

# Basic behavioral science research priorities in minority health and health disparities

Chanita Hughes Halbert,<sup>1,2</sup> Caitlin G. Allen<sup>3</sup>

<sup>1</sup>Department of Population and Public Health Sciences, University of Southern California, Los Angeles, CA, USA

<sup>2</sup>Norris Comprehensive Cancer Center, University of Southern California, Los Angeles, CA, USA

<sup>3</sup>Department of Public Health Sciences, Medical University of South Carolina, Charleston, SC, USA

Correspondence to: C.H. Halbert, [hughesha@musc.edu](mailto:hughesha@musc.edu)

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## Abstract

Achieving health equity among disparity populations has been a national, regional, and local priority for several years. Health promotion and disease prevention behaviors play an important role in achieving health equity; the first generation of behavioral science studies in minority health and health disparities have provided important insights about the nature and distribution of risk exposure behaviors in disparity populations. Interventions have also been developed to enhance health promotion and disease prevention behaviors using behavioral counseling, tailored health communications, and interventions that are developed collaboratively with community stakeholders. Although intervention development and evaluation are components of transdisciplinary translational behavior research, discovery science is a critical first step in translational research. Consistent with this, conceptual models and frameworks of minority health and health disparities have evolved to include multilevel determinants that include basic behavioral mechanisms such as stress responses and stress reactivity that have physiological, psychological, and behavioral components that are relevant to minority health and health disparities. This report describes priorities, opportunities, and barriers to conducting transdisciplinary translational behavioral research during the next generation of minority health and health disparities research.

## Keywords

Basic behavioral science, Health disparities, Minority health, Priorities

## INTRODUCTION

Achieving equity in health care and public health outcomes among racial and ethnic minorities and individuals from other medically underserved groups has been a national, regional, and local priority for several years. Seminal events in the growth and evolution of minority health and health disparities research include the creation of the Office of Minority Programs at the National Institutes of Health (NIH) in 1990, the National Center on Minority Health and Health Disparities (NCMHD) in 2000, and the transition of the NCMHD to the National Institute of Minority Health and Health Disparities (NIMHD) in 2010. With support from the NIMHD, other institutes at the NIH, foundations, advocacy groups, and scientific organizations, an expansive evidence base has been generated to define the nature and distribution of disparities between racial/ethnic minorities

## Implications

**Practice:** Multilevel determinants are important to health promotion and disease prevention behaviors; biological, psychological, and behavioral risk factors should be addressed as part of interventions for health behavior change in disparity populations.

**Policy:** Policies about population health management, public health practice, and health care delivery can be informed by the impact of interventions on basic behavioral mechanisms that are relevant to these outcomes.

**Research:** Transdisciplinary and translational basic behavioral science research in minority health and health disparities can provide novel insights into the biological, psychosocial, and behavioral mechanisms that should be addressed to improve the precision of health behavior interventions in disparity populations.

and to develop, implement, and evaluate interventions that target health behaviors and other factors in clinical, community, and public health settings [1]. There are also now several peer-reviewed journals that focus on health and health care outcomes in racial and ethnic minorities (e.g., *Journal of Racial and Ethnic Disparities*, *Health Equity*), conceptual models have been developed to guide research on minority health issues, and professional organizations now include special interest groups and other entities that work to shape and guide priorities related to racial disparities and health equity research, clinical care, public health, and policy.

The progress that has been made in several areas related to minority health and cancer health disparities has been reported recently in the American Association for Cancer Research (AACR) Cancer Disparities Progress Report [2]. As described in the AACR Report, progress in addressing cancer health disparities has been slow and continued efforts and investments are needed from all stakeholders and policymakers to address multilevel barriers to

health equity. Consistent with this report, the NIH 2021–2025 Strategic Plan for Minority Health and Health Disparities emphasizes conducting research to understand determinants of vulnerability to diseases among minority populations and to examine the nature and distribution of determinants of minority health and health disparities through basic, behavioral, clinical, and applied studies. The NIH Strategic Plan also stresses the importance of translational studies to move research findings into interventions that are developed and tested in diverse settings [3].

According to the county health rankings model, health behaviors (e.g., physical activity, diet, and tobacco use) related to health promotion and disease prevention for chronic and acute conditions are critically important to disease risk and health outcomes in all populations [4]. Cardiovascular disease and cancer, for instance, continue to be the leading causes of morbidity and mortality among adults in the USA. These diseases still disproportionately affect racial and ethnic minorities in terms of morbidity and mortality resulting from exposure to behavioral risk factors that could be mitigated by health behavior change. For instance, recent data on cancer prevention behaviors shows that 31.3% of African American men and 38.3% of African American women are physically inactive, and 15% of African Americans smoke cigarettes [5]. Consistent with this, health promotion and disease prevention behaviors are foundational to the cancer control continuum [6] and behavioral risk factors are among the determinants included in conceptual models of minority health and health disparities [7]. Effective communication of information about disease risk, strategies for making behavior changes, and the outcomes of making health behavior changes is also essential in health promotion and disease prevention interventions, but several factors can diminish the receipt, processing, and application of health information.

In 2016, Czajkowski et al. defined transdisciplinary translational behavioral (TDTB) research as studies that focus on translating discoveries in basic behavioral science into strategies for improving health and described ongoing efforts in TDTB, opportunities to advance this type of research, and barriers to conducting these studies using NIH-funded projects as examples [8]. Similarly, Mensah and Czajkowski emphasize the importance of integrating key concepts from behavioral science research with endpoints that are relevant to clinical and public health outcomes as part of translational behavioral science research [9]. Within the context of prevention research, translational studies progress from discovery (i.e., basic) science that seeks to understand the mechanisms that contribute to health risk behaviors, to intervention development and evaluation in controlled settings, to real-world applications and evaluations

of interventions, to widespread dissemination [10]. Discovery science is a central component of translational research; basic behavioral science research is defined as ...[research that is] designed to further our understanding of fundamental mechanisms and patterns of behavioral and social functioning relevant to the Nation's health and well-being, and their interactions with each other, with biology and the environment (p. 8) [11]. Congruent with this, the NIH has funded several different consortia to conduct basic behavioral science research that has a focus on understanding the biological mechanisms involved in health risk and health promotion behaviors. The Science of Behavior Change (SOBC), for instance, was established through the NIH Common Fund (<https://commonfund.nih.gov/behaviorchange>) to facilitate the development of interventions that target the underlying mechanisms of health behaviors to ensure that behavior interventions are effective, efficient, and can reliably improve health behaviors and outcomes [12]. Studies in the SOBC use an experimental medicine approach to identify mechanisms of behavior change, develop valid instruments or assays of these mechanisms, and develop and test interventions to influence mechanisms [12, 13]. For instance, stress reactivity and stress resilience have been identified as important targets for behavioral interventions and research in the SOBC has examined stress reactivity, executive control, and health behaviors in undergraduate college students and other populations [14]. There is considerable opportunity to improve the precision of health promotion and disease prevention interventions in disparity populations using the TDTB framework and methods from basic behavioral science research. Exposure to chronic stress from structural racism and discrimination, for instance has been hypothesized as a determinant of risk exposure behaviors in African Americans [15–17]. However, there is a paucity of empirical data on the link between biological mechanisms such as stress reactivity and health behaviors specifically in minority populations.

The field of minority health and health disparities is at a critical juncture where it is essential to move beyond comparisons of black-white differences in risk behaviors and health outcomes to more precise strategies for health promotion and disease prevention that target multilevel determinants effectively, efficiently, and reliably. The purpose of the present report is to describe priorities, opportunities, and barriers to conducting TDTB research to address minority health and health disparities. Consistent with the emphasis on intervention development and evaluation in frameworks for translational behavioral science [8–10], this report describes early health behavior change interventions that were developed for African Americans and summarizes previous NIH initiatives that were established to

enhance the salience and impact of health promotion and behavior change interventions among individuals from this community. These examples are used to illustrate where health promotion and disease prevention research in disparity populations has been to set the stage for the research questions and issues that should be prioritized in the next generation of TBTD basic behavioral science research to address minority health and health disparities. While several health disparity populations exist in the USA (e.g., Hispanics/Latinos, underserved rural populations), it is beyond the scope of this report to summarize health behavior interventions that have been developed and evaluated in all of these groups. This report focuses on research that has been conducted in African Americans because the Black population has grown more than 29% since 2000 and now makes up about 14% of the U.S. population [18]. Further, African Americans were among the first health disparity population to be identified as a priority for health promotion and behavior change interventions and these early interventions provide an important context and foundation for the next generation of transdisciplinary and translational basic behavioral science research in minority health and health disparities across diverse populations.

#### **EARLY HEALTH BEHAVIOR CHANGE INTERVENTIONS FOR AFRICAN AMERICAN COMMUNITIES**

According to the Centers for Disease Control and Prevention, about 60% of adults have at least one chronic disease and 40% have two or more conditions that include heart disease, cancer, diabetes, and hypertension that are caused by health risk behaviors such as physical inactivity, unhealthy diets, and tobacco use and exposure [19]. Consequently, health promotion and disease prevention interventions have focused on individual level determinants that include awareness about risk factors, developing skills for disease prevention, and improving access to clinical services for early detection and treatment [20–22]. This early research on health behavior change interventions among African Americans has been important from a behavioral science perspective, but has had mixed findings. For instance, education, counseling, and supervised exercise resulted in short-term increases in physical activity and improved dietary behaviors among African Americans with diabetes, but these effects were attenuated at the 6-month follow-up and the intervention had a modest effect on weight loss [23]. Similarly, there were no differences in physical activity and dietary behaviors among obese African American women who received a 14-week, church-based education intervention and those who were randomized to the control condition [24, 25]. However, a church-based multicomponent intervention that used motivational interviewing and culturally appropriate educational materials led to greater increases in

fruit and vegetable consumption compared to the self-help group [26]. In a similar line of investigation, modest weight loss was reported among participants with diabetes who received a lifestyle intervention consisting of group sessions in which education about nutrition and physical activity was provided along with self-monitoring tools [27] and one cohort of African American women who received a combined breast health and weight loss intervention reported significantly increased levels of physical activity and weight loss compared to those who received general health information counseling [28]. In addition, dietary quality (e.g., intake of fruits and vegetables) increased significantly among African American women who received education and training on physical activity and nutrition compared to those who received education only; yet, those in the education only condition reported a significantly greater decrease in overall energy intake and both groups significantly decreased their percent energy from fat [29].

Considerable efforts have also been made to develop and evaluate tailored health communication interventions to promote behavioral change in African Americans based on the premise that messages that address an individual's health beliefs, values, and other unique characteristics will be more effective than general health information [30, 31]. In one study, African American women who received culturally and behaviorally tailored magazines about mammography and fruit and vegetable intake reported greater increases in daily fruit and vegetable consumption and were more likely to get a mammogram compared to those who were in the control group or received behaviorally or culturally tailored materials only [32]. Tailored health communications and interventions have evolved from printed materials, in-person risk education and counseling [33] to health information technology. Faro and colleagues have used machine learning strategies to tailor smoking cessation messages to African American smokers [34]. Specifically, this investigative team developed a collective intelligence tailored messaging system that included a database of messages that provided motivational content about cessation and strategies for making a quit attempt. African American smokers were sent daily messages and were asked to evaluate the influence of these messages, engagement with the intervention website, and smoking status. Compared to a historical control of white smokers, African American smokers reported greater engagement with the intervention and were more likely to quit smoking [34]. While machine learning strategies hold promise in terms of tailoring health communications, Cappelletti et al. found that participants who had unmet basic needs (e.g., financial hardship, food insecurity, unstable housing) reported greater psychosocial stress, and greater stress reduced the

recollection of receiving tailored health information and acting on this information [35].

#### COMMUNITY BASED PARTICIPATORY RESEARCH FOR HEALTH BEHAVIOR CHANGE

Early interventions that were developed to promote health behavior change in African Americans have been criticized because they were not sensitive to the priorities, concerns, and resources available in communities to support and sustain risk reduction behaviors. Community-based participatory research (CBPR) has emerged as an important framework for developing, implementing, and evaluating health behavior interventions in racial and ethnic minorities following the creation of NIMHD's CBPR Research Program. NIMHD's program was established in 2003 to support academic-community partnerships that work together to develop, implement, evaluate, and disseminate interventions that address diseases and conditions that contribute to racial disparities in health and health outcomes. CBPR is a collaborative process for conducting translational research through which: (a) the community is acknowledged as the primary unit of identity, (b) efforts are developed and implemented to enhance the existing strengths of the community, (c) collaborative relationships between the academic institution and community partners are fostered throughout the entire research process, and (d) knowledge that is gained through the partnership is translated into specific action [36, 37]. Several academic-community partnerships were established through NIMHD's CBPR program and other subsequent initiatives (e.g., Transdisciplinary Collaborative Centers in Precision Medicine and Minority Health) [38, 39]. The West Philadelphia Consortium to Address Disparities is one example of an academic-community partnership that was funded through NIMHD's CBPR program. This partnership consisted of academic and community investigators with expertise in minority health and health disparities, community outreach and education, dissemination and implementation research, behavioral science, public health, health promotion and disease prevention who worked together from 2005 through 2016 to identify priorities and needs for health promotion and disease prevention among community residents and develop and evaluate theory-based health behavior interventions among African Americans in the Philadelphia metropolitan area. During the initial project period, the partnership conducted formative research to understand the needs and preferences of African American residents [40], translated these data into interventions that targeted these needs and priorities [41], and evaluated the feasibility and reach of these approaches [42]. For instance, the Consortium developed two approaches for motivating behavior change in terms of fruit and vegetable intake and physical activity and conducted a comparative

effectiveness trial that evaluated the effects of integrated (INT) versus disease-specific (DSE) risk education on changes in dietary behaviors and physical activity in a community sample of African American men and women [43]. An important goal for the INT intervention was to help participants to see the connection between risk factors for cancer and CVD to motivate health behavior changes. Diet and physical activity outcomes were evaluated at baseline and 1-month following the risk education interventions; there were significant increases in the proportion of participants who met physical activity guidelines from baseline to follow-up. However, the effect for intervention group was not statistically significant in the multivariate logistic regression model of 1-month physical activity that controlled for baseline levels and factors that were associated significantly with retention in the follow-up interview. In addition, there were no significant changes in the likelihood of meeting guidelines for fruit and vegetable intake, but participants who completed all four intervention sessions, regardless of randomization to INT or DSE, had an increased likelihood of meeting physical activity guidelines. There was also a significant interaction between education and intervention group. Addressing community concerns is one of the key principles of interventions developed using CBPR; process evaluation data measured during the 1-month follow-up interview demonstrated that the INT and DSE risk education protocols addressed community priorities for diet and physical activity, participants were engaged with the interventions, and satisfaction with the intervention content was high.

Health promotion and disease prevention behaviors occur in a social and community context; CBPR studies emerged as a priority for minority health and health disparities research in an effort to address these factors. However, previous reports have also described the ways in which exposure to contextual stressors such as racial discrimination and neighborhood deprivation contribute to unhealthy behaviors (e.g., being physically inactive, unhealthy dietary behaviors, and noncompliance with screening recommendations) [16, 17]. Since the police killing of George Floyd during the summer of 2020, there has been increased attention on structural racism and how the history and current practices of segregation and discrimination in the USA has had an adverse effect on health care and outcomes in racial and ethnic minorities. There is a long and disturbing history of racism and discrimination in the USA; discrimination is often conceptualized and measured as a psychosocial stressor in most health behavior research [15]. Accordingly, prior studies have examined the nature, distribution, and consequences of racial discrimination on health-related outcomes using observational studies and laboratory methods [44, 45]. Studies have also examined

the neurobiology of stress responses associated with exposure to racial discrimination [46] and this work raises important empirical questions about the biological mechanisms through which racial discrimination activates stress responses (e.g., HPA-axis) and regions of the brain that process social cues and play a role in decision-making, motivation, and learning (e.g., anterior cingulate cortex). Recent research has shown that African Americans who reported racial discrimination had lower activity in brain regions that are associated with social and emotional connections and the extent to which individuals obtain and reveal health information [47]. This research raises important questions about the extent to which discrimination stress, and overall stress responses, may limit the effects of persuasive health messages and information relevant to TBTD. Thus, although CBPR is a translational research process that focuses on intervention development using health behavior theories (e.g., Health Belief Model) as the conceptual basis, studies conducted using CBPR may not be based on findings from basic research from human or animal studies. According to translational behavioral research frameworks, health behavior interventions that are developed for disparity populations also need to target physiological drivers and underpinnings of health risk behaviors to improve health promotion and disease prevention in these groups.

#### **BASIC BEHAVIORAL SCIENCE RESEARCH**

An important goal for basic behavioral science research is to improve the effectiveness, efficiency, and reliability of behavioral interventions by targeting physiological, cognitive, neurological, and psychological mechanisms that influence how and why individuals perform health behaviors. Stress responses have emerged as important putative targets for health behavior interventions [12]; stressors such as racial discrimination have been recognized as a psychosocial stress among African Americans and other disparity populations for a number of years [45]. However, exposure to social and psychological stressors beyond racial discrimination is emerging as an important factor in conceptual models of minority health and health disparities. In particular, stress reactivity, or one's physiological and psychological responses to a stress, is now included in these frameworks [48, 49]. The inclusion of stress reactivity in frameworks of minority health and health disparities is based in part on findings from animal studies that examined the association between physiological stress responses and biological pathways involved in the onset of diseases that disproportionately affect African Americans in terms of morbidity and mortality [50] and as in the first generation of studies in minority health and health disparities [1], previous basic behavioral sciences studies have compared African Americans and whites in terms of

physiological stress responses. Cortisol, for instance, is the primary hormone that is responsible for the stress response that includes an increase in cortisol following exposure to a stressor and a gradual decline in cortisol levels once the stressor has been mitigated [51]. Chronic exposure to stressors and cumulative exposure to stress can dysregulate this process and result in an altered cortisol response. In the Coronary Artery Risk Development in Young Adults (CARDIA) study, for example, African Americans were more likely than whites to have a dysregulated diurnal cortisol rhythm compared to whites [52]. Overall, these differences in cortisol responses were independent of socioeconomic (SES) characteristics, but having fewer SES resources was associated with a dysregulated cortisol response among African Americans [52]. Further, Chong et al. found that African Americans had a significantly lower cortisol response to a laboratory-based psychosocial stressor compared to whites [53]. Similar findings have been reported in important subgroups of disparity populations. For instance, Hooper recently demonstrated that cortisol levels are lower at critical timepoints in the trajectory of a smoking cessation intervention (e.g., at baseline, end of treatment) among African Americans compared to whites [54]. Cortisol slopes (from baseline, end of treatment, and 1-month follow-up) were also flatter among African American smokers compared to white smokers in this study [54]. In a recent analysis that compared diurnal cortisol slopes between African American and white men in the MIDUS II study, African American men were more likely than white men to exhibit blunted cortisol responses [55]. Cortisol slopes, or a blunted cortisol response, were associated with having co-morbidities among African American men, but not white men in this study; thus, cortisol (or stress) responses may be an important physiological target for health behavior interventions that are developed for African American men.

Several studies have also compared African Americans and whites in terms of allostatic load, which is an indicator of biological dysregulation in response to psychological and social stress. Allostatic load is determined based on physiological biomarkers such as immune (C-reactive protein), neuroendocrine (cortisol), metabolic (HbA1c), and autonomic (systolic and diastolic blood pressure) functioning [56] which are also implicated in chronic diseases that are leading causes of morbidity and mortality among African Americans. Allostatic load has also been examined as a mechanism of racial disparities in health outcomes [57–59]; in an exploratory study of the association between allostatic load and resiliency in African American and white Veterans, Halbert et al. found that allostatic load was higher among men who reported they were able to bounce back compared to men who had lower

levels of resiliency [60]. A recent systematic review of allostatic load and risk exposure behaviors demonstrated that being physically active and eating a healthy diet is associated with lower allostatic load [61], which is consistent with the operational and conceptual definition of this construct. That is, individuals who are physically inactive and those with unhealthy dietary behaviors are likely to be overweight or obese and to have other biomarkers that are above normal clinical values (e.g., diastolic and systolic blood pressure) and subsequently, have higher allostatic load.

As in the first generation of minority health and health disparities research [1], black-white comparisons of cortisol and allostatic load have been critical to characterizing differences in stress responses between African Americans and whites. Similarly, measuring stress in terms of racial discrimination and self-reported perceived stress provides important observational data on the association between stress and health behaviors [62]. However, African Americans are a heterogeneous population and there is important within group variation in social determinants, health beliefs, and health behaviors that may be obscured in studies that are designed to measure the magnitude of racial differences in allostatic load and cortisol. Further, the small number of African Americans (and other disparity populations) that have been included in racial group comparisons of allostatic load and cortisol is not likely to be sufficient to complete sub-group analyses of stress responses specifically in African Americans (and other disparity populations). Lastly, African Americans and other disparity populations are likely to vary in terms of their individual reactivity to racial discrimination and other types of stressors.

#### **PRIORITIES FOR BASIC BEHAVIORAL SCIENCE RESEARCH IN MINORITY HEALTH AND HEALTH DISPARITIES**

Translational research in minority health and health disparities has four essential components that include: (a) basic science research to identify biological mechanisms involved in disease risk and progression; (b) clinical trials and interventions that test approaches to modify these mechanisms; (c) patient, provider, and community outreach to disseminate evidence-based interventions into clinical and public health practice and community programs; and (d) implementation and institutionalization of interventions into practice based on relevant policies and guidelines [63]. This framework is consistent with those that have been established for translational prevention research and TDTB [9, 10] and can be used to identify priorities for the next generation of TDTB in minority health and health disparities. The inclusion of stress responses and stress reactivity in conceptual models and frameworks of minority health and health disparities is

an important step forward in establishing a TDTB research agenda in minority health and health disparities that is consistent with the goals of basic behavioral science and several overarching initiatives in medical care and public health practice. The precision medicine initiative, for instance, focuses on integrating genetic, environmental, and lifestyle factors to ensure that individuals receive the right medical care at the right time. Similarly, basic behavioral science research aims to ensure that health behavior interventions are maximally effective by targeting the mechanisms that influence how and why individuals perform health behaviors. Providing the right health information to individuals is also the goal of tailored health communication [31], but a potential criticism of tailored health behavior interventions is that they may not be reaching individuals at the right time. Previous research has shown that the extent to which individuals have unmet basic needs related to social determinants (e.g., financial hardship, food insecurity, housing) and psychosocial stress may minimize the benefits of tailored messages because the time is not right to receive and act on this information [35]. A greater understanding of how social determinants and other psychosocial factors contribute to adverse stress responses and reactivity in disparity populations could provide important insights about how to target tailored messages and other types of health behavior interventions more effectively in these populations.

There is considerable opportunity to improve the precision of health promotion and disease prevention interventions in disparity populations using the TDTB framework and methods from basic behavioral science research. For instance, stress reactivity and stress resilience have been identified as important targets for behavioral interventions and research in the SOBC has examined stress reactivity, executive control, and health behaviors in undergraduate college students and other populations [14]; however, there has not been a sufficient number of basic behavioral science studies that have examined these targets specifically in minority populations and most research related to stress responses in African Americans have focused on racial discrimination as the primary stressor. This may focus may be appropriate in light of the police killings during the summer of 2020, but it could also be argued that these events are the result of pervasive structural racism that leads to chronic exposure to stress among African Americans. Thus, an important priority for the next generation of minority health and health disparities research is to conduct basic behavioral science studies that examine overall stress responses (and other putative targets such as executive functioning) using biological measures and endpoints along with self-reported data on these variables. The next generation of research in this area should also examine within group variability in basic behavioral

mechanisms (e.g., stress reactivity) among African Africans (and other disparity populations) to determine the extent to which these responses differ based on socioeconomic factors, are related to key constructs from health behavior theories, and are associated with health promotion and disease prevention behaviors. Within this research framework, it is important for basic behavioral science studies to identify biological mechanisms and consequences of stress responses and stress reactivity in disparity populations to understand the extent to which these reactions influence neural processes (e.g., brain activity), the quality of information processing of alternate messages that are delivered in written communications and interpersonal interactions, and the impact of these cognitive processes on health promotion and disease prevention behaviors.

With respect to interventions, there is an emerging evidence base about the impact of interventions that are based on complementary and alternative medicine (e.g., mindfulness training, yoga) on stress responses, but disparity populations have not been included in these studies with sufficient representation. Greater efforts are needed to develop and evaluate interventions that target basic behavioral mechanisms (e.g., stress responses) among disparity populations and to examine the impact of these interventions on physiological stress responses (e.g., cortisol, allostatic load) and health behaviors. It is also important for other biological mechanisms that contribute to health disparities (e.g., oxidative stress) to be measured as intervention endpoints in addition to behavioral outcomes. Complementary and alternative interventions, for instance, can be important to help individuals manage individual stress responses, but interventions are also needed to mitigate stress by addressing unmet social needs using evidence-based strategies that help individuals to address social determinants. Interventions are now being developed to evaluate the effects of navigation to address social needs among patients in health care settings [64]; referring patients to social services may mitigate unmet social needs and provide an opportunity to promote health behavior change once social risk factors have been addressed. Physiological measures of basic behavioral mechanisms or clinical parameters (e.g., blood pressure) could be incorporated into these studies to demonstrate the clinical and public health relevance to health promotion and disease prevention endpoints.

As in early studies that were conducted to develop health behavior change interventions that targeted priorities and concerns among communities in disparity populations, it continues to be important for diverse stakeholders to be engaged in the process of identifying key issues related to stress and stress responses in minority groups. These stakeholders should also be actively engaged in the development, implementation, and evaluation of

interventions within a TDTB framework. Active community engagement could identify the myriad types of stressors (beyond racial discrimination and structural racism) that disparity populations experience, provide insight into the behavioral strategies that are used to manage stress responses within one's lived experience, and contribute to the development of interventions that are practical, salient, and likely to be accepted by diverse patient and community groups. A participatory approach that involves community stakeholders and academic investigators working together is consistent with the frameworks that are being used to guide translational behavior research. Identifying intervention targets, or potentially modifiable factors, for instance, is the first step in the experimental medicine approach that is being used in the SOBC[12] and Phase I of Obesity-Related Behavioral Intervention Trials (ORBIT) is to identify treatment targets and test and pilot test interventions [65].

Examining basic behavioral processes such as stress responses and stress reactivity within the broader social, psychological, and behavior context beyond, but inclusive of racial discrimination and structural racism, in disparity populations could be the type of transformational and paradigm changing research that is needed to promote and ultimately, sustain health equity in disparity populations by targeting health promotion and disease prevention behaviors that contribute to morbidity and mortality. However, the lack of diversity and representation of disparity populations in behavioral science research continues to be a significant challenge and may also slow progress in the next generation of transdisciplinary and translational basic behavioral science research in minority health and health disparities. The lack of racial and ethnic diversity in cancer clinical trials is being addressed nationally through programs that support academic medical centers and community oncology practices that have a large proportion of patients from disparity populations and other medically underserved groups into clinical trials. The NCI Community Oncology Research Program (NCORP) supports academic medical centers and community oncology facilities across the USA to focus on enrolling minority and medically underserved patients into clinical trials and cancer care delivery studies [66]. Similarly, the Centers for Population Health and Health Disparities were supported by NIH to identify determinants of disparities in health care and outcomes[66] and enrolled individuals from disparity populations into observational studies and clinical trials [67]. The Transdisciplinary Collaborative Centers in Precision Medicine funded by the NIMHD also have a specific focus on enrolling minority populations into precision medicine research [38, 39] and are now generating empirical data on recruitment and retention outcomes[68] along with findings from translational research on

Priorities for basic behavioral science research in minority health and health disparities		
Basic science	Intervention development	Outreach and education
<ul style="list-style-type: none"> <li>• Characterize basic behavioral mechanisms in disparity populations</li> <li>• Identify socioeconomic, psychological, and social correlates of basic behavioral mechanisms within groups</li> <li>• Examine the association between mechanisms and outcomes that are relevant to clinical care and public health</li> <li>• Evaluate between-group differences in basic behavioral mechanisms</li> </ul>	<ul style="list-style-type: none"> <li>• Develop interventions to address basic behavioral mechanisms that are relevant clinically and for public health collaboratively with diverse stakeholders</li> <li>• Conduct studies to confirm interventions engage and modify mechanisms and outcomes</li> <li>• Collect and analyze multilevel data (e.g., social determinants of health, basic behavioral mechanism) as part of interventions</li> <li>• Ensure adequate representation of disparity populations in interventions and observational studies</li> </ul>	<ul style="list-style-type: none"> <li>• Provider, patient, and community outreach and education about basic behavioral mechanisms</li> <li>• Establish transdisciplinary research teams within and between disease sites and conditions (as appropriate)</li> <li>• Enhance workforce diversity in research teams</li> </ul>
Translate findings into practice through dissemination and implementation research. Use findings to inform policies about public health practice, population health management, and health care delivery.		

the interactive effects of genetic, environmental, and lifestyle determinants of disease risk and outcomes in disparity populations. It is important for the next generation of basic behavioral science research to learn from and adapt these models to ensure that there is adequate representation of diverse disparity populations in TDTB studies. Lastly, investigators with expertise and training in diverse disciplines that include basic science, neurosciences, psychology, health behavior change, and community and patient engagement need to be assembled into multidisciplinary teams that work to integrate theories, conceptual models, and methods to examine biological processes related to basic behavioral processes (e.g., stress responses and stress reactivity), determine how these processes interact with social and psychological factors to contribute to health risk and disease prevention behaviors, and translate this evidence into interventions that target physiological and psychological mechanisms.

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#### Compliance with Ethical Standards

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