TBM

SYSTEMATIC REVIEWS

The Role of Behavioral Medicine in Addressing Climate Change-Related Health Inequities

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Abstract

Climate change is the greatest threat to global health in human history. It has been declared a public health emergency by the World Health Organization and leading researchers from academic institutions around the globe. Structural racism disproportionately exposes communities targeted for marginalization to the harmful consequences of climate change through greater risk of exposure and sensitivity to climate hazards and less adaptive capacity to the health threats of climate change. Given its interdisciplinary approach to integrating behavioral, psychosocial, and biomedical knowledge, the discipline of behavioral medicine is uniquely qualified to address the systemic causes of climate change-related health inequities and can offer a perspective that is currently missing from many climate and health equity efforts. In this article, we summarize relevant concepts, describe how climate change and structural racism intersect to exacerbate health inequities, and recommend six strategies with the greatest potential for addressing climate-related health inequities.

Implications

Practice: Behavioral medicine practitioners have an important role to play in addressing climate-related health inequities in their clinical practice.

Policy: Policymakers who want to address health inequities exacerbated by climate change should support legislative action that prioritizes environmental justice and health equity.

Research: Future research should be aimed at dismantling structural racism, incorporating environmental justice efforts, and identifying effective communication strategies that promote action on climate change and health equity.

Keywords

Climate change, Health inequities, Structural racism, Environmental justice

The health harms of climate change are accelerating at an alarming rate and having a significant impact on the well-being of the general population [1]. In 2020, the intersection of climate change and structural racism on the health of individuals from racialized groups targeted for marginalization in the United States entered the national conversation in new ways and included a reckoning among health professionals about the importance of addressing the root causes of health inequities [2, 3]. It was against this backdrop that the Society of Behavioral Medicine's *Health Inequities and Climate Change Presidential Working Group* convened to develop strategies for addressing climate-related health inequities.

Structural racism exacerbates climate-related health inequities through increased exposure to climate hazards, increased sensitivity to the health harms of climate change, and decreased adaptive capacity in communities targeted for marginalization. Through policy decisions such as redlining and the creation of "sacrifice zones" (i.e., geographic areas that have been permanently impaired by environmental damage or economic disinvestment), structural racism plays a central role in perpetuating the adverse health effects of climate change on populations targeted for marginalization.

In this call to action for the behavioral medicine community, we summarize relevant concepts, describe how climate change and structural racism intersect to exacerbate health inequities, and recommend strategies that have the greatest potential for addressing systemic causes. Throughout the article, we take a deliberate antiracist approach and attempt to embody the principles we recommend with the content and terminology we use. We center the voices of members from communities targeted for marginalization in determining solutions for dismantling structural racism, including recommendations to use intentional language. Therefore, we use the term "communities targeted for marginalization" throughout instead of terms such as "minorities," "marginalized communities," and "oppressed communities," as a means of centering the *conditions* imposed on these communities as the root cause of health inequities while avoiding terminology that further oppresses these communities through the implication that they are holistically defined by their oppression [4, 5].

DEFINITIONS

Health Inequities

A health inequity is a particular type of health difference that adversely affects groups of people who have systematically experienced significant obstacles to health based on characteristics historically linked to discrimination or exclusion [6].

Individuals from racialized groups targeted for marginalization have worse health outcomes than their white counterparts [7], including worse infant and maternal mortality [8], cardiovascular disease [9], cancer [10], Type 2 diabetes [11], hypertension [12], and pulmonary disease [13]. Lighter skin tone maps on to lower mortality rates, highlighting the influence of "colorism" and anti-Black racism [14, 15]. There is a growing recognition of the importance of addressing the root causes of health inequities, including structural racism [16] as well as climate change, which exacerbates health inequities and is predicted to amplify them further in the coming decades [17].

Racism

Racism has a structural basis and is embedded in long-standing social policy. It includes private prejudices held by individuals and is also produced and reproduced by laws, rules, and practices, sanctioned and implemented by various levels of government, and embedded in the economic system as well as in cultural and societal norms [18].

Racism can take place across different levels. *Internalized racism* comprises beliefs about race which are influenced by culture. Internalized racism can work as a psychosocial stressor and is associated with depression, anxiety, and stress [19–21]. *Interpersonal racism* refers to discriminatory interactions between individuals that reinforce hierarchical ordering of racialized groups. Although the most readily recognized forms of interpersonal racism include racially motivated attacks and microaggressions, unconscious bias, and other discriminatory behaviors in healthcare settings can lead to substandard care and worse health outcomes among individuals from racialized groups [7, 22–24]. *Institutional racism* refers to unfair policies and discriminatory practices of institutions that restrict access to the goods, services, and opportunities of societies. For example, financial institutions' failure to provide adequate home financing to qualified applicants from racialized groups (i.e., mortgage discrimination) contributes to inequities in socioeconomic status and the decline of neighborhoods targeted for marginalization [25]. *Systemic racism* is the system in which policies, institutional practices, cultural representations, and other factors operate in various overlapping and reinforcing ways to systematically disempower and endanger racialized groups. For example, the Social Security Act of 1935 created a system of employment-based health insurance coverage that interacts with discriminatory hiring practices [26] to restrict access to health care for racialized groups leading to health inequities. *Structural racism* refers to the totality of ways in which societies reinforce racial discrimination through inequitable systems that are historically rooted and culturally reinforced.

There are many ways in which structural racism manifests. For example, government-sponsored racial residential segregation created a platform for broad social disinvestment in neighborhood infrastructure and services (e.g., transportation, schools), and is a primary cause of racial differences in socioeconomic status (SES) by restricting access to home ownership (a major determinant of intergenerational wealth), education, and employment opportunities [27]. Current policies that tie wealth to local political power—and therefore resource allocation—help perpetuate these structural disadvantages and promote racial stereotypes that undercut support for policies with the potential to improve economic well-being and environmental conditions for low SES individuals from all racial and ethnic identities.

CLIMATE CHANGE EXACERBATES HEALTH INEQUITIES

Structural racism has concentrated the conditions that determine vulnerability to climate change in communities targeted for marginalization. These conditions include increased exposure, increased sensitivity, and decreased adaptive capacity [28–30]. *Exposure* refers to human contact with various environmental hazards (e.g., extreme weather events, exposure to toxic waste, infectious disease vectors), which will continue to increase with climate change, especially in communities targeted for marginalization. *Sensitivity* is the degree to which climate hazards impact humans, and is determined by underlying individual and community characteristics, such as SES and chronic disease burden. *Adaptive capacity* is the ability to cope with the consequences of climate change, which is impaired for individuals and communities with insufficient access to resources and political power.

Exposure

As a consequence of government-sponsored racially discriminatory policies, such as racial residential segregation, individuals from communities targeted for marginalization are at increased risk of exposure to climate hazards given their higher likelihood of living in risk-prone areas. For example, historically redlined neighborhoods [27] are disproportionately exposed to extreme intra-urban heat [31]. These communities are also more likely to be located in flood-prone areas [32, 33], near sites that release toxic waste when flooded [34], in areas with aging or decaying infrastructure, and in areas with a high burden of air pollution [35–37]. Discriminatory practices also often

designate these same communities as "sacrifice zones" or "fenceline communities," in which toxic pollutants and chemical exposures are concentrated, decreasing property value and opportunities for upward mobility while exacerbating health risks for individuals living in these communities [34, 38–41].

Sensitivity

Discriminatory policies, attitudes, and resource distribution also create barriers to health and contribute to inequities in the prevalence of chronic conditions associated with increased sensitivity to climate hazards [29]. Some of these barriers include limited access to full-service grocery stores with healthy and affordable dietary choices [42], limited access to green spaces [43], clustering of alcohol outlets [44], and targeted tobacco marketing [45]. These barriers increase risk of developing chronic illnesses such as cardiometabolic disease [46], cancer [47], and pulmonary disease [47, 48], all of which are illnesses that confer increased risk of climate-related morbidity and mortality [17, 49–51]. The systematic disinvestment in neighborhoods targeted for marginalization has also resulted in under-resourced health facilities, making it more difficult to recruit experienced and well-credentialed primary care providers and specialists [18], creating challenges in appropriately managing chronic conditions [52], and in providing continuity of care for patients with chronic diseases during and in the aftermath of extreme weather events [53].

Adaptive Capacity

Material and psychosocial circumstances can collectively impede the ability of individuals from communities targeted for marginalization to prepare for, respond to, and cope with climate-related hazards. Restricted access to the resources needed to follow emergency preparedness instructions, including being unable to stockpile food or evacuate in response to a warning, create barriers for residents of communities targeted for marginalization to prepare for extreme weather events [54]. Similarly, lack of adequately insulated housing, inability to afford or use air conditioning, and inadequate access to public shelters such as cooling centers limit the ability of individuals from these communities to respond to heat waves. Furthermore, the pervasive racial wealth gap leads to inequitable access to climate change mitigation resources. For example, solar panel adoption could help communities manage increasing climate change-related electricity costs and disruptions, as well as aid climate change mitigation [55], but there are barriers to adoption within communities targeted for marginalization [56].

Institutional racism also contributes to diminished adaptive capacity by limiting the ability of individuals from communities targeted for marginalization to cope with climate hazards. For example, the Federal Emergency Management Agency (FEMA) has a program for voluntary buy-out of flood-prone properties. However, this managed retreat program is available only to privileged communities [57]. Furthermore, Black disaster survivors have a lower probability of receiving FEMA assistance, and FEMA provides greater postdisaster financial assistance to white disaster survivors, even when the amount of damage is the same [58, 59].

A CALL TO ACTION FOR BEHAVIORAL MEDICINE

Climate change is already exacerbating health inequities rooted in structural racism. As public awareness of the shared structural causes of climate change and racism increases, the specific behavior changes necessary to address climate-related health inequities become clearer. These include consumer [60], professional [61], and social behaviors [62, 63] that influence market forces and policy changes impacting both structural racism [64] and climate change [55, 65], thus diminishing health inequities (Figure 1) [66].

The field of behavioral medicine is uniquely qualified to address climate change-related health inequities. It could offer a perspective currently missing from many climate and health equity efforts by leveraging its scholarly, educational, advocacy, and clinical practices to ensure that proposed solutions deliver better, more equitable health outcomes. We offer the following recommendations for how behavioral medicine professionals can center antiracism in professional activities aimed at addressing structural determinants of climate-related health inequities (Table 1). We further encourage behavioral medicine professionals to reflect on ways that addressing climate-related health inequities can

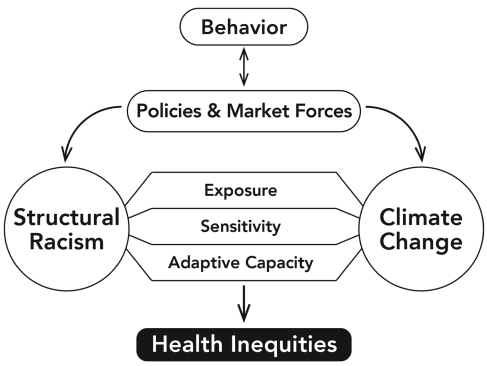

Fig. 1 | Behavior changes that influence policies and market forces (such as supporting bans on development of new fossil fuel infrastructure near communities targeted for marginalization, urging professional institutions to divest from fossil fuels, and advocating for fair distribution of health resources and environmental burdens) are more likely to address both structural racism and climate change than behavioral changes aimed at reducing individual carbon footprint. Structural racism leads to increased exposure and sensitivity, and decreased adaptive capacity to the health consequences of climate change, amplifying health inequities.

Table 1 |

Summary of recommendations for behavioral medicine in addressing climate-related health inequities
1. Adopt standards for the measurement and reporting of race as a sociopolitical construct in all behavioral medicine research and practices, including those directed at addressing climate change.
2. Operationalize the concept of structural racism in all behavioral medicine research and practices, including those directed at addressing climate change.
3. Incorporate environmental justice efforts into behavioral medicine research and practices.
4. Center the voices of communities targeted for marginalization in all behavioral medicine research and practices, including those that address climate and environmental justice.
5. Prioritize policy action on climate change and health equity.
6. Identify effective communication strategies to foster action on climate change and health equity issues.

be integrated into research, education, advocacy, and clinical practice.

Recommendation 1: Adopt Standards for the Measurement and Reporting of Race as a Sociopolitical Construct in All Behavioral Medicine Research and Practices, Including Those Directed at Addressing Climate Change

Modern American medicine has historical roots in scientific racism, which reified the concept of race as an innate biologic attribute [67]. However, race is socially constructed, and should only be used in behavioral medicine research and practice as a proxy for exposures to racism [68]. A wide adoption of guidelines and policies on conceptualizing race and ethnicity [69–71] is important because requiring behavioral medicine professionals to recognize the social and environmental conditions imposed on racialized groups as the fundamental causes of health outcomes can help identify modifiable systemic factors contributing to health inequities exacerbated by climate change [72]. *Therefore, we recommend that behavioral medicine professionals adopt the practice of conceptualizing race as a sociopolitical construct in all research, publications, grant announcements and proposals, and other professional activities.*

Recommendation 2: Operationalize the Concept of Structural Racism in All Behavioral Medicine Research and Practices, Including Those Directed at Addressing Climate Change

Structural racism is at the crux of racial health inequities exacerbated by climate change. Naming racism and identifying the type (internalized, interpersonal, institutional, systemic) of racism impacting health outcomes helps center the relevant social, environmental, and structural conditions imposed on communities targeted for marginalization as modifiable factors contributing to climate change-related health inequities.

Structural factors, such as education, housing, social security, and healthcare policies interact with broader cultural and institutional contexts to shape health trajectories [73, 74]. Thus, implementing theoretical frameworks, methodologies, and language that contribute to a paradigm shift from focusing on "individual behaviors" to examining the cumulative and interactive effects of systemic structures on health [5, 75–78], including measures of structural racism [79–81], are crucial for addressing climate-related health inequities. *Therefore, we recommend that behavioral medicine professionals name racism, identify the type of racism contributing to climate-related health inequities, and adopt antiracism strategies in all professional activities.*

Recommendation 3: Incorporate Environmental Justice Efforts Into Behavioral Medicine Research and Practices

Environmental justice is the fair treatment and meaningful involvement of all people in the development, implementation, and enforcement of policies and practices determining the distribution of environmental resources and burdens. The environmental justice movement, primarily led by communities targeted for marginalization, has battled discriminatory policies and practices that amplify climate change-related health disparities [82–85] and increase risk of exposure to other hazards. As behavioral medicine professionals, we must partner across communities and disciplines to generate evidence needed for legislative action and advocate for meaningful policy changes nationally and locally (including at our own institutions). For example, the construction of oil pipelines is concentrated near Indigenous communities, increasing health risks via environmental destruction, exposure to toxic chemicals, and increased risk of sexual violence [86–89]. Research on the short and long-term health, behavior, and quality of life consequences of proximity to fossil fuel infrastructure supports legislation banning new fossil fuel infrastructure development in communities targeted for marginalization [39, 55, 90]. Additionally, many interventions that target the disproportionate exposure to hazards due to structural racism [18, 91], as well as the integration of various antiracism approaches [92], have been tested. However, additional research is needed on the feasibility of scaling up targeted interventions [93] and whether the combination of interventions at different levels (individual, institution, policy) confer multiplicative effects for health [94]. Behavioral medicine's efforts to address the unequal health consequences of climate change must operate from an environmental justice perspective

to be truly impactful. *Therefore, we recommend that behavioral medicine professionals apply environmental justice principles in all professional activities.*

Recommendation 4: Center the Voices of Communities Targeted for Marginalization in All Behavioral Medicine Research and Practices, Including Those That Address Climate and Environmental Justice

Social and economic interventions at the community and population levels are crucial for addressing the structural determinants of health inequities. However, funding agencies are more likely to fund studies focusing on biologic and mechanistic investigations [95]. This pattern perpetuates the racial gap in grant funding because individuals from communities targeted for marginalization are more likely to propose research focused on social determinants of health and economic interventions [96]. Additionally, funding agencies and research institutions rely heavily on metrics that reflect exclusionary professional networks [97], which perpetuate the lack of diversity in the academic and scientific workforce [98].

The lack of diversity in the academic and scientific workforce contributes to the implementation of interventions developed from a limited, white-centered perspective, and can therefore exacerbate the very inequities that were the target of the intervention. For example, "urban greening" interventions developed without community partnership can lead to "climate/environmental gentrification," or can be experienced as disruptive, thereby displacing and siphoning resources away from individuals in the communities meant to benefit from the interventions [99, 100].

Community-based participatory research is one approach that promotes the development of interventions to address community concerns and health inequities through a collaborative effort between researchers and community members involved as equal partners in all stages of research, and incorporates community practices, capacity building, and co-learning [101]. Other approaches that prioritize decision support, citizen science, community engagement, grassroots movements, and a research culture that is more inclusive [102–104] can also be implemented. Additionally, centering the lived experiences of individuals from communities targeted for marginalization leads to the development of more appropriate interventions, enhances the relevance and generalizability of findings, provides disciplines with valuable perspectives, and embodies antiracism principles as a part of the process. For example, "Indigenizing" food sovereignty is a broad, restorative, and sustainable approach to addressing food systems in a way that centers the voices and expertise of communities targeted for marginalization and most directly impacted by environmental injustices [105].

At the institutional level, behavioral medicine professionals can ask how diversity metrics (including diversity in leadership positions and salary inequality) and biases in hiring and promotion processes are evaluated and addressed, what type of diversity training is offered [18], and what procedures are in place to handle allegations of racial discrimination. Behavioral medicine professionals also can help center the voices of individuals from communities targeted for marginalization by incentivizing collaborative, community-oriented approaches to scholarship, advocating for systems-level supports that are invested in retention of professionals from communities targeted for marginalization, and amplifying the work and expertise of colleagues from these communities through recommendations for awards, positions on study sections, and leadership roles with decision-making power. *Therefore, we recommend that behavioral medicine professionals support this essential culture shift to ensure that approaches used to address climate-related health inequities will have a healthy impact on all communities while also improving health equity.*

Recommendation 5: Prioritize Policy Action on Climate Change and Health Equity

An outsized emphasis in behavioral literature has focused on behavioral changes for reducing individuals' greenhouse gas emissions (i.e., "sustainable behaviors") [106–108]. However, these are not sufficient to reduce climate change threats and behavioral changes aimed at addressing the systemic determinants of climate change and health inequities are required. In 2019, two federal bills, the Green New Deal [109] and the Environmental Justice Act of 2019 [110], were introduced to the House of Representatives and the Senate, both of which have the potential to address the structural causes of health inequities exacerbated by climate change. In addition to state and federal environmental laws, local land use planning, zoning code changes, ordinances, public health codes, and administrative policies at the city, county, and municipality levels have tremendous environmental justice potential [111].

Research can contribute to the evidence base needed to implement national, state, and local policies that address climate change and health equity [112, 113], including information used in environmental reviews and impact analysis conducted for local zoning and siting decisions [111]. Research can also evaluate the combined environmental and health impact of policies that subsidize fossil fuels [114], encourage the consumption of unhealthy foods [115] with high environmental impact [116, 117], or tobacco taxation policies, which both reduce smoking rates [118] and the environmental impact of tobacco [119].

Climate change and health equity policies can also be advanced through direct advocacy efforts [120].

There are multiple examples of advocacy leading to institutional policy change including student-led advocacy to divest from fossil fuels at Historically Black Colleges and Universities [121], Harvard [122], and the University of Minnesota [123], medical students advocating for the inclusion of climate change in their educational curriculum [124], and nurses advocating to reduce the environmental footprint within their healthcare systems [125]. These institutional efforts can influence market forces, which is especially important for system-level changes in fossil fuel consumption, where market prices fail to reflect the true cost of use [126]. As behavioral medicine professionals often working within large academic or healthcare institutions, we can also participate in broader advocacy efforts, which have the potential to influence higher-level structural factors as demonstrated by the Black Lives Matter movement leading to policy reforms in policing [127].

Climate-related health inequities are the result of tremendous power imbalances resulting from structural racism. Advocacy efforts lead by members from communities targeted for marginalization are strengthened when individuals from different backgrounds and in positions of power support them [128]. Behavioral medicine professionals can amplify the impact of their research and advocacy efforts by recognizing and applying their own privileges and positions of power to advance antiracism efforts. *Therefore, we recommend that behavioral medicine professionals conduct research on behavior changes that can impact structural determinants of climate change and health inequities, recognize individual privileges and positions of power, and engage in advocacy efforts related to climate change and health equity.*

Recommendation 6: Identify Effective Communication Strategies to Foster Action on Climate Change and Health Equity Issues

Although the science is settled on the anthropogenic causes of climate change [129], and evidence continues to mount on the adverse and inequitable health impacts of climate change [28], climate change denial messages and efforts to delay or minimize climate action—including claims that it is too late to act on climate change (i.e. "doomism") and shifting focus to "sustainable behaviors"—have been widely successful in stymying restorative action [107, 130, 131]. Climate change denial efforts are well-funded [132], and the same funders are the top monetary contributors to lawmakers sponsoring discriminatory bills and opposing policies necessary for reducing health inequities [66]. Therefore, communication strategies that go beyond disseminating scientific evidence on climate change and move toward increasing public recognition of the shared systems that contribute to both climate change and health inequities are needed. Communication that informs consumers of corporate practices that help uphold the structural determinants of climate change and health inequities are especially important. Consumer behavior changes can influence market forces and pressure companies to stop funding groups and organizations that are the worst contributors to climate change and perpetrators of climate change denial [133–135], thus addressing multiple structural-level factors.

Research has demonstrated that there are underlying factors that increase the likelihood of public engagement and motivate climate-related behaviors including changing norms, making messages personally relevant, appealing to values, emphasizing immediacy of benefits, and engaging emotional connection with the content [108, 136, 137]. Thus, communication strategies that prioritize action on climate change and environmental justice would likely benefit from framing in ways that are consistent with these underlying motivational factors. *Therefore, we recommend that behavioral medicine professionals focus on developing communication strategies that expand public knowledge and foster action on the shared determinants of climate change and health inequities.*

CONCLUSION

We have described how systemic factors drive structural racism and climate change and how these work synergistically to exacerbate health inequities (Figure 1). Our recommendations focus on how behavior changes that actively challenge these systemic factors can help dismantle the structural determinants of climate change and health inequities (Table 1). Additional forms of advocacy are described in the paper on climate advocacy and policy (this issue).

The behavioral medicine community can help bolster climate change and health equity efforts by expanding the scientific evidence needed for legislative action, using positions of influence to address power imbalances and advocate for system-level changes, and identifying effective strategies for advancing climate and health equity efforts. As an interdisciplinary field that is focused on health promotion, disease prevention, health equity, and addressing the biomedical, behavioral, and psychosocial aspects of health and well-being, behavioral medicine has an opportunity and the responsibility to heed the call to action for addressing climate change-related health inequities. How we respond to that call will impact the health of individuals from communities targeted for marginalization, future generations, and the health of the entire population.

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Compliance With Ethical Standards

Conflicts of Interest: All authors declare that they have no conflicts of interest to disclose.

Human Rights: This article does not contain any studies with human participants performed by any of the authors.

Informed Consent: This article does not involve human participants and informed consent was therefore not required.

Welfare of Animals: This article does not contain any studies with animals performed by any of the authors.

Transparency Statements

Five transparency statements related to (1) study registration, (2) analytic plan registration, (3) availability of data, (4) availability of analytic code, and (5) availability of materials.

1. **Study registration**: This article does not contain any studies with human participants or animals performed by any of the authors. Formal registration is not applicable for this manuscript.
2. **Analytic plan preregistration**: This article does not contain any analyses performed by any of the authors. Formal preregistration for an analysis plan is not applicable for this manuscript.
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