the study population in terms of their genetic similarity to one another or to a reference panel (for example, ‘individuals projecting to the region [−0.1,−0.04] in PC1 and [0.2, 0.6] in PC2 of a PCA generated from the 1000 Genomes dataset<sup>41</sup>). Another suggestion by the report when using genetic similarity measures and a reference dataset, such as the 1000 Genomes Project, is to use a sample abbreviation and the suffix ‘like’ (for example, using 1KG-YRI-like individuals’ for ‘individuals with a pairwise genotypic dissimilarity



less than  $10^{-3}$  to the Yoruba of Ibadan sample of the 1000 Genomes Project'), which avoids continental labels and invites readers to read methods more closely.

## Application and interpretation

### **Recommendation 6: Evaluate biases in population representation and participation, measurements, patterns of missingness and generalizability**

Addressing biases affecting historically minoritized populations is crucial for advancing scientific equity and rigor. Biases in recruitment and inclusion of historically minoritized groups greatly limit how much we can generalize findings<sup>8,10,22</sup>. Notable biases include the underrepresentation of historically minoritized populations in study populations, the overrepresentation of wealthy white families in developmental neuroimaging research when excluding based on motion correction thresholds<sup>42</sup>, that anatomical templates were not derived from diverse populations, the restriction of genetics research to those of European ancestry, that many measures may not have been normed with diverse samples, and so on. Further research and discussion are needed for each of these issues, as they are critical for developing truly inclusive and antiracist methods for research. In addition to the overall representation of the sample population, researchers should evaluate whether planned or implemented study measurements (that is, self-reported measures and assessments, exclusion/inclusion criteria, magnetic resonance imaging measures) contain any systematic biases.

Researchers should evaluate the sociodemographic composition and representation of the final analytic sample compared to the original sample, as these impact the generalizability of findings from a given study. While more recent neuroimaging cohorts consist of larger sample sizes, they may not comprise the composition of the whole population (that is, the USA for the ABCD Study and the Human Connectome Project) and, therefore, may overrepresent some populations while underrepresenting others, which may be further exacerbated by recent evidence indicating bias based on the exclusion criteria of neuroimaging studies<sup>42</sup>. Yet another factor that can contribute to a bias in study populations and their responses may be related to nonrandom patterns of missingness for particular populations, which may be due to study demands, the language of study materials or congruency between participant culture and research culture. Even in the case of a representative sample, the sample sizes for some minoritized populations may not be enough to justify a stratified sample, possibly resulting in erroneous and harmful findings (see ref. 43 for examples of problematic uses of data about American Indian people, and recommendations for utilizing data to advance health among American Indian and Alaska Native populations). In some cases, the sample sizes might be small enough that reporting them might risk participant identification. While some statistical approaches may attempt to adjust or correct for bias in representation, such as the use of post-stratification or non-participation scores, researchers should be mindful that if race and ethnicity (or any other sociodemographic variable used to compute post-stratification weights) are associated with any features or variables in a model, these adjustments may introduce new biases<sup>44</sup>. Researchers must be aware of and address these potential distortions in their analyses.

### **Recommendation 7: Avoid ‘health equity tourism’ by acknowledging prior equity work, and interrogating upstream causes instead of simply exploring ‘race and ethnicity effects’**

In the wake of George Floyd and Breonna Taylor’s murders and the ongoing efforts of the Black Lives Matter movement in 2020, biomedical research saw a surge in ‘health equity tourists’—individuals who superficially engage with race or ethnicity in research without a deep understanding of the variables or the historical and systemic context of racial and ethnic health disparities<sup>45</sup>. This rise in consciousness around systemic racism saw a spike in medical journal articles mentioning ‘racism’ in the year 2020. However, in the 30 years prior, only 1% of over 200,000 articles had ever acknowledged it, with the majority of those articles being opinion or commentary pieces instead of empirical papers<sup>46</sup>. This potentially superficial engagement risks diluting established equity-focused research and overlooking sustained efforts by minority researchers dedicated to health equity (see ref. 45 for discussion of how urgency during the start of the coronavirus disease 2019 pandemic led to papers claiming a link between Black physiology and increases in coronavirus disease 2019 rates). This trend toward health equity tourism has led to research that superficially examines ‘race effects’ or ‘ethnicity effects’ without genuinely engaging with the meaning of these terms or with established research on racial and ethnic health disparities. Such endeavors do not equate to health disparities research, as health disparities research is motivated by interrogating upstream causes or determinants that give rise to the observed health disparities between populations that benefit from structural advantage (that is, white populations) and historically minoritized populations<sup>47,48</sup>.

Health disparities research should be driven by the goal of beneficence and being motivated to design research processes and questions to benefit those populations facing disparities. Public health critical race praxis (PHCRP), informed by critical race theory (CRT), advocates for ‘centering the margins’—prioritizing the needs of minoritized populations<sup>49-51</sup>. Coupled ethical–epistemic analysis, an approach derived from environmental science and public health, intertwines ethical and knowledge-based considerations and encourages researchers to evaluate ethical implications alongside the scientific inquiry process and to understand their interplay<sup>52-54</sup>. Adopting frameworks such as these helps antiracist researchers to ensure their work focuses not only on doing no harm, but also on doing good.

## **Communication and dissemination**

### **Recommendation 8: Champion strength-based approaches, instead of deficit-based, when reporting on minoritized groups and prioritize the inclusion of minoritized voices in the research process**

Strength-based approaches recognize individuals and communities for their assets, resources and potential, advocating for narratives that empower rather than diminish and provide a constructive alternative to deficit-focused narratives that highlight perceived weaknesses and minimize the strengths of individuals or communities<sup>12</sup>. Although structural and contextual factors may result in adverse health effects for some populations relative to others, authors should avoid generalizing these negative health effects across domains and equating them to ‘impaired’ functioning. While deficit-focused models may help identify



adverse health outcomes, they may perpetuate a cycle of negative beliefs and contexts that imply populations experiencing these disparities need ‘fixing.’ Use of deficit-based language such as ‘vulnerable,’ ‘at risk,’ ‘distressed’ or other qualifiers can suggest a lack of agency and incorrectly place the onus of disparities on the individuals themselves. For example, deficit models can lead to attributing health behaviors in minoritized youth to differences in culture, in contrast to white youth whose development is attributed mainly to psychological processes (see ref. 55 for more on the cultural (mis)attribution bias), perpetuating the notion that ‘deficits’ may be driven by differences in cultural practices.

Shifting to strength-based approaches allows for a more nuanced portrayal, recognizing both the adversities faced and the resilience of minoritized communities. By focusing on community assets and resilience, research narratives can transform from highlighting vulnerability to celebrating the ability to thrive despite systemic challenges. One example is described in ref. 56, where community factors are measured in the context of not only structural racism but also structural resilience.

Engaging minoritized voices in the research process, not only as subjects but also as active contributors, is essential to creating an inclusive narrative. Counternarratives, a key component of PHCRP and CRT, use first-person accounts to showcase positive experiences within structurally oppressed communities, challenging deficit-based language and further stigmatization. In this way, researchers can hand the microphone to minoritized individuals to amplify their voices and perspectives.

Many tools and methods allow researchers to extend their research endeavors outside the ‘ivory tower’ and involve their study communities. Techniques such as focus groups and qualitative interviews can help ensure that research instruments accurately reflect participants’ realities and that interpretations of data avoid reinforcing stigmas.

Collaboration with community leaders through liaison boards or town hall meetings can also uncover insights into potentially problematic research aspects and contribute fresh perspectives to the study. Researchers can explore participatory action research and community-based participatory research as methods for centering the experiences of historically minoritized groups in their work. Such inclusive methodologies increase the relevance and impact of research and ensure that findings are communicated with respect for the diverse and complex realities of human experiences. We urge neuroscientists and other biomedical researchers to consult existing literature on these community-focused research methods to guide the transformation of their practices toward a more equitable and community-engaged approach<sup>57-59</sup>.

## Research culture and practices

### **Recommendation 9: Develop a plan for responsible use and communication of race and ethnicity in your research process**

Developing a plan within one’s research team to interpret and apply practices for responsible use and communication of race and ethnicity is critical for advancing equitable research communication practices. While the neuroscience community is increasingly aware of

systemic racism's impact on research, the scholarship in this area, including CRT and intersectionality theory, predates recent discussions yet often goes unrecognized owing to the historical marginalization of scholars of color, particularly women<sup>60,61</sup>. Thus, we have a prime opportunity to educate ourselves on frameworks and perspectives highlighting ways to incorporate antiracism principles into our research practices, such as PHCRP<sup>49-51</sup>.

While this Perspective provides recommendations, in the end, each research project will require a tailored plan, depending on the measures used, the subset of the sample population and the geographical and historical context of the research. As described in previous sections, while 'race' and 'ethnicity' are constructs often used in research, their use is quite variable. For ABCD Study users, we invite readers to see ref. 62 for a list of questions developed by ABCD Study researchers for authors to consider as they research diverse samples.

We suggest the following recommendations to develop a robust research plan for the responsible use of data with race and ethnicity. First, explore and identify research frameworks or theories to ground your operationalizations of race and ethnicity variables. The 'appropriate' framework for race and ethnicity will depend on the specific outcome variables, sample and methods for a given study. We have described several frameworks, such as PHCRP and QuantCrit (Box 5), that may be useful. Second, cultivating a research environment that advances its members' cultural and structural competence is crucial for the responsible use and communication of race and ethnicity. An antiracist environment includes not only considering many of the recommendations in this paper but also evaluating how issues of systemic racism extend to research practices as a team and as individuals. In particular, it is essential to evaluate training and education efforts and how they may negatively impact the training experience and success of minoritized scholars as researchers<sup>63,64</sup>, as this will be crucial for the sustainability of future antiracist efforts in neuroscience research.

### **Recommendation 10: Embrace that responsible use and communication of race and ethnicity requires continuous intention and engagement**

To catalyze change in research, we must proactively and collectively understand how systemic racism influences our methodologies. Enacting change involves engaging with publications that include critical critiques of methods, frameworks and practices, engaging our collaborative networks to discuss problematic practices in our research flows and amplifying uniquely insightful voices of historically minoritized groups. Recognizing that race and ethnicity are social constructs, it is vital to accept that the responsible handling and communication of these concepts require continual learning. The changing nature of systemic racism demands constant vigilance; as we address one manifestation, others emerge. As long as racial and ethnic constructs correlate with health disparities, we must relentlessly examine the influence of systemic racism on our research methods. Effective communication about race and ethnicity transcends adherence and compliance; it necessitates ongoing education and introspection. Thus, a simple checklist or flowchart cannot replace a tailored plan specific to each research project. No one-size-fits-all blueprint exists for addressing racial/ethnic structural inequity in neuroscience research.

### **Recommendation 11: Challenge standard conventions in the scientific process that are harmful to minoritized groups**

Harmful practices can be unintentionally reinforced by applying the conventional standard approaches, using justifications such as ‘what has always been done before’ while ignoring contemporary discussions that advance our conceptual understanding of the forces that give rise to systemic racism. As gatekeepers of knowledge, researchers have the responsibility to challenge and discontinue conventional approaches that cause harm to historically minoritized populations. As such, several researchers have now delineated essential practices to mitigate the negative portrayal of historically minoritized groups and to eliminate barriers that limit the participation of minoritized groups in developmental neuroimaging studies<sup>65-67</sup>.

### **Conclusion**

The availability of human biomedical datasets with dense phenotypic and genetic data on demographically diverse individuals across the US population has provided an essential opportunity for research into health disparities among minoritized, underrepresented groups. This endeavor demands a sophisticated grasp of demographic constructs, such as race and ethnicity, which transcends simplistic categorical variables. Biomedical researchers must consider the entire array of cultural and environmental factors that influence development and behavior, often aligning with self-identified race or ethnicity owing to historical systemic biases. Differentiating the variability in brain–behavior links is crucial to clarify misleading notions of biological determinants of race and to identify actionable factors to rectify health disparities.

Importantly, the brain does not develop in isolation; common genetic variants shape it, yet experiences throughout life also modulate our unique models of the world, influencing behavior and variability in brain structure and function at multiple levels of abstraction. Systemic racism in the USA intertwines individuals’ experiences with genetic or ancestral backgrounds, blurring the lines between environmental and genetic influences on brain development. Therefore, biological or genetic inferences of brain or behavioral differences across minoritized groups cannot be drawn with high confidence. Associations between genetic ancestry, cultural experiences and brain structure and function, therefore, create confounds that can generate spurious brain–behavior associations if not carefully considered and modeled. Understanding the complex landscape of genetic, cultural, socioeconomic and environmental factors experienced by the research participants in population neuroscience datasets is essential to model and interpret brain–behavior associations accurately and fairly and avoid stigmatizing inferences. While best practices for increasing our understanding and modeling of these factors are emerging and will evolve with broader education and structural shifts in society, we strongly urge the research community to remain intentional and thoughtful in their efforts to eliminate future harm.

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**BOX 1****Theoretical influences****What are race and ethnicity?**

While definitions vary, race and ethnicity are commonly used to describe and categorize individuals in US society. Here, we define race as a socially constructed classification used to divide humans into groups based on biased judgments of physical characteristics and appearance, and which have been historically politically driven and used to establish social hierarchies<sup>3,68</sup> (see ref. 69 for a ‘multidimensional’ definition of race). Ethnicity, often tied to race, is also a social construct used to categorize diverse populations and establish personal and group identity<sup>70</sup>. The meaning and labels of these terms have changed according to contemporary political and social trends and represent the cumulative and dynamic forces (that is, systemic, interpersonal and internalized racism) that result in the differential racialization of individuals, or how individuals are ‘raced’ within a social system. While different racial and ethnic groups may engage in various cultural practices, researchers should be mindful not to use ‘race,’ ‘ethnicity’ and ‘culture’ as interchangeable terms in their papers.

**Critical race theory (CRT)**

We strongly draw from CRT, a framework of legal analysis engaged in studying and transforming the relationship between race, racism and power across dominant cultural forms of expression<sup>71,72</sup>. For decades, scholars and activists of CRT have researched and evaluated ways in which racism is inherent and present in law and legal institutions of the USA, and as such creates and maintains socioeconomic and political inequities between white and other, racial and ethnic minoritized, communities (in particular, Black and African Americans, Latinx, Asian and Native Americans). The CRT framework, applied in many fields, provides a way to interrogate the social mechanisms and factors through which race and ethnicity converge on meaning in society. While a detailed discussion of all of CRT is beyond the scope of this paper, many CRT scholars endorse the following tenets or principles<sup>71</sup>:

- Race is socially constructed, not biologically innate.
- Racism in the USA is embedded within the structure of society and is normal (ordinariness). This ordinariness makes it challenging to acknowledge, although it plays an integral role in how people are racialized.
- Because racism advances the interests of all white people, both affluent and working-class, there is little incentive to eradicate racism in a large segment of society. Also referred to as interest convergence or material determinism, this means that advances for people of color occur only when they tend to serve the interests of dominant white groups.
- Members of minority groups periodically undergo differential racialization depending on the needs or interests of white people.

- No individual can be adequately identified by membership in a single group (intersectionality, anti-essentialism).
- People of color are uniquely qualified to speak on behalf of their own group(s) regarding the forms and effects of racism (voice of color).

**Public health critical race praxis (PHCRP)**

In addition, our recommendations are strongly influenced by the PHCRP, an instrumental framework initially put forth by Chandra Ford and Collins Airhihenbuwa, which concretely outlines how CRT can be applied to equitably advance health-focused research among minoritized groups<sup>49-51</sup>.

**Additional frameworks**

This is not the first and is likely not to be the last article that aims to provide discussion and recommendations on the use and communication of race and ethnicity in research studies (see refs. 73 and 30 for a discussion of these topics almost two decades ago). The discussions and recommendations within this Perspective have been greatly influenced by the Leeds Consensus Statement on Ethnicity Research<sup>74</sup>, a set of recommendations developed in 2013 by human participant researchers from diverse fields with the intention of creating global guidelines for the responsible use and communication of ethnicity.

We also acknowledge the efforts in other fields, such as public and population health, social epidemiology, and education, which have inspired our recommendations in the field of neuroimaging<sup>75-79</sup>. To learn more about the critical inquiry frameworks that have influenced this paper and pushed scholars, such as ourselves, to critically examine the structural forces of oppression that operate our process as researchers, we invite readers to examine works on QuantCrit<sup>80</sup>, PsyCrit<sup>81</sup> and liberation psychology<sup>82</sup>.

**BOX 2****Useful key terms for discussing and promoting equitable analytic models in neuroscience****Systemic racism:**

The set of societal practices, beliefs, values and policies that were created to disempower, disadvantage and exclude people on the basis of race and ethnicity such that power is upheld and concentrated among the group with historical power (for example, white people have historically held power in the USA and other Western regions in the form of access to privilege, resources, opportunities and decision-making)<sup>2</sup>.

**Structural racism:**

Societal-level systems (for example, laws, policies, health systems, criminal procedures and built environment) that create, uphold and justify unequal distribution of power and resources to benefit some while disadvantaging other racial and ethnic groups<sup>2,83-85</sup>.

**Discrimination:**

Negative differential treatment of a group of people due to prejudices about their identity (for example, exclusion or hostile treatment due to ethnicity or gender)<sup>56</sup>.

**White supremacy culture:**

An ideology that presumes white people are superior to people of other races<sup>13,86</sup>. In the USA, white supremacy culture manifests in all aspects of society, primarily through a socially conditioned view that whiteness is the dominant culture for accepted norms. For further reading on white supremacy culture, and how this ideology permeates across all levels of American culture, see ref. 13.

**Racialization:**

The process of attributing racial meaning to an identity unrelated to race, including attributing racial meaning to social systems and practices or groups<sup>83</sup>; see also differential racialization<sup>87</sup>.

**Minoritized groups:**

Socially defined groups (for example, racial and ethnic communities) that have been historically marginalized or excluded systemically through oppression (that is, structural racism)<sup>86</sup>.

**Biosocial determinism:**

The idea that socially and culturally constructed factors, such as race and ethnicity categories, are related to innate biological differences in neural structure and/or function<sup>17</sup>.

**Antiracism:**

A stance that supports the active deconstruction of practices, attitudes, systems and policies that uphold a racial hierarchy or the superiority of one race over another. This

stance acknowledges racism in society, rather than the individual person, as the root cause of racial inequities. This includes dismantling processes that perpetuate white supremacy culture and instead implementing practices that promote equitable distribution of power and resources across all racial and ethnic groups<sup>86</sup>.

**Equity:**

An ongoing process to overcome barriers and achieve justice and fairness to correct imbalances in access and power, acknowledging that not everyone started from the same place owing to systemic and structural racism (note: differentiated from equality, which means providing the same to everyone).

**Health disparities or inequities:**

Health disparities or inequities are potentially avoidable differences in health (or in health risk or disease burden) among a group of people who are disadvantaged as a result of systemic factors, including racism, biases and discrimination<sup>47,48</sup>. Racial or ethnic inequities refer to differences in health based on race or ethnicity.

**Health equity tourism:**

Opportunistic engagement in health equity research by those who have no prior experience, or intentional or sustained commitment to the field, motivated by the pursuit of timely and temporary increases in interest and opportunities<sup>45</sup>.

**Strength-based approach:**

Focuses on social and cultural assets and resources among individuals and communities in support of narratives that empower minoritized groups, instead of deficit narratives<sup>12</sup>.

**Intersectionality:**

A consideration that people can identify with and have multiple memberships to social identities (for example, race, ethnicity, sex, gender and SES) creates unique and different lived experiences and exposures to inequities<sup>86</sup>.

**Stigmatization:**

Attributing a characteristic to someone or a group so as to project a negative view of their social identity, including exercising exclusion or unfair treatment on the basis of a characteristic<sup>88</sup>.



**BOX 3**

**The ABCD Study**

Throughout this Perspective, we use the ABCD Study—a demographically diverse pediatric dataset with which the authors have expert knowledge—as an example, to highlight important challenges with regard to race, ethnicity and social inequities, and to discuss opportunities in response to these challenges. The ABCD Study is a landmark, large-scale study taking place in the USA that holds promise in helping to advance our understanding of adolescent health and development. The ABCD Study is a longitudinal study collecting neuroimaging, neurocognitive, genetic, physiological, psychosocial and other behavioral data from more than 11,000 sociodemographically diverse youth recruited from 9–10 years of age, from across the USA, to investigate the host of factors that may affect adolescent health<sup>89,90</sup>. Enrollment to the ABCD Study occurred between 2016 and 2018, with annual visits of participants planned for up to 10 years. As a commitment to open and reproducible science, data from the ABCD Study are publicly available for users to access, further highlighting the importance of addressing the responsible use of these data<sup>1,91-94</sup>, and the perpetuation and reproduction of narratives and practices that impact historically minoritized populations as a result of their misuse.

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**BOX 4****An example of measuring and classifying race and ethnicity using a US sample**

In the USA, race and ethnicity are usually collected by self-report using two survey questions, based on the recommendations from OMB Directive 15 (see recommendation 2):

1. A question asking about race with the following minimum categories:
  - American Indian or Alaska Native,
  - Asian or Pacific Islander,
  - Black or African American, and
  - White
2. A question asking about ethnicity with the following minimum categories:
  - Hispanic origin, or
  - Not of Hispanic origin.

From there, how the responses to those two questions are coded is left up to the researcher(s). Here we present an example of one coding scheme commonly used in a number of research studies, including the ABCD Study and its curated releases (more information on available data at <https://abcdstudy.org/scientists/data-sharing/>). We present some benefits of using this scheme, and some limitations and points for consideration. The purpose of this example is to provide a point of reflection for researchers, and whether this scheme is appropriate or not for any given study depends on the question, goals and population.

In the ABCD Study, caregivers are presented with the following two questions with the following response options:

1. What race do you consider the child to be? Please check all that apply.
  - White
  - Black/African American
  - American Indian, Native American
  - Alaska Native
  - Native Hawaiian
  - Guamanian
  - Samoan
  - Other Pacific Islander
  - Asian Indian
  - Chinese

- Filipino
- Japanese
- Korean
- Vietnamese
- Other Asian
- Other race
- Refuse to answer
- Don't know

2. Do you consider the child Hispanic/Latino/Latina?

- Yes
- No
- Refuse to answer
- Don't know

The following steps are then taken to code participant responses to create the 'race\_ethnicity' variable, which categorizes participants into exclusive ethnoracial categories:

1. Any response indicating 'yes' to the Hispanic/Latino/Latina question is coded as 'Hispanic/Latino'
2. Any response that only indicated being white is coded as 'non-Hispanic white'
3. Any response that only indicated being Black/African American is coded as 'non-Hispanic Black'
4. Responses that only indicated Asian Indian, Chinese, Filipino, Japanese, Korean, Vietnamese or other Asian are coded as 'non-Hispanic Asian'
5. Responses that indicated more than one race, and those that indicated American Indian, Native American, Alaska Native, Native Hawaiian, Guamanian, Samoan, other Pacific Islander or other race are coded as 'multiracial/other'

This construct may be useful in specific scenarios, including:

1. Comparing estimates to other census-derived effects and describing population-level trends
2. Examining small subsamples that risk the identifiability of participants, or
3. Accounting for Hispanic and Latinx individuals who do not feel represented when asked to report their race<sup>95</sup>

However, this combined ethnoracial construct has the following limitations:

1. It contributes to the ongoing erasure, invisibility and lack of recognition of various important populations, such as those that identify as American Indian and Alaska Native, Native Hawaiian or Other Pacific Islanders.
2. This coding scheme also contributes to the lack of recognition of Middle Eastern or North African as a social category, as this has historically been subsumed under the white category, and is not reflected in any of the response options.
3. Including multiracial along with the 'other' category ignores a growing number of people in the USA and ignores Afro-Latinx and Indigenous Latinx individuals.

How to improve on this classification structure?

With the growing availability of datasets, researchers may not have much input into how these questions are administered during the study. However, we suggest that researchers do any of the following:

1. Include a list of all available response options and the coding scheme for aggregated race/ethnicity variables in the methods section or in the supplementary information (as space allows).
2. When using an 'other' label, list out the categories aggregated into this category in the legend or footnotes of a table, and the justification for aggregating race and ethnicity categories.
3. Identify the limitations of the coding scheme and the categories that it leaves out.

**BOX 5****QuantCrit: a framework to critically examine the use of race and ethnicity in statistical models****Quantitative CRT (QuantCrit)**

QuantCrit is an interdisciplinary framework that applies principles from CRT to quantitative research methods to critically examine the ways in which race, ethnicity and racism permeate statistical approaches and models. Importantly, QuantCrit challenges hidden assumptions, biases and power dynamics that may perpetuate racial inequity or misrepresentations<sup>80,96,97</sup>. QuantCrit scholars (that is, scholars who engage in critical approaches to quantitative inquiry<sup>30</sup>) have identified a number of assumptions and research practices that uphold white-centric practices in quantitative research as normative and thus, in turn, invalidate or minimize the experience of minoritized populations.

**QuantCrit applied to quantitative human neuroimaging studies**

Importantly, QuantCrit acknowledges the principle of non-neutrality of numbers<sup>98</sup>. One example of this is using a categorical variable for race and ethnicity and assigning white as the reference group to then control or account for race and ethnicity. This results in the use of a broad and socially constructed variable to explicitly provide a correction for being different from the majority reference group. While this may be useful in descriptive epidemiological research, where the purpose is to describe the average racial outcome disparity between two different relevant social groups (see Quincy Thomas Stewart in ref. 30), most researchers do not provide an operationalization or framework through which to interpret race and ethnicity, instead justifying this decision on the basis of standard convention. In fact, most researchers ‘accounting for race and ethnicity’ use ‘white’ as the default reference category, and thereby promote the notion that ‘baseline’ is contingent on ‘white=neutral’<sup>99,100</sup>, and that minoritized groups are deviations from what is considered or expected as ‘typical’<sup>39</sup>. QuantCrit thus recommends that scholars draw from theoretical frameworks that consider systemic inequity as part of the equation and acknowledge how variation in outcomes is influenced by oppressive forces.

QuantCrit scholars have identified three moments in the quantitative research process in which researchers can interrupt and change research practices that center, or prioritize, white narratives and perpetuate racial inequity. In brief, QuantCrit articulates a set of recommendations for researchers to position their analysis to practice antiracism throughout three moments of the quantitative research cycle: (1) adaptation of antiracism stance during the initial development of research questions and selection of measures or variables, (2) a critical evaluation of role of race/ethnicity in your analysis, and (3) the use of a theoretical framework that adapts a strength-based interpretation of results and explicitly considers the role of systemic inequities and oppression. For instance, instead of controlling for non-white racial and ethnic group membership, one could use mixture modeling to investigate subgroup heterogeneity (that is, latent variables derived from observed variables or indicators, and correspond to a pattern of indicators rather than a categorical variable)<sup>98</sup>. Another example is to conduct separate models by group, for

example, performing a separate latent class analysis for each group, if the researcher has a theoretical informed hypothesis that posits unique effects within each group<sup>78,99</sup>.

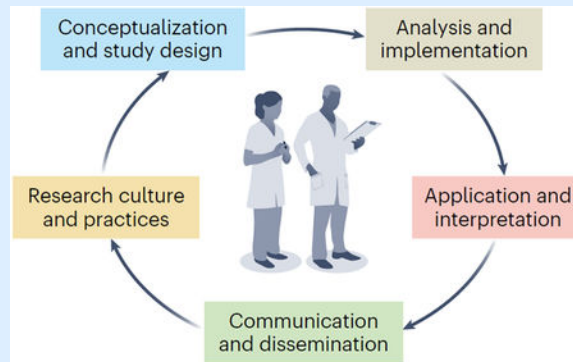
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**BOX 6****Summary of recommendations for the responsible use and communication of race and ethnicity in neuroimaging research****Domain 1: Conceptualization and study design**

Recommendation 1: Define race and ethnicity as socially constructed concepts whose meaning originates and is dependent on social, political and historical forces.

- If race and ethnicity are mentioned in your papers or studies, communicate explicitly how you are addressing the social, historical and political forces of racialization that give meaning to race (race as a social construction, not biological significance).
- Frameworks such as CRT and PHCRP can be useful to contextualize forces that result in race and racism (Box1).
- Consider the local context of your sample and the relationships that race and ethnicity can have with other social categories such as religion, indigeneity and migrant status.

Recommendation 2: Provide clear categorization and coding rationale for race and ethnicity variables and include race and ethnicity information about study populations.

- Include detailed sociodemographic information, including race and ethnicity, about your sample, disaggregated as much as possible.
- Include a description of all response categories available, and avoid using 'other' as a label. If using 'other', list all of the categories being aggregated somewhere in your paper.
- Specify the rationale and coding scheme used to summarize race and ethnicity information (for example, summarizing race and ethnicity information separately, or using a combined ethnoracial construct)

Recommendation 3: Avoid using race and ethnicity as proxies for social and environmental forces and directly measure those variables instead.

- Do not assume that race and ethnicity are independent or equivalent to other social and political constructs, particularly SES.

**Domain 2: Analysis and implementation**

Recommendation 4: Justify the inclusion of race and/or ethnicity in statistical models, and avoid including them by default.

- Avoid using race and ethnicity as ‘covariates of no interest,’ ‘control variables’ or ‘nuisance covariates’ by default (ask yourself: is there another variable that more closely captures the phenomenon I want to describe?)
- If you will be introducing race and/or ethnicity variables into your models, describe the construct they represent (ask yourself: what do race and ethnicity mean in my model?).
- Consider whether the race and ethnicity variables in your model are perpetuating the stigmatization of minoritized populations by implying biological essentialist interpretations, and neglecting to acknowledge race and ethnicity as socially constructed concepts.
- Acknowledge the implications and limitations of setting ‘white’ as the reference group and ‘accounting for race and ethnicity’. This uses a broad proxy variable to suggest that minoritized groups are deviants relative to a white group.

Recommendation 5: Race and ethnicity should not be equated with genetic ancestry.

- Avoiding using and interpreting genetic ancestry factors as interchangeable with race and ethnicity (see ref. 41).
- Avoid using genetic ancestry factors with labels (that is, ‘African’, ‘European’, ‘Asian’ and ‘American’) of continental regions and/or race-ethnicity categories, and instead use measures of genetic similarity (such as PCA labels PC1 and PC2).
- When using a reference dataset, researchers can use an abbreviation of the dataset and the suffix ‘-like’ (for example, 1KG-YRI-like to describe individuals from the 1000 Genomes Project), which requires reading more information about methods, instead of using broad social categories for understanding.
- Define, describe and make clear the differences among race, ethnicity, genetic ancestry and genetic similarity in your papers.

**Domain 3: Application and interpretation**

Recommendation 6: Evaluate biases in population representation and participation, measurements, patterns of missingness and generalizability.

- Consider how the underrepresentation of historically minoritized populations in neuroimaging may impact the norms used on exclusion criteria (including motion correction thresholds), anatomical templates and normed scores for measurements.
- Evaluate missingness patterns in study samples.

Recommendation 7: Avoid ‘health equity tourism’ by acknowledging prior equity work, and interrogating upstream causes instead of simply exploring ‘race and ethnicity effects’.

- Prioritize beneficence, and center the experiences of minoritized communities when conducting health disparities research.
- Focus not only on the numerical gaps in an outcome based on race and ethnicity, but rather on the upstream factors that cause the gaps.

#### **Domain 4: Communication and dissemination**

Recommendation 8: Champion strength-based approaches, instead of deficit-based, when reporting on minoritized groups and prioritize the inclusion of minoritized voices in the research process.

- Avoid language and models that focus only on the perceived weaknesses of a population (for example, ‘vulnerable’, ‘at risk’ and ‘distressed’).
- Focus on assets and strengths of communities, and present counterexamples of stereotypes and positive examples (‘counternarratives’) of individuals from minoritized populations.
- Cite scholars from the groups being the focus of research, and use community-focused or participatory methods (for example, community advisory boards) when possible.

#### **Domain 5: Research culture and practices**

Recommendation 9: Develop a plan for responsible use and communication of race and ethnicity in your research process.

- Explore and implements a research framework or epistemological theory to ground your operationalizations on race and ethnicity. Some examples of these include PHCRP or the National Institute for Minority Health and Health Disparities framework.
- Cultivate research environments that advance the structural competence and cultural humility of its members.
- Think about the recommendations provided in this document and how they may manifest in your research.

Recommendation 10: Embrace the idea that responsible use and communication of race and ethnicity requires continuous intention and engagement.

Recommendation 11: Challenge standard conventions in the scientific process that are harmful to minoritized groups.

**BOX 7****Guided checklist for research on social stratification in human neuroimaging research****Generating the research question and introduction**

- **History:** Have I attended to the historical or structural processes that shaped people's lives and the terms of my research? What historical-structural phenomena (for example, policies, housing and labor) have contributed to the research question or problem under investigation?
- **Literature:** Has my framing of the literature contributed to epistemic exclusion, the marginalization of some ways of knowing, such as exploring counternarratives, in favor of dominant ones? Does the literature review critique existing literature, particularly when issues of social justice and equity have been overlooked? Do I cite researchers who come from the ethnoracial populations studied?
- **Context:** Have I considered the context-specific factors, including unique cultural practices, beliefs and ideologies, that influence the lives of the individuals in my research? Where is my topic of research manifesting, and why does it matter?
- **Advancing equity and social justice:** Have I considered the way in which my work can advance equity and justice for individuals from minoritized groups? How will I make these connections explicit in our writing? Does the literature review emphasize 'advocacy with' rather than 'speaking for' marginalized populations? Have I been mindful of content that may reinforce notions of saviorism? Do I frame my questions/findings in a way that implies that an individual, community or population is responsible for health risks or outcomes?
- **Language and framing (avoid the following):** Do I suggest that individual behavior can systematically overcome challenges with structural determinants? Do I posit social identity as a risk factor? Do I use blame, stigmatizing language or stereotypes? Do I fail to acknowledge heterogeneity within different identities and groups? Do I use dehumanizing language, such as labels, instead of adjectival forms or nouns with descriptive phrases (person-first language)?

**Methodology and data collection**

- **Standpoint:** Have I accounted for my standpoint and biases concerning the people who are the subject of my research? Where do my beliefs manifest in my research design, data collection and analyses? Can I name and defend these choices? Have I considered including a positionality statement to describe my proximity (or lack thereof) to the groups I am describing?

- **Measurements/constructs:** How did I arrive at my variables? Are my participants' experiences of the extant research guiding the selection of my variables or constructs under investigation? Do I need to theorize and/or develop new measurement tools to address my research questions more adequately?
- **Sampling:** Have I selected a sample on the basis of convenience or my research questions? Have I considered the multiple identities of my participants and how other samples might be more representative? Do I have theoretical and scientific reasons for choosing to include or not include a 'control group'?
- **Participation:** Before writing, have I shared research conceptualizations or findings with individuals or groups from the communities I am researching? Have I included their thoughts in my study conceptualization or interpretation (and given appropriate credit)? Have I investigated if some individuals or groups have experienced past harms associated with my line of research? If so, have I invited these individuals or groups to weigh in on my study?
- **Operationalization and classification:** What classification system am I using to describe race and ethnicity data (for example, OMB Directive 15 categories)? Were race and ethnicity self-reported, observer-reported or extracted from electronic health records? What are the limitations of my classification system? If I am using a combined ethnoracial construct, have I communicated that explicitly? What groups are not being accounted for when using my classification? If I use 'other' as a category, have I identified everyone in that category somewhere?
- **Language and terminology:** Am I considering community-specific terminology or generational differences? Am I avoiding the use of terms that may have roots in eugenics or racist philosophies (for example, in the USA: Caucasian, Oriental and Eskimo)? Have I consulted any inclusive or equity language style guides?
- **Avoiding biological essentialism:** Do my constructs or communications imply that there is a biological significance to race or ethnicity? Am I conflating self-reported race and ethnicity with ancestry?

#### **Data analysis and results**

- **Analytic strategies:** Why am I using these particular analytic approaches to my data? How might my data be pointing me toward unfamiliar or nontraditional approaches? How might my analytic tools constrain my potential findings?
- **Reporting:** If variables such as race/ethnicity, sex/gender and/ or SES were used as covariates or for sample characteristic reporting, are they appropriately labeled, and are limitations of such reporting/labels addressed? If I show differences between social groups in your analysis, have I provided enough theoretical justification for why this comparison is needed?

- **Power dynamics:** Am I interpreting effects as structural instead of as individual effects when reporting on social categories?
- **Intersectionality:** Rather than merely describing people as occupying multiple positions of subordination, marginality and/or privilege, have I focused on how these categories co-construct one another and are not discrete aspects of lived experience?

#### **Discussion, conclusions and implications**

- **Commitment to equity:** Is my topic of interest impacted by social inequity? If so, have I made this impact explicit? Is my interpretation of the findings grounded in a historical approach that acknowledges any structural forces that have shaped the literature to date? Have I considered how my findings and interpretations reinforce or disrupt these oppressive narratives?
- **Avoiding determinism:** If individual-level factors or characteristics are discussed, have we also considered ecological and systems-centered perspectives?
- **Generalizability:** Are limitations of generalizability and/or transferability of results sufficiently described?

#### **Communication and dissemination**

- **Action:** In what ways can my research approach interrupt systemic racism? What work is my research intended to do in the world? Does my research adequately attend to issues of social justice and the potential for research to catalyze social change, or does my research just generate knowledge for the sake of knowledge? Do the implications of my research extend beyond my own research program?
- **Community:** How does my work involve and contribute to the communities or groups under investigation? Have I sufficiently involved them in developing my conclusion and my steps for future research?