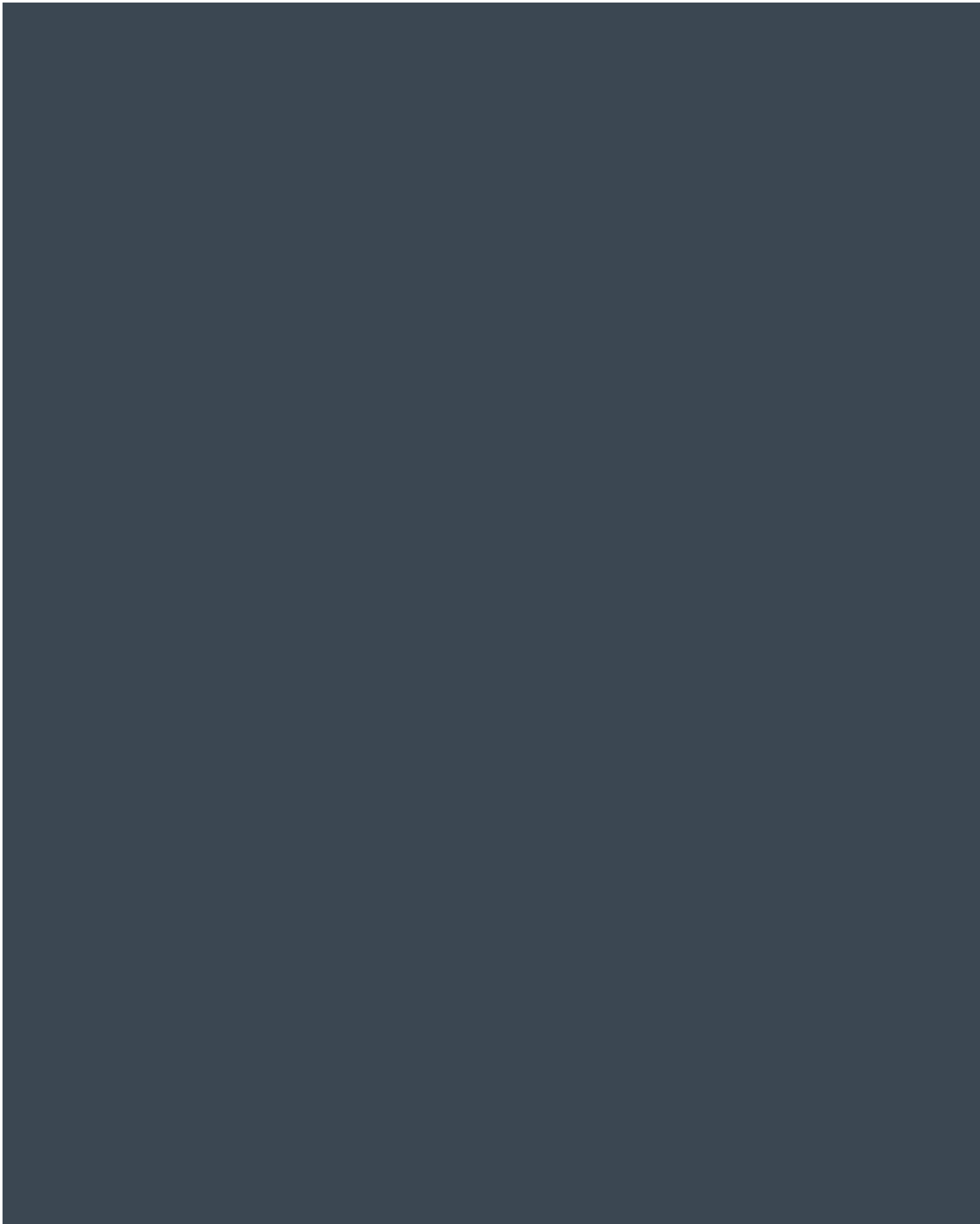


STRESS AND **HEALTH DISPARITIES**

*Contexts, Mechanisms, and Interventions Among Racial/Ethnic Minority
and Low Socioeconomic Status Populations*



AMERICAN
PSYCHOLOGICAL
ASSOCIATION



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Working Group Members

Elizabeth Brondolo, PhD, Chair

Kahaema Byer, MS

Peter J. Gianaros, PhD

Cindy Liu, PhD

Aric A. Prather, PhD

Kamala Thomas, PhD

Cheryl L. Woods-Giscombé, PhD, RN, PMHNP-BC

APA Staff

Lula A. Beatty, PhD

Senior Director, Health Disparities

Patricia DiSandro

Program Coordinator, Health Disparities

Gwendolyn Puryear Keita, PhD

Executive Director (2006–2016), Public Interest Directorate



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PSYCHOLOGICAL
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STRESS AND HEALTH DISPARITIES

Contexts, Mechanisms, and Interventions Among Racial/Ethnic Minority and Low-Socioeconomic Status Populations

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Health Disparities Office
Public Interest Directorate
American Psychological Association
750 First Street, NE
Washington, DC 20002-4242
(202) 336-6036
lbeaty@apa.org

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PREFACE

In 2011, the American Psychological Association (APA) approved the support of a health disparities initiative as an activity of its recently adopted strategic plan. The purpose of the initiative was to increase support for research, training, public education, and interventions that reduce health disparities and promote health equity among underserved and marginalized populations.

We view health as a state of optimal physical, mental, and social well-being and not just the absence of disease. We understand health disparities to be persistent, avoidable differences in health experienced by disadvantaged populations as a result of social injustices. Beginning with Secretary Heckler's report in 1985 (U.S. Department of Health and Human Services, 1985), disparate gaps in health have been documented across a wide range of illnesses and health status indicators and within a number of population groups.

We limited the initial scope of our initiative to three health problems, namely, substance abuse, obesity, and stress. These conditions are significant health problems for many disadvantaged groups in their own right, and they are also correlates and predictors of other health outcomes and disparities. For example, drug use—including tobacco, alcohol, and illicit drugs and related behaviors—is the actual cause of death for most of the leading causes of death in the United States (Mokdad, Marks, Stroup, & Gerberding, 2004). Racial/ethnic minority populations experience more adverse consequences of drug use and addiction, have less access to quality drug treatment, enter drug treatment with more severe complicating problems, and have fewer abstinence-supporting resources (Marsh, Cao, Guerrer, & Shin, 2009). Obesity is linked to at least 20 chronic diseases, increases the risk of premature death, and reduces overall quality of life (Levi, Vinter, St. Laurent, & Segal, 2010; Sherry et al., 2010). Racial/ethnic minority groups disproportionately experience obesity (Levi et al., 2010). Similarly, stress is linked to coronary vascular disease, obesity, diabetes, and autoimmune disorders (Djuric et al., 2010). Stressors more frequently experienced by racial and ethnic minority groups, including racial discrimination, have been associated with health status and health behaviors (Ahmed, Mohammed, & Williams, 2007; J. S. Jackson, Knight, & Rafferty, 2010).

The health disparities initiative is based in the Public Interest Directorate (PI; <http://www.apa.org/pi>), home to offices and programs that focus on the needs of underserved and vulnerable populations—including, for example, racial/ethnic minorities; low-SES communities; lesbian, gay, bisexual, and transgender individuals; and persons with disabilities. A working group was established to prepare a report summarizing critical factors that contribute to the understanding of the role of stress in health disparities and to make action recommendations for APA and others, such as researchers, health care

providers, community leaders, and policymakers, to more effectively improve the overall health and quality of underserved populations through addressing stress.

The Health Disparities National Steering Committee appointed a working group of psychologists with expertise in varying aspects of stress. They are Elizabeth Brondolo, PhD, Chair; Kahaema Byer, MS; Peter J. Gianaros, PhD; Cindy Liu, PhD; Aric A. Prather, PhD; Kamala Thomas, PhD; and Cheryl L. Woods-Giscombé, PhD, RN, PMHNP-BC.

The working group appreciates the thoughtful reviews of the report provided by the following groups: Committee on APA Division Relations; Board of Scientific Affairs; Committee on Early Career Psychologists; Committee on Disability Issues in Psychology; Committee on Children, Youth, and Families; Division 54: Society of Pediatric Psychology; Committee on International Relations in Psychology; Policy and Planning Board; Board for the Advancement of Psychology in the Public Interest; Committee on Psychology and AIDS; Committee on Sexual Orientation and Gender Diversity; American Psychological Association of Graduate Students; Committee on Legal Issues; Board of Educational Affairs; Committee on Early Career Psychologists; Committee on Socioeconomic Status; Committee on Aging; Committee on Rural Health; and Ethics Committee.

The working group also appreciates the APA staff who provided guidance and support in the development of this report. They include Lula A. Beatty, PhD (Senior Director, Health Disparities); Patricia DiSandro (Program Coordinator, Health Disparities); and Gwendolyn P. Keita, PhD (Executive Director, 2006–2016, Public Interest Directorate). We would also like to acknowledge Rashaun Roberts, PhD, of the Centers for Disease Control and Prevention, who served on the working group, and Amandeep Kaur, MA, of St. John's University for her conscientious and insightful contributions to the research and writing of this report.

EXECUTIVE SUMMARY

There are well-documented disparities in health by socioeconomic status and race and ethnicity (National Center for Health Statistics, 2012.) Stress has been identified as one of the top 10 determinants of disparities in health (World Health Organization [WHO], 2008). This report presents a state-of-the-science overview of research examining stress as a driver of disparities in health.

Stress occurs when individuals experience demands or threats without sufficient resources to meet these demands or mitigate the threats (Lazarus & Folkman, 1984). We document disparities in stress exposures; explore biopsychosocial mechanisms that may link stress to health, with a particular focus on disparities in depression, cardiovascular disease, and cancer; and identify interventions on the individual, family, community, and national levels that may reduce stress and the effects of stress on health among health disparity populations. The aim is to identify actions that APA and others can take to reduce stress and stress-related health disparities.

FINDINGS

Documenting Disparities in Stress Exposure

There are significant disparities by socioeconomic status (SES) and race in self-reports of stress. Individuals of low (vs. high) SES and Black and U.S.-born Hispanic individuals (in comparison to Whites) report higher levels of stress. Members of racial and ethnic minority groups report greater exposure to discrimination (Sternthal, Slopen, & Williams, 2011). There are also social class and racial disparities in exposure to specific objective threats to safety and financial security across the lifespan, including greater exposure to violence and barriers to occupational advancement (Browning et al., 2017; Pager, Western, & Padulla, 2009).

As important, there are also significant race and class disparities in access to a wide range of personal, social, educational, and material resources across the lifespan (P. Taylor, Kochhar, Fry, Velasco, & Motel, 2011). For Black, Hispanic, and Native American individuals, neighborhood disadvantage across the lifespan compounds the deprivation of poverty at the individual level (Drake & Johnson-Reid, 2014; Sarche & Spicer, 2008; Thorpe, Brandon, & LaVeist, 2008). Without sufficient resources, even minor demands are more stressful. Racial and ethnic discrimination compounds these effects by increasing threat exposure and creating barriers to the development of the resources needed to respond to these threats (Brondolo, Libretti, Rivera, & Walsemann, 2012; R. Clark, Rodney, Anderson, Clark, & Williams, 1999; Krieger, 2014; Lewis, Cogburn, & Williams, 2015).

Mechanisms Linking Stress to Health

Stressors related to social and economic disadvantage have demonstrable downstream effects on a wide range of psychological, neurobiological, physiological, and behavioral processes related to health.

On a psychological level, the stressors associated with social and economic disadvantage have effects on the way individuals think and feel about themselves and others, potentially generating new threats, heightening appraisals of threat, and undermining the personal resources needed to respond to the threats (Brondolo, Ng, Pierre, & Lane, 2016; Gallo & Matthews, 2003; Kraus, Piff, Mendoza-Denton, Rheinschmidt, & Keltner, 2012). On a neurobiological level, stressors associated with disadvantage can affect the development of the brain structures and processes necessary to support effective self-regulation and stress recovery (Hofmann, Schmeichel, & Baddeley, 2012). On a physiological level, threat appraisals elicit activation of neuroendocrine, immune, and autonomic systems throughout the body (Gianaros & Wager, 2015). Frequent, intense, or persistent activation of these systems may alter their self-regulatory capacities, leading to impairments in stress recovery, including notable disruptions to sleep. On a behavioral level, stressors and their downstream effects on psychobiological stress systems may also shape health behaviors, driving obesity and substance use in particular (J. S. Jackson et al., 2010). Processes at any one level influence those at another, potentially exacerbating or prolonging the effects of stress.

Interventions to Reduce Disparities

Efforts to reduce health disparities have included a wide range of individual, dyadic, family, and community-level approaches. On an individual and dyadic level, promising approaches include culturally adapted cognitive behavior stress management interventions and mindfulness approaches (Burnett-Zeigler, Schuette, Victorson, & Wisner, 2016; Lechner et al., 2013), as well as training to improve children's cognitive control competencies (Diamond & Lee, 2011), parent-child interactions (Mortensen & Mastergeorge, 2014), and patient-provider communication (Havranek et al., 2012). Systemic interventions have attempted to decrease discrimination at work or school (Paluck & Green, 2009), reduce violence by improving economic access (Masseti & David-Ferdon, 2016) or police-community engagement (Graziano, Rosenbaum, & Schuck, 2014), increase access to healthy foods and recreational facilities, and facilitate engagement in health care through the use of community partners (Victor et al., 2011), among other approaches derived from community-based participatory research (see reviews by A. R. Clarke et al., 2013; Glik et al., 2016). The literature on disparity-reduction interventions is still growing, and the findings indicate both positive outcomes and concerns about potential challenges and side effects. There is also a growing recognition that there are important personal, situational, institutional, and regional moderators of outcomes (Abrams, 2010; D. R. Williams & Mohammed, 2013).

Gaps in Knowledge

Health disparities research has grown rapidly and provided greater understanding of the role of specific stressors in influencing stress processes and/or health outcomes. However, there has been limited research examining the ways in which factors at one level (i.e., at the national, community, family, or individual level) drive stress exposures at other levels. Additionally, there is a need for further research clarifying potential bidirectional relationships among stressors, stress processes, and health outcomes. This type of research can help develop a clearer understanding of the antecedents and consequences of stress exposure. Relations among stressors and outcomes have largely but not exclusively been studied in relatively narrowly defined populations, making it difficult to understand the degree to which stress effects generalize across health disparity populations. Although disparities in stress exposure and stress processes have been identified, there is a need for more explicit tests of the hypothesis that disparities in stress account for disparities in health.

Further, interventions have also focused on specific threats or gaps in resources, but further research is needed to determine if these interventions modify stress processes and have replicable effects on health outcomes. Unintended consequences of these interventions have been identified, and a clearer understanding of the personal and contextual factors that explain variations in outcomes is still needed.

RECOMMENDATIONS

FOR RESEARCH, EDUCATION, PRACTICE, PUBLIC AWARENESS, AND POLICY

Recommendations for Research

1. Support longitudinal multidisciplinary research programs capable of examining the interrelationships among barriers to health operating at the individual, family, community, and national levels.
2. Support research to identify the best strategies to reduce prejudice and discrimination and to identify moderators of response to strategies to reduce race-related stress.
3. Support research to determine the kinds of social and psychological resources that are needed to facilitate integration of workplaces, neighborhoods, schools, and other institutions.
4. Support new research to develop the complex models and statistical methods to understand the effects of stress on susceptibility and resilience.
5. Expand fellowships for young researchers in health disparities. Develop modules for curricula in behavioral medicine and health statistics to facilitate the study of the causes and consequences of health disparities.

Recommendations for Education/Practice

6. Improve the capacity of psychology training programs to train clinicians to discuss and address the effects of inequality and injustice on individual and community health.
7. Provide graduate and continuing education training to all psychologists and other health care providers working with racial/ethnic and low-income or low-SES populations to ensure that they are highly competent and skilled in best practices for addressing minority and culture-related stress.
8. Integrate multidisciplinary work (e.g., from the perspectives of organizational psychology, sociology, anthropology, and other disciplines) to develop strategies for improving collaboration and problem solving among diverse groups.

Recommendations for Public Awareness

9. Partner with community-based organizations, schools, and other professional organizations to plan strategic collaborative efforts to disseminate information on stress and its implications for health disparities.
10. Develop a media campaign to help the public, policymakers, clinicians, communities, and individuals understand stressors and their impact on health priority populations and health disparities. This campaign should explicitly address the stress-inducing implications of persistent exposure to implicit biases, microaggressions, racism/discrimination, and classism.

Recommendations for Policy

11. Advocate for funding for research on reducing and managing stress at all levels for racial/ethnic and low-SES populations.
12. Advocate for access to mental health services for individuals and families under stress.



INTRODUCTION

Good health is not equally distributed. Socioeconomic status (SES), race, and ethnicity affect health status and are associated with substantial disparities in health outcomes across the lifespan (Braveman, Egerter, & Williams, 2011; WHO, 2013). Specifically, in comparison to those with higher incomes, individuals living below the poverty level have poorer mental health, are diagnosed with more chronic health conditions (e.g., diabetes, hypertension), and have a shorter lifespan. A recent analysis indicates that men whose income is in the top 1% live almost 15 years longer than men with incomes in the bottom 1%; for women, income differentials are associated with almost 10 years' difference in life expectancy (Chetty et al., 2016; National Center for Health Statistics, 2012).

Although progress has been made, there are still disparities in health by race/ethnicity in the United States (Agency for Healthcare Research and Quality, 2015). For example, despite significant decreases in infant mortality and overall increases in life expectancy over the years, Black Americans continue to have the highest rates of infant mortality and, among adults, the shortest lifespan (Xu, Murphy, Kochanek, & Arias, 2016). American Indians live an average of 4 years less than the general U.S. population, partly as a function of diabetes-related illness (Indian Health Service, 2017). Identifying and ameliorating fundamental causes of health disparities is a national priority reflected in Healthy People 2020 (U.S. Department of Health and Human Services, 2016b).

Stress is one of the top 10 social determinants of health inequities (WHO, 2008). The relationship of stress to the onset and course of many major mental and physical health conditions is well documented (Lovallo, 2015; WHO, 2008). The frequency, intensity, and duration of stress exposure are not the same for all groups of Americans. As we will review in this report, low-income individuals and members of racial/ethnic minority groups are disproportionately exposed to stress across life domains—facing greater threats to health, safety, and economic advancement (Baum, Garofalo, & Yali, 1999; Sternthal et al., 2011).

When social position shapes stress exposure and consequently leads to disparities in health outcomes, these stress exposures are unjust. They are also costly. Stress-related illness and injury are estimated to cost the United States more than \$300 billion per year, including costs related to stress-related accidents, absenteeism, employee turnover, diminished productivity, and direct medical, legal, and insurance costs (American Institute of Stress, 2013).

Disparities in stress exposure can be prevented and addressed. Disparities in stress-related health outcomes can be identified and treated (D. R. Williams & Mohammed, 2013). But the development of effective programs to prevent and eliminate dis-

parities in stress and health outcomes depends on a clear understanding of both stress exposures and the pathways through which stress contributes to health and health disparities.

PURPOSE

The purpose of this report is to synthesize existing research on socioeconomic, racial, and ethnic disparities in stress and health. We begin by reviewing the evidence on socioeconomic and race/ethnicity disparities in stress exposures and then identify the mechanisms that may link disparities in stress exposure to disparities in health. We also review a wide range of interventions that have been implemented to reduce health disparities and identify potential benefits and concerns. The aim of this report is to provide guidance for APA and others in their efforts to address stress and stress-related health disparities.

To enable a detailed examination of the evidence, we focus on the experiences of stress associated with low SES and membership in a racial and/or ethnic minority group in the United States. On an individual level, SES reflects education, income, occupational status, and often assets (APA, 2010). There is significant overlap between race/ethnicity and SES across the lifespan (National Center for Health Statistics, 2012; U.S. Census Bureau, 2013). However, as researchers have tended to focus analyses of disparities on either SES or race (while controlling for other variables), we present data on race and class differences separately, highlighting overlap as data are available.

The report is organized to address three sets of questions:

1. What are the race, ethnicity, and SES disparities in stress exposure across the lifespan? Which factors in the social, economic, and political environment drive these disparities in stress exposure?
2. How does stress affect physical and mental health? What are the effects on the mind and brain, on physiological reactivity and recovery, and on health behaviors?
3. What are effective interventions to reduce stress and its effects on health among health disparity populations?

In the answers to these questions, we highlight three major issues. First, stress occurs when individuals face threats but do not have sufficient resources to respond to these threats. Our target groups—those of low SES and members of marginalized racial and ethnic minority groups—live and work in social and physical environments that increase the likelihood of exposure to threats but decrease the availability of the material and social resources necessary to address these threats and mitigate their effects on health. Racial and ethnic discrimination compound these effects by increasing threat exposure and creating barriers to the development of needed resources (R. Clark et al., 1999; D. R. Williams, Yu, Jackson, & Anderson, 1997).

Second, stress has downstream effects on the individual, affecting a wide range of psychological and physiological processes involved in the stress response. These psychophysiological

processes mediate the relationship of stress to health. But the effects of stress on the brain and body are bidirectional, with the effects of stress on psychophysiological processes potentially increasing the frequency and duration of threat exposure and creating barriers to the acquisition of resources. Addressing health disparities is likely to require interventions that reduce threats and improve resources in the social and physical environment, as well as interventions that target the psychophysiological stress processes triggered by stress exposure.

Third, research on stress, stress processes, and health has guided the development of a wide range of interventions to reduce health disparities. The intervention literature is still in its early stages, but preliminary evidence suggests that interventions can diminish threats and increase resources on an individual and neighborhood level, and some data suggest these changes may reduce health disparities (Glik et al., 2016; D. R. Williams & Mohammed, 2013). However, there is also evidence that some interventions that target stress processes in health disparity populations may have unintended consequences (Miller, Yu, Chen, & Brody, 2015). More effective interventions to reduce health disparities will depend on a better understanding of the drivers of stress processes and the identification of potential moderators of intervention response (including factors at the community, family, and individual level).

SOME METHODOLOGICAL NOTES

In this report, we examine disparities by SES and race in stress exposures, stress processes, and health outcomes. The data also suggest that there are further variations by other sociodemographic characteristics (e.g., nativity, place of birth, gender, and region of the country, among others) and by the local cultural and political climate (Richman & Hatzenbuehler, 2014; D. R. Williams, Priest, & Anderson, 2016). Where the data are available, we present research examining the intersection of race, SES, and other status-related characteristics on stress exposure and outcomes. We take a lifespan approach to the data, highlighting the ways stress exposures in childhood may change underlying psychophysiological processes across the lifespan, with cumulative effects on susceptibility and resilience. To better understand the drivers of these disparities, we attempt to integrate research on historical, cultural, and community-level factors that may influence stress exposures.

This multidisciplinary and multilevel approach can inform a dynamic person-in-context approach to understanding health disparities. Person-in-context approaches allow us to understand the bidirectional relationships between the individual (i.e., person) and the specific social and environmental context in which he or she develops and lives (i.e., the context; Ellis, Boyce, Belsky, Bakermans-Kranenburg, & Van IJzendoorn, 2011). Different contexts may present specific threats and specific barriers to resources at the individual, family, and community level. Consequently, different interventions may be needed to address the varied needs of individuals living and working in different contexts (e.g., urban,



rural, conservative, liberal, economically stressed, ethnically diverse, etc.), who have differing levels of resources (e.g., different genetic characteristics, sociopolitical histories, cultural practices, or family support).

IMPLICATIONS AND RECOMMENDATIONS

The demands facing disadvantaged individuals are markedly different from those facing individuals with greater advantages, and the gaps in available resources are substantial. The threats facing those in less advantaged and more dangerous environments may not be as salient to those who do not face the same threats. We hope to make disparities in stress exposures, stress processes, and health outcomes more visible to better inform disparity-reduction efforts.

The final section of the report presents recommendations for research, education, practice, and policy. The aim is to pro-

vide guidance to a wide range of stakeholders. For scientists and scientist-administrators, this report reviews the state of the science on stress and health disparities with the aim of highlighting complexities in the existing literature and the gaps in knowledge that need further research. For clinicians, the discussion of stress mechanisms can help identify new targets for intervention. The presentation of existing interventions may increase awareness of treatment approaches to reduce disparities. For policymakers and health care advocates, evidence of disparities in a wide range of stressors and their potential effects on health can guide strategies for targeting advocacy and intervention efforts at a local and national level. For educators, the presentation of the links between the social environment, stress, and health can help to identify skills that psychologists will need to address health disparities. This research can suggest new approaches to clinical training. For the public at large, an accessible source of information about stress and health disparities may help individuals manage their own stress and their health in a more informed manner.

LIMITATIONS

This report has important limitations. First, we focus on disparities related to specific targeted populations: individuals of low SES and members of racial and ethnic minority groups. Further, much but not all of the available literature on health disparities focuses on African American and Latino populations. We include findings on Native American/American Indian, Asian, and other groups if data are available. Many of the findings and the models of stress we present may have implications for health disparities related to sexual orientation and gender identity, groups who also face substantial discrimination (Bogart, Revenson, Whitfield, & France, 2014). Although we include some examples, we do not provide detailed reviews of the health issues facing these groups. Similarly, we have not provided detailed reviews of the causes and consequences of disparities in health and health care associated with physical or intellectual disability (Krahn & Fox, 2014).

As the report documents, the antecedents and consequences of stress exposures are often specific to the contexts in which individuals live and work. A narrower focus on the ways these contexts are shaped by SES, race, and ethnicity permitted a more intensive look at the antecedents and consequences of stress exposure for low-SES and racial minority populations. Although this narrower approach has limitations, we hope the depth of the literature review will provide insight valuable to other researchers and clinicians who are investigating other health disparity populations living in a wide variety of contexts.

We focus on depression, cardiovascular disease (CVD), and cancer, but there are also health disparities in many other health conditions, including birth outcomes, diabetes, autoimmune diseases, and AIDS, as well as other mental health disorders. Although we do not address all these different conditions, some of the mechanisms we identify as contributing to depression, CVD, and cancer are applicable to the development of disparities in these conditions as well.

As we identify stressors and stress processes, we draw on selected examples to illustrate the complexity of the issues. We cannot provide a comprehensive review of all possible stress exposures and resources but instead focus on some highly salient stressors, including violence exposure and discrimination, while limiting coverage on other important stressors, including those related to acculturation and immigration. The research reviewed focuses primarily on U.S. populations.

Further, our report places a heavy emphasis on the role of social cognition in stress and illness. We place an emphasis on social cognitive processes, as they are involved in many of the mechanisms that link stress to health outcomes, including physiological reactivity and health behavior (Brondolo, Blair, & Kaur, 2017). Other formulations of the psychological mediators of stress are also possible. Nonetheless, we hope this report generates new ideas and motivates further research and advocacy.

IMPORTANT NOTE

In the next sections of this report we focus on race, ethnicity, and socioeconomic disparities in stress and health, but we recognize there are risks to this endeavor. Identifying the greater burdens of stress and illness that fall on some groups can further stigmatize members of those groups (Ruiz & Brondolo, 2016). However, we cannot remediate harm if we do not know where the difficulties lie.

We also recognize that the focus on the harmful effects of stress tells only a part of the story. The challenges facing targeted communities and individuals can also provide opportunities for solidarity and growth. These challenges may help individuals to join together for a common cause, to strengthen their faith, to develop pride and resilience, and to bring to light pressing moral issues. As members of targeted groups articulate concerns about justice and opportunity, they may change the way others think and feel about members of their group; and in the process, they may also change their own social cognition (Brondolo & Jean-Pierre, 2014; Malat, Timberlake, & Williams, 2011; Nicolas et al., 2008). Individual, family, and community efforts to support equality and opportunity may also foster the development of social cognitive processes that can promote health and well-being (Brannon, Markus, & Taylor, 2015). We hope that despite the risks, examining disparities in stress exposures and health can permit more effective targeting of policy and practice and promote social justice (in alignment with Principle D, Justice, APA's *Ethical Principles of Psychologists and Code of Conduct*; see APA, 2017).

DISPARITIES IN STRESS EXPOSURE

WHAT IS STRESS?

Stress is present in so many aspects of everyday life that the topic can seem too big to study. There is no consensus on how to define stress, how to classify stress exposure, or even how to measure it in research (Kagan, 2016). But there are many good approaches for conceptualizing stress and understanding the ways in which stress can affect health, and these approaches are used to guide the analysis (S. Cohen, Gianaros, & Manuck, 2016). In this section, we present definitions of stress and a conceptualization of the stress–health relationship.

Definitions

Definitions and formulations of stress, which are commonly used in studies of health disparities, emerged from the work of the physiologist John Mason (1975) and psychologist Richard Lazarus and colleagues (Lazarus & Folkman, 1984). From different perspectives, these scientists proposed that the degree to which a situation is perceived as threatening and elicits stress is a psychological process—a function of the individual’s appraisals of the situation. They argued that an individual appraises a situation as threatening when his or her estimates of the demands presented by the situation are greater than the resources he or she has available to meet those demands. Stress can be perceived when the demands are physical (e.g., lifting a piece of furniture, fighting off a physical attack, carrying a child) or psychological (e.g., facing a loss, humiliation, or failure).

People may experience stress when they are faced with high-intensity demands—particularly those that are unpredictable, uncontrollable, or dangerous—but do not have adequate resources. People may also experience stress even when the demands appear to be relatively minor if they do not have the resources they need. In contrast, when individuals have the resources they need, they do not perceive these demanding situations as threatening. Instead, the demands are perceived as a

FIGURE 1

Estimating the effects of demands and resources



challenge. Challenges, even difficult ones, are capable of promoting growth and fostering pride and resilience (Lazarus, 1993).

The degree to which a situation is appraised as a threat (vs. a challenge) can vary depending on a host of factors. Some factors are related to the demands themselves, and others may be related to the individual’s own history and circumstances. For example, among the factors that can affect perceptions of threat are the personal salience of the demands (i.e., the degree to which they threaten self-identity or integrity), the duration and magnitude of the demands (e.g., acute vs. chronic exposure), and the proximity of the demanding events (e.g., events involving direct exposure, vicarious or secondary exposure, or historical exposure; Baum, Cohen, & Hall, 1993; Duncan & Hatzenbuehler, 2014; Segerstrom & Miller, 2004). Each of these variables may affect the type and intensity of resources needed to cope with the demands.

As we will document, individuals facing economic and social disadvantage experience more subjective and objective threats but often have fewer resources to respond to these threats. The situation is compounded because the threats themselves and their effects on stress-related processes within the individual further undermine the personal, social, and material resources

Individuals facing economic and social disadvantage experience more subjective and objective threats but often have fewer resources to respond to these threats

that individuals and communities need to prevent and mitigate the threats. Further, *stress clustering*—the accumulation of multiple stressors from different sources—is a phenomenon that is more common for individuals facing social and economic disadvantages (Sternthal et al., 2011). Stress clustering can add to the overall burden of stress exposure and exacerbate disparities. Specifically, the burdens associated with an initial stress exposure may be intensified if the original stressor initiates stressful event sequences—new stressors that occur because of the effects of the original event (Liu & Tronick, 2013; Segerstrom & Miller, 2004).

Stress Processes

On an acute level (i.e., in the moment), stressors elicit predictable psychological and physiological responses (Gianaros & Wager, 2015). Threatening events trigger threat appraisals, even when individuals are unaware of these effects (Brosschot et al., 2014). These threat appraisals can be accompanied by a wide range of thoughts and feelings (e.g., anger, sadness, and fear), and can produce changes to cognitive functions (e.g., attention and memory).

Threat appraisals trigger mobilization of the physical systems (e.g., the autonomic nervous system, the neuroendocrine system) necessary to engage the psychological and physiological functions (e.g., cognitive, affective, immune, and metabolic functions) that are needed to help the body meet demands (Gianaros & Wager, 2015). Once the stressor has ended, built-in regulators help return physiological systems to prestress levels and restore homeostasis, conserving

resources for the next stressor (Seeman, McEwen, Rowe, & Singer, 2001).

More severe or persistent stressors can produce more persistent changes to psychological and physiological structures and processes. Persistent or severe stress can shape social cognition—the ways in which people perceive, interpret, and respond to social interactions and the world at large (Fiske & Taylor, 2013). In some cases, these changes to social cognition can increase threats, heighten threat appraisals, and undermine the resources needed to mitigate threats and reduce their health effects. Over the long run, the effects of stress on social cognition may shape individuals' relationships with others and their ability to set and achieve goals (including those related to health; Brondolo et al., 2012, 2016).

Chronic stress can disrupt the regulation of physiological systems that mediate the stress response (McEwen & Gianaros, 2010). Stress may also affect health behavior, increasing substance use or dysregulated food consumption (J. S. Jackson et al., 2010). Over time, the effects of stress on physiological stress responses and health behavior can lead to an increase in allostatic load—a composite measure of stress dysregulation and its consequences across bodily systems with documented effects on health outcomes (McEwen & Gianaros, 2010).

A clearer picture of disparities in stress exposure and a more detailed understanding of the relationship of stress to health have led to a growing consensus that stress may play a central role in race and class disparities in health outcomes (Baum et al., 1999; A. E. Clark, D'Ambrosio, & Ghislandi, 2016; Krieger, 2014; Sternthal et al., 2011; Stolley, LaVeist, &

Krieger, 2004; Yoshikawa, Aber, & Beardlee, 2012). Both race and SES influence stress exposure, as these social status variables affect the demands people face and their access to the resources necessary to meet those demands. Over the lifespan, greater stress exposure may alter social cognitive processes, disrupt psychophysiological stress reactivity and recovery, and interfere with the self-regulation of health behavior, contributing to the well-documented relationship of stress to impairments in mental and physical health (Miller, Chen, & Cole, 2009; Miller, Chen, & Parker, 2011). To address the health consequences of disparities in stress exposure, researchers need a clear understanding of the nature of these disparities and the mechanisms through which they can affect health outcomes.

More severe or persistent stressors can produce more persistent changes to psychological and physiological structures and processes

DOCUMENTING DISPARITIES IN STRESS EXPOSURE

We begin by examining disparities in self-reported exposure to stress, reflecting the notion that experiences of stress are a function of appraisal processes—individual-level perceptions of the relationship of demands to resources. However, to develop a more comprehensive understanding of health disparities, it is also necessary to evaluate disparities in exposure to objective threats and to examine gaps in social and material resources. Disparities in objective indices of stress exposure may serve as potential antecedents of stress appraisals. Identifying these upstream disparities in exposure to threat and resources may help identify targets for prevention and intervention. In a special section (see pp. 15–18), we examine the ways in which some of the racial and ethnic disparities in stress exposures are likely to stem from racial and ethnic bias.

Disparities in Self-Reported Stress Exposure

The findings of population-based studies suggest SES and race/ethnicity disparities in the prevalence of different types of self-reported stress. Overall, low SES is associated with greater self-reported stress across most types of measures. In comparison to those with higher levels of SES, individuals with lower levels of education and income report more severe (but not more frequent) daily hassles (Grzywacz, Almeida, Neupert, & Ettner, 2004), higher levels of perceived stress (S. Cohen & Janicki-Deverts, 2012), more intense stress across life domains (Hatch & Dohrenwend, 2007), and more frequent exposure to traumatic events (N. Breslau et al., 1998). Individuals who currently have low SES report having experienced more adverse events during childhood (Nurius, Logan-Greene, & Green, 2012; Topitzes, Pate, Berman, & Medina-Kirchner, 2016).

There are also significant race/ethnicity differences in self-reported stress exposures. In investigations of self-reported stress across specific life domains, Black individuals in comparison

to White individuals report more stress exposure overall, including exposure to discrimination (Boardman & Alexander, 2011; S. Cohen & Janicki-Deverts, 2012; Sternthal et al., 2011). U.S.-born Hispanic adults also report more stress than White adults (Sternthal et al., 2011). Some studies (Boardman & Alexander, 2011; Sternthal et al., 2011), but not all (S. Cohen & Janicki-Deverts, 2012), suggest that race differences persist even after controlling for SES.

Studies of self-reported trauma exposure in childhood and across the lifespan suggest that race differences depend in part on the type of trauma experienced (Roberts, Gilman, Breslau, Breslau, & Koenen, 2011; Schilling, Aseltine, & Gore, 2007). For example, White adults report more trauma exposure overall than other groups. However, Black and in some cases Hispanic adolescents and adults are more likely to report having been exposed to traumatic events that involved witnessing or experiencing violence (Roberts et al., 2011; Schilling et al., 2007).

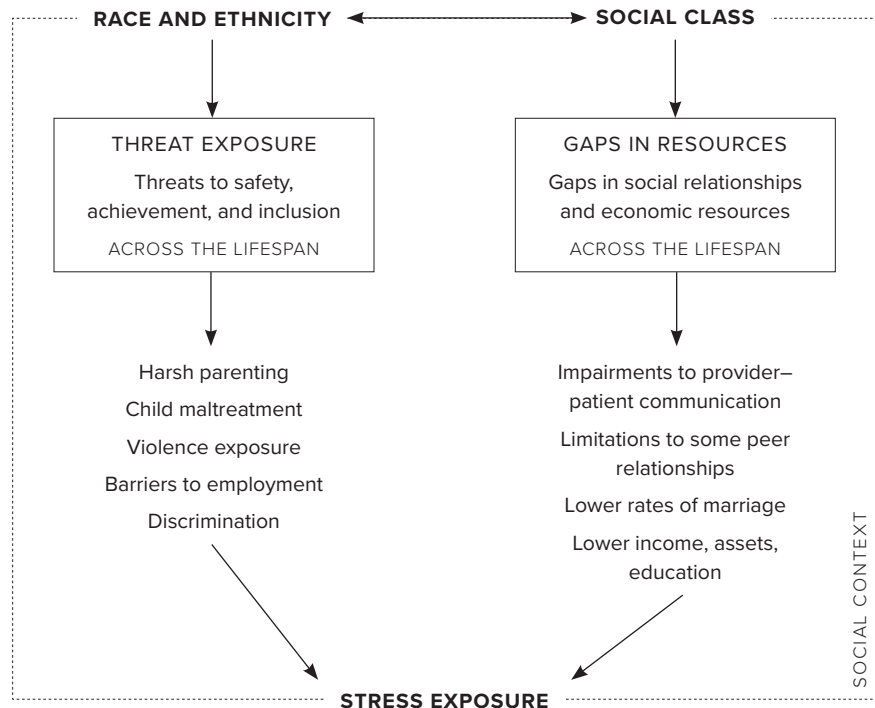
Disparities in Objective Indices of Demands

There are disparities by SES, race, and ethnicity in a wide variety of objectively measured demands. In this section, we focus on disparities in objective threats to safety (e.g., documented child maltreatment, documented violent crime, and reported occupational injuries) and threats to financial security, including threats to employment and occupational advancement. Threats in these and other domains shape the social and environmental context for health disparity populations.

Threats to safety

Low SES is associated with greater risk for threats to safety across the lifespan. Data from the National Interview Survey indicate that children from families with low SES are substantially more likely to be exposed to maltreatment, including physical abuse and neglect (Jonson-Reid, Drake & Kohl, 2009; C. Lee, Coe, & Ryff, 2017). Individuals living below the federal

FIGURE 2 Socioeconomic status and race/ethnicity create contexts that increase stress exposures





poverty level have about twice the risk of becoming a victim of a nonfatal violent crime as those with higher incomes. Low-income women are more likely to be victims of intimate partner violence than are more affluent women (Renzetti, 2009). Neighborhood SES (e.g., proportion of residents living below poverty level, proportion employed) is a risk factor for being a victim of homicide (Ulmer, Harris, & Steffensmeier, 2012). Loss of employment when businesses relocate is associated with increased homicide rates in both Black and White communities (Barranco & Shihadeh, 2015).

Consistent with the self-report data, there are also race and ethnicity differences in threats to safety across the lifespan. However, the evidence suggests some of these differences are a function of SES. For example, the U.S. Department of Health and Human Services (2016a) found that reports of maltreatment were more likely to be made concerning Black and Native American children in comparison to White or Hispanic children. Similarly, there are both SES and race/ethnicity differences in elder abuse, although these data are relatively new and not fully consistent. The findings suggest some increase in risk for older adults in less educated families and among the Black, Hispanic, and American Indian elderly (Dong, 2015).

There are also race differences in exposure to violence, both as a witness or a victim. As reported to the National Crime Victimization Survey, Black individuals aged 12 and older were more likely to report being victims of a violent crime (1.4%) than were Hispanic (1.1%) or White (1.1%) individuals (Truman & Langdon, 2015). Although the data are just beginning to accumulate, epidemiological studies suggest high rates of violence exposure among Native American/American Indian populations, with some indication that these rates are higher than for all or most other groups (Sapra, Jubinski, Tanaka, & Gershon, 2014).

Some of these race differences appear to be a function of race differences in SES. For example, some data suggest that race effects vary depending on the type of maltreatment and are poten-

tially confounded by the effects of SES (Andrews et al., 2015; Hussey, Chang, & Kotch, 2006; Menard, Bandeen-Roche, & Chilcoat, 2004). Black youth (and to a lesser extent Hispanic youth) are significantly more likely than White or Asian youth to spend time in (i.e., to live in or travel through) areas documented to have high levels of violent crime. However, when family and neighborhood SES (and other indices of disadvantage) were entered into the equation, differences between Black and White adolescents were no longer significant (Browning et al., 2017). Similarly, Black women are more likely than White women to experience intimate partner violence, but these race differences are substantially reduced or disappear if Black and White women come from economically similar communities or if SES differences are controlled (for review, see Renzetti, 2009). There is some evidence that Native American women have higher rates of exposure to domestic violence than any other racial

or ethnic group (Sapra et al., 2014). Economic disadvantage is likely to explain the high rates of violence exposure seen among Native American/American Indian populations, as more than 27% of the population lives at or below poverty level (Tighe, 2014).

Occupational injuries are another threat to safety. Race differences in occupational injuries also reflect the overlap between race and SES. Rates of injuries for Black employees are about a third higher than for White employees, in part because African Americans are more likely to work in sectors (e.g., machining, fabricating) with greater risk for injury (Bureau of Labor Statistics, 2011; Strong & Zimmerman, 2005). Hispanic men are more likely to suffer a fatal occupational injury than any other group of employees, with foreign-born Hispanic individuals accounting for the bulk of this effect. Differences between foreign-born and U.S.-born effects may be partly a function of the fact that foreign-born Hispanic men may be wary of objecting to unsafe conditions, as they may not have or perceive themselves to have sufficient employment protections as a function of their immigration status (Leong, Eggerth, Flynn, Roberts, & Mak, 2012).

Threats to financial stability

There are also significant race/ethnicity differences in threats to employment and advancement. Overall, unemployment rates have historically been the highest among African American males. For example, as of January 2016, the unemployment rates for Asian Americans and White Americans were 3.7% and 4.3%, respectively, while the unemployment rate for Black Americans was 8.8% (Bureau of Labor Statistics, 2016). New data on unemployment rates among Native American adults indicate that they are also much more likely to be unemployed than are Whites (DeVoe & Darling-Churchill, 2008; Sapra et al., 2014).

Audit studies reveal barriers to employment and occupational advancement. When Black or Latino (vs. White) men submit résumés for low-wage jobs, they are less likely to be called for interviews, less likely to receive employment,

When Black or Latino . . . men submit résumés for low-wage jobs, they are less likely to be called for interviews, less likely to receive employment, and . . . less likely to be offered a front-of-house job involving customer service

and if they are offered employment, less likely to be offered a front-of-house job involving customer service (Pager et al., 2009). Asian Americans face discrimination in promotion or advancement. Despite high levels of education, training, and experience, they are substantially less likely than Whites to be promoted to upper levels of management or to be awarded partner status (Li, 2014).

In sum, there are substantial disparities by race and SES across subjective and objective stressors. Low-SES individuals report more stress exposure overall; Black Americans and U.S.-born Hispanic Americans report more stress exposure across most domains. Most notably, there are significant socioeconomic and race differences in objective reports of exposure to threats to safety from violence and from occupational injury. These threats emerge, at least in part, as a function of residence in disadvantaged neighborhoods and employment in more dangerous working conditions (Browning et al., 2017; Leong et al., 2012; Meyer, Yoon, & Kaufmann, 2013). All racial and ethnic minorities appear to face threats to financial security, and Black, Hispanic, and Native American individuals face significant barriers to employment (Li, 2014; Pager et al., 2009; Tighe, 2014). As we will review in the next sections, the capacity to respond to these threats is attenuated by gaps in a wide range of resources as well as the presence of other threats, some of which are associated with discrimination.

Disparities in Access to Resources

In this section, we focus on disparities in two major types of resources: social capital (i.e., interpersonal skills and social networks at the individual, family, and community levels; Warren, Thompson, & Saegert, 2001) and economic capital (i.e., material resources including income and assets). Barriers to the development and maintenance of social capital are seen over the course of the lifespan for our target groups (Brondolo et al., 2012; Gallo & Matthews, 2003).

Children raised in low-SES households have fewer supportive interactions with their parents and are more likely to be exposed to harsh parenting and inter-

Job security, job stability, and nonwage compensation that provide for an improved quality of life have all declined precipitously for low-wage earners

personal conflict within the household (Evans & Kim, 2013). Parents with low (vs. higher) SES demonstrate lower levels of involvement in their young children's education (Hornby & Lafaele, 2011; Y. Kim, Sherraden, & Clancy, 2012); for low (vs. high) SES children, parental involvement is more likely to decrease over time (Wang, Hill, & Hofkens, 2014). Neighborhood disadvantage (i.e., low levels of resources across multiple domains) is associated with lower levels of family cohesion (Caughy et al., 2012).

Economic disadvantage undermines the formation of marriages (Watson & McLanahan, 2011), and marriage plays a critical role in financial stability and social support. Low-income individuals are less likely to marry than those with more income. There are also racial disparities in marriage: 90.4% of White adults have married by age 46, in comparison to 68.3% of Black and 84.6% of Hispanic adults (Aughinbaugh, Robles, & Sun, 2013; Raley, Sweeney, & Wondra, 2015). Native Americans have substantially lower rates of marriage than Whites (U.S. Census Bureau, 2007).

The overall support network available to disadvantaged individuals tends to have more limited social and economic resources (Havranek et al., 2015). In comparison to higher SES individuals and those who are White or Hispanic, lower SES and Black individuals are more likely to depend on family members for social connection (G. L. Jackson, Kennedy, Bradbury, & Karney, 2014; R. J. Taylor, Chatters, Woodward, & Brown, 2013). As one possible consequence, Black working-class men are less likely to have connections to employers who can offer

them a job (U.S. Department of Labor, 2012). With fewer married role models, Black individuals may experience gaps in social support from peers and other married couples at critical developmental junctures (e.g., when first married), potentially undermining the success of these new marriages (G. L. Jackson et al., 2014).

There are also increasing disparities in material assets for low-income individuals and racial and ethnic minorities. Job security, job stability, and nonwage compensation that provide for an improved quality of life have all declined precipitously for low-wage earners. For example, during the period from 1982 to 1996, among individuals whose incomes are in the 10th percentile or lower, there has been a 75% decline in nonwage compensation (e.g., health insurance). In contrast, those whose incomes are in the top 90th percentile have experienced a 45% increase in nonwage compensation during the same period (Western, Bloome, Sosnaud, & Tach, 2012). Over the last 30 years, fewer individuals have been able to move up the economic ladder and out of poverty (Lowrey, 2014).

Across all SES and racial/ethnic groups, there have been substantial decreases in jobs providing stable employment, combined with increases in contingent jobs (contract-based work). However, white-collar employees are able to command high salaries and bonuses that act as a hedge against job loss. These are options that are not available to those in low-wage jobs, making potential job loss a more severe threat (Rubin, 2014).

There are striking racial and ethnic disparities in income, assets, and overall

wealth (wealth reflects all household assets minus household debt; Pollack et al., 2013). To provide one example: in 2009, the median wealth of non-Hispanic White households in the United States was \$113,149. In contrast, the median wealth of Hispanic households was \$6,325, and the median wealth of non-Hispanic Black households was \$5,677 (P. Taylor et al., 2011). Native Americans from any tribe also have very high rates of poverty in comparison to non-Hispanic Whites, although there are variations in the absolute levels of poverty among tribes (Huysen, Takei, & Sakamoto, 2014; Sarche & Spicer, 2008). In contrast, Asian Americans have household incomes that are equal to or exceed those of White Americans (Macartney, Bishaw, & Fontenot, 2013). More than half of all Americans experience a period of poverty at least once. The numbers are much higher for Black Americans; 84% of Black individuals spend at least a year in poverty over their lifetime (Drake & Jonson-Reid, 2014).

However, income levels tell only a portion of the story of disparities in resources (Yoshikawa et al., 2012). White children from low-income families are more likely to live in middle-class areas with more social and material resources. In contrast, substantial groups of Black (44%) and Latino(a) (33%) children from low-income families live in areas of high poverty (i.e., where 40% or more of the families are at poverty level; Drake & Jonson-Reid, 2014). Similar rates are seen for Native American children (Sarche & Spicer, 2008). High poverty areas cannot provide resources to supplement gaps in individual income, assets, and education (Drake & Jonson-Reid, 2014). School segregation, in part a function of neighborhood segregation, further deprives Black and Hispanic students of needed educational and social resources in many areas (Lankford & Wyckoff, 2006). The history of discrimination in education against American Indians has been well documented (Cornell & Kalt, 2000).

In sum, there are significant disparities by SES and race in access to valuable interpersonal, educational, and material resources across the lifespan. For Black, Hispanic, and Native American

children and adults, the gaps at the individual level are compounded by gaps in resources at the neighborhood level (Drake & Jonson-Reid, 2014). Among older adults, contextual effects are seen as well. Less educated older adults living in areas of concentrated disadvantage have greater disability than do less educated adults living in more resourced areas (Montez, Zajacova, & Hayward, 2017). As we will see in the next section, some of the exposure to threats and gaps in resources may be a function of discrimination.

A Special Focus: Discrimination and Other Race/Ethnicity-Related Stressors

Racial and ethnic discrimination has been defined as “the beliefs, attitudes, institutional arrangements, and acts that tend to denigrate individuals or groups because of their phenotypic characteristics or ethnic group affiliation” (R. Clark et al., 1999, p. 805). Detailed reviews concerning the conceptualization and measurement of racism and other forms of discrimination are available elsewhere (APA, 2016; Brondolo, Brady, Libby, & Pencille, 2010; S. P. Harrell, 2000).

Discrimination is widely considered a salient psychosocial stressor (Brondolo, Lackey, & Love, 2011; R. Clark et al., 1999). Discrimination can become a chronic stressor when there are repeated episodes of maltreatment, discriminatory behavior occurs over a prolonged period, discriminatory conditions do not change, and discrimination triggers exposure to other demands. Most important, discrimination can become a persistent stressor because the resources to address dis-

crimination are limited (see reviews by Brondolo, Brady, Beatty, Pencille, & Contrada, 2009; Brondolo et al., 2012).

Discrimination or unfair treatment can occur on multiple levels: cultural, institutional, interpersonal, and internalized (S. P. Harrell, 2000). We briefly review these different levels of discrimination, as they may serve as fundamental causes of other stress exposures (D. R. Williams & Collins, 2001). Cultural discrimination involves the dissemination of attitudes about the relative rights, privileges, and status that should be afforded to different groups (S. P. Harrell, 2000). Discrimination is expressed on a cultural level through the depiction of members of different SES or racial/ethnic minority groups in mass media formats (i.e., widely used forms of communication, including film, television, advertisements, newspapers and magazines, and the Internet; S. P. Harrell, 2000). These mass media presentations serve as a primary method for communicating stereotypes about group members and serve to establish norms about the behaviors associated with group membership. These messages may strengthen existing negative attitudes toward individuals of marginalized racial or ethnic groups or individuals of low SES (Dalisaay & Tan, 2009; Gilens, 1996; Mastro & Kopacz, 2006; Rose & Baumgartner, 2013).

Institutional discrimination refers to the specific policies and procedures of institutions (e.g., government, business, schools, medical centers, and/or churches) that consistently result in unequal treatment for particular groups (Better, 2002; Gee, Ro, Shariff-Marco, & Chae, 2009; D. R. Williams & Jackson,

Cultural discrimination involves the dissemination of attitudes about the relative rights, privileges, and status that should be afforded to different groups



Prejudice and discrimination affect the ability to accumulate social, personal, educational, and material capital, limiting the resources needed to respond to these threats

2005). Institutional discrimination can be seen in the forces that create and maintain residential segregation, defined as “the degree to which groups of people categorized on a variety of scales (race, ethnicity, income) occupy different space within urban areas” (Kramer & Hogue, 2009, p. 179). Historical and current discriminatory actions on the part of institutions and individuals have contributed to residential segregation; these issues have been extensively reviewed elsewhere (Acevedo-Garcia, Lochner, Osypuk, & Subramanian, 2003; Emerson, Chai, & Yancey, 2001; Massey, Eggers, & Denton, 1994). Ongoing portrayals of members of stigmatized racial and ethnic minority groups as less intelligent and more violent and lazy are likely to drive the desire for distance from members of these groups (Dixon, 2008; see review in Brondolo et al., 2012). The history of discrimination toward American Indian tribes and the consequent effects on

residential resources have been well documented (see Cornell & Kalt, 2000; Evans-Campbell, 2008; Tighe, 2014).

Across all income groups, Blacks tend to live in more racially segregated areas than do Whites, but residential racial segregation is most pronounced among individuals with low levels of income and education (D. R. Williams & Collins, 2001). For racial and ethnic minorities, including Black and Latino(a) Americans, residential segregation confers structural disadvantages, as these neighborhoods offer substantially fewer resources in terms of safe and secure housing and streets, quality education, and health care, among other resources that have direct implications for health (Kwate, 2008; Thorpe et al., 2008; D. R. Williams & Jackson, 2005). An analysis of the current costs and benefits of reservation life is beyond the scope of this report. However, depending on the tribe and reservation, there can be significant

Decreasing demands also limits the opportunities for self-actualization—the ability to develop new skills and ideas and new ways of thinking about oneself and the world

barriers to educational attainment and employment (Cornell & Kalt, 2000).

Another current and widely recognized source of institutional discrimination against racial and ethnic minority group members includes some policies and procedures in law enforcement. Much evidence suggests that compared with White Americans, Black and Latino(a) Americans are more likely to be interrogated by the police (e.g., stop and frisk), more likely to be arrested, and more likely to be incarcerated and to receive harsher sentences, even when controlling for a wide range of case- and jurisdiction-related variables (Bushway & Gelbach, 2010; Doerner & Demuth, 2010; Pew Charitable Trusts, 2008; B. W. Smith & Holmes, 2014). New evidence suggests similar disparities are present for Native Americans, and complex laws regarding jurisdictions for enforcement may exacerbate these effects (Tighe, 2014). High incarceration rates can undermine available social and material capital in the community (Clear, 2008).

Interpersonal racism has been defined as “directly perceived discriminatory interactions between individuals

whether in their institutional roles or as public and private individuals” (Krieger, 1999, p. 301). Discrimination can be experienced in the form of blatant or subtle actions that influence social inclusion, safety, and opportunity and communicate disrespect. Discrimination can also be experienced in the form of microaggressions: “brief and commonplace daily verbal, behavioral, or environmental indignities, whether intentional or unintentional, that communicate hostile, derogatory, or negative racial slights and insults towards people of color” (Sue et al., 2007, p. 271).

Exposure to interpersonal discrimination is a highly prevalent phenomenon (Arellano-Morales, Elder, Sosa, Baquero, & Alcántara, 2016; Broman, Mavaddat, & Hsu, 2000; Landrine & Klonoff, 1996). Diary and some survey studies suggest that individuals may experience episodes of discrimination on a weekly basis (Brondolo et al., 2008; Ong, Fuller-Rowell, & Burrow, 2009; Torres & Ong, 2010).

Individuals can be targeted for discrimination and experience consequences of this discrimination even if they are not aware of being targeted and the perpetrators are unaware of their bias (Smedley, Stith, & Nelson, 2003). As one example, empirical studies examining attitudes toward hypothetical Black and White employees indicate that, on average, individuals will reward Whites more than Blacks for the same level of effort and will punish Blacks more than Whites for poorer performance, without awareness that there are racial disparities in their decision-making process (DeSante, 2013).

The data on discrimination and stress exposure are consistent with the notion that discrimination renders members of disenfranchised and stigmatized groups more vulnerable to social harm, less likely to receive protection from harm, and less able to benefit from their own individual initiative. At the same time, prejudice and discrimination affect the ability to accumulate social, personal, educational, and material capital, limiting the resources needed to respond to these threats. Further, as a function of racial and ethnic discrimination, members

of minority groups may also consciously or unconsciously internalize prejudicial beliefs against their own group; both types of internalized discrimination have been identified as sources of stress for Black Americans (Chae, Nuru-Jeter, & Adler, 2012; J. Taylor, 1990; Tull, Sheu, Butler, & Cornelious, 2005).

Bidirectional and Multilevel Effects

Taken together, the evidence documents the ways in which gaps in resources and the presence of threats on multiple levels contribute to an overall greater burden of stress for health disparity populations. Deficits in resources can make each demand more threatening. Without sufficient resources, individuals can be at risk for exposure to new stressors and can experience a greater burden of negative emotion (i.e., frustration, fear, and guilt) in response to each stressful event.

For individuals facing severe structural disadvantage and those facing discrimination, it may not be possible to decrease stress by increasing personal or material resources. Access to additional resources may be dependent on political processes, often outside individual control. Similarly, there may be limited options and coping resources for handling episodes of discrimination on an individual level (Brondolo et al., 2009). Therefore, targeted or disadvantaged individuals may attempt to reduce stress by reducing demands. Individuals may reduce demands through social isolation or by minimizing strains at work or school. They may reduce opportunities to be targeted for discrimination by socializing primarily with family members (R. J. Taylor et al., 2013). But decreasing demands also limits the opportunities for self-actualization—the ability to develop new skills and ideas and new ways of thinking about oneself and the world (Maslow, Frager, & Cox, 1970).

The data suggest that discrimination both directly and indirectly increases stress exposure and creates barriers to accessing necessary resources. For example, disparities in exposure to violence are a function of living or even traveling through disadvantaged areas (Browning et al., 2017). Black individuals are more

The combination of threats and resources affects the individual's growth, development, and health on a moment-to-moment basis and shapes resilience over the lifespan

likely than White individuals to live in areas with high structural disadvantage (Browning et al., 2017; Ulmer et al., 2012). Institutional and interpersonal discrimination contributes to the likelihood that Black individuals will live in disadvantaged and segregated areas (Emerson et al., 2001; Mouw, 2002; D. R. Williams & Collins, 2001). Complex relationships between the U.S. government and tribal authorities, as well as the structure of governance within each community, contribute to the level of disadvantage seen in some American Indian communities (Cornell & Kalt, 2000).

Residence in a severely disadvantaged area is associated with increased risk for adverse events in childhood, and these adversities and other trauma exposures are associated with lower SES in adulthood and difficulties maintaining employment (Font & Maguire-Jack, 2016; Topitzes et al., 2016). Limitations to the quality of education in disadvantaged communities undermine the resources needed to successfully pursue better opportunities (Pager et al., 2009). Efforts to improve economic conditions on an individual level are constrained, as discrimination-related barriers to employment and employment advancement limit the ability of Black and Hispanic individuals to pursue other opportunities (Pager & Western, 2012).

Remediating the threats associated with violence in disadvantaged neighborhoods is made more difficult because concerns about biased law enforcement and sentencing practices interfere with the ability of disadvantaged communi-

ties to effectively engage with police to reduce violence. Interventions, including new approaches to community policing and community-police engagement, have yielded some benefits but also identified some unintended negative consequences of these interventions (Graziano et al., 2014). To address the relationship of economic disadvantage to violence, investigators have used the creation of business improvement districts to successfully decrease urban violence (Masseti & David-Ferdon, 2016), but they have not yet tested effects on health. Basic research is beginning to identify chains of relationships between sources of disadvantage and threat and health outcomes to identify targets for intervention. However, much more multilevel, multidisciplinary work is needed.

Intersectionality: Considering the Full Context

An examination of the effects of stress on health requires a consideration of the full context in which individuals develop, live, work, and age (Diez-Roux, 2007; Kawachi, Adler, & Dow, 2010; Sampson, Morenoff, & Gannon-Rowley, 2002). The communities in which individuals live may present threats (e.g., threats associated with residential segregation), and the residents within communities may face additional threats (e.g., domestic violence, occupational injury) in the other contexts to which they are exposed (e.g., home, work, etc.). Similarly, social and physical contexts also vary in the degree to which they provide social, intellectual, and material resources, including familial

support, educational and professional opportunities, and recreational facilities, among many other resources (Sampson et al., 2002).

The combination of threats and resources affects the individual's growth, development, and health on a moment-to-moment basis and shapes resilience over the lifespan. Mothers with higher levels of education are better able to help their young children manage stress and learn cognitive control skills (Dickson, Gregg, & Robinson, 2016; NICHD Early Child Care Research Network, 2016). Students who can reach out to educated parents can develop more of their own emotional and intellectual resources to solve future problems. Children whose parents do not have those resources may be able to gain access through better educated neighbors, if they are available (Leventhal & Brooks-Gunn, 2000). Prosocial friendship networks can help adults find jobs and spouses (P. S. Adler & Kwon, 2002; G. L. Jackson et al., 2014). Neighborhoods with rich recreational and educational opportunities help individuals develop a wider range of skills and stress management resources (Gutman & McLoyd, 2000). Rural, suburban, and urban environments may differ greatly in the degree to which these resources are available and the ways in which these resources are provided.

In contrast, mothers who have faced traumatic stressors are more likely to make negative attributions about their children's behavior (Schechter et al., 2009). Less educated mothers are less able to help their children manage their homework (Evans & Kim, 2013; Wang et al., 2014). Segregated and disadvantaged neighborhoods limit the capacity to form cross-race relationships that can facilitate networking, and fewer married role models can limit the support young couples have. Social networks that contain more individuals facing significant stressors can place more burden on their members and offer less support (Bronfalo et al., 2012). Violent neighborhoods can disrupt opportunities for rest, relaxation, and recreation (Wilson, Kirtland, Ainsworth, & Addy, 2004).

Over the course of their development and in their daily life, individuals interact within a wide range of contexts. The nature of the stressors and resources present in the physical and social environments/contexts varies, depending on the full complex of their social characteristics. For example, threat exposure and resource availability vary by age; gender; race; ethnicity; region; SES; lesbian, gay, bisexual, and transgender status; disability status; immigration status; and a host of other variables operating both separately and in combination. In turn, the effects of these sociodemographic variables are a function of historical and present circumstances that affect attitudes toward groups defined by these social statuses and the ability of members of these groups to prevent threats and access resources (Cole, 2009).

For example, reports of stress exposure across life domains among Hispanic adults vary depending on immigration status. U.S.-born Latino(a)s have overall stress exposures more similar to those of Black individuals, whereas foreign-born Latino(a)s have patterns of stress exposure generally more similar to those of Whites (Sternthal et al., 2011).

Exposure to discrimination also varies by cultural background, nativity, region of the country, and education level, among other factors. For example, among Hispanics, Cuban Americans report significantly lower levels of exposure to discrimination than do Mexicans or other Hispanic groups (Arellano-Morales et al., 2016), and Hispanics in Chicago report more discrimination than do those in the Bronx (New York), independent of SES and a host of other demographic variables. There are also regional differences in *racial animus*, a term used to describe intensely negative and visceral attitudes toward others of a different race or group. Stephens-Davidowitz (2014), for example, examined racial animus toward Black Americans and its effect on voting patterns.

These variations are possibly a function of different historical circumstances. It is important to note that public policies toward new immigrants may affect perceptions of discrimination and stress, as

national security and political concerns about the government in Cuba reduced the institutional barriers to acceptance facing immigrants from Cuba in the period following Fidel Castro's rise to power (Arellano-Morales et al., 2016).

The links between SES and threat exposure also vary by race/ethnicity. For example, the effects of low income on crime victimization are similar for Black and White individuals, but Hispanic individuals with low levels of income have lower rates of victimization than do Black and White individuals with comparable incomes (E. Harrell, Langton, Berzofsky, Couzens, & Smiley-Donald, 2014). In contrast, Hispanic women are more likely than either Black or White women to experience intimate partner violence and recurrent violence, even after controlling for SES, although not all studies have reported these effects (see review by Cummings, Gonzalez-Guarda, & Sandoval, 2013).

Stress clustering may also be a problem for members of racial and ethnic minority groups who are immigrants. They may also be exposed to additional stressors associated with lack of language proficiency, the challenges associated with immigration and establishing citizenship or residency, difficulties in understanding and negotiating a new culture, and isolation from members of one's own cultural group and challenges in retaining cultural practices (Contrada et al., 2000; Zeiders, Umaña-Taylor, Jahromi, Updegraff, & White, 2016).

On the other hand, immigrants and other targeted groups may have unique sources of support and cultural practices that provide important benefits for resilience. For example, some evidence suggests that living in an ethnic enclave provides support and affirmation for immigrants that may mitigate the effects of stress on mental health (Shaw et al., 2012). For foreign-born individuals, ethnic density may provide benefits for mental health that override the threats associated with neighborhood disadvantage (Denton, Shaffer, Alcántara, Clemow, & Brondolo, 2014).

As regional, cultural, sociodemographic, and economic variations in threat

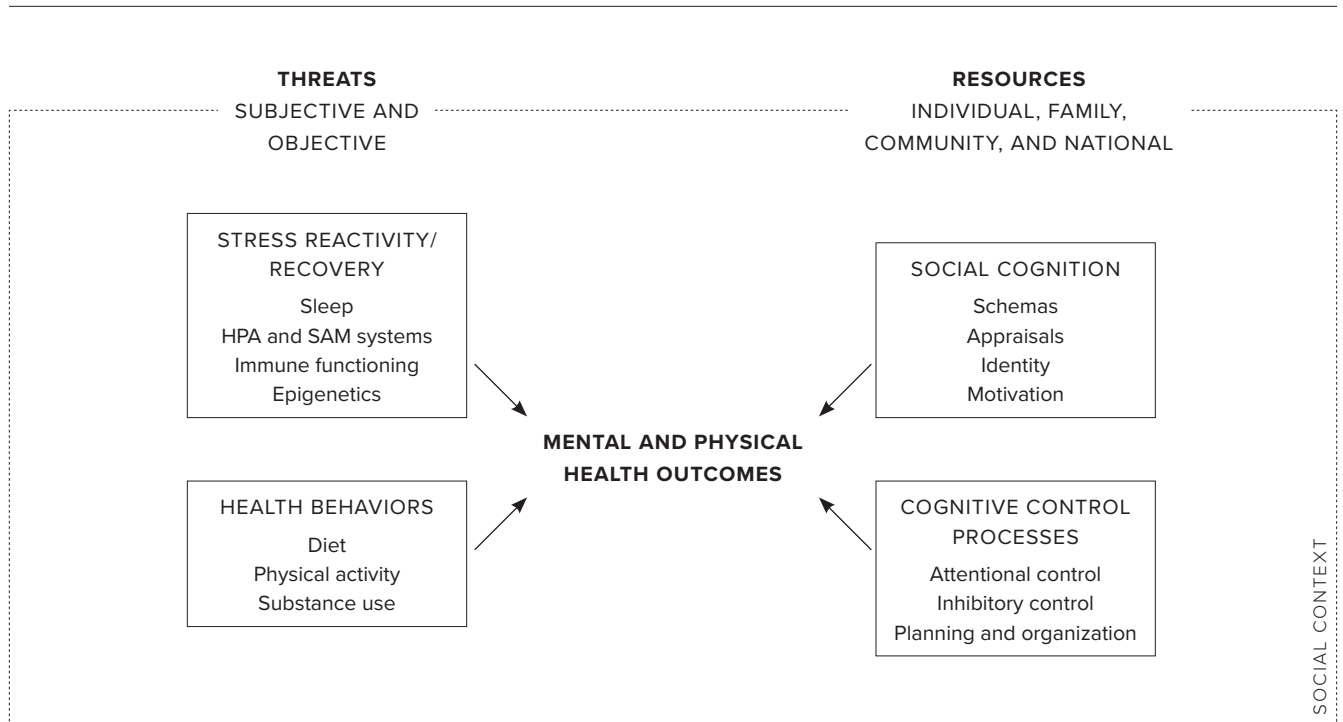
exposure are identified, researchers can begin to investigate the antecedents and consequences of these variations. Identifying these variables will permit the development of more generalizable models of the factors that contribute to disparities in stress exposure and health outcomes. This helps facilitate understanding of the ways in which different contexts affect daily life and exacerbate or attenuate the effects of stress exposure on psychobiological processes that impair health.

MECHANISMS LINKING STRESS TO HEALTH

How does stress get “under the skin” and affect health? In this section we examine the ways in which social contexts and the accompanying stress exposures facing low-SES individuals and racial and ethnic minority group members affect stress processes within the individual. We start by examining the effects of the social context on the individual’s psychological processes, including processes involved in the perception and interpretation of the self and the social world (i.e., social cognition), as well as the underlying processes that govern attention, planning,

memory, and other functions (i.e., cognitive control processes). Next, we examine the ways in which stress affects brain systems and processes as well as physiological systems throughout the body. Finally, we examine the effects of stress on health behavior. Together, these stress processes can increase the risk for new threat exposures, undermine personal and social resources, prolong the effects of psychobiological effects of stress, and produce changes to physiological systems and health behavior that impair health.

FIGURE 3
Stress processes and health outcomes



Note: HPA = hypothalamic-pituitary axis; SAM = sympathetic-adrenomedullary branch of the autonomic nervous system.

STRESS AND SOCIAL COGNITION

Schemas

Social cognition—the mental structures and processes involved in perceiving, understanding, and responding to the social world—is shaped by the individual and the social context (Fiske & Taylor, 2013). Every day, individuals meet demands, gather resources, and manage stress. As they do, they learn about themselves—about their own motivations, capabilities, and limitations. In their daily interactions (e.g., at home, in public, at work or school, at the doctor’s office), individuals form ideas and develop expectations about other people and relationships, and the world at large. These different expectations are modified through subtle and direct feedback from all the people with whom they interact—family, friends, coworkers, neighbors, and even strangers. An individual’s understanding of social norms and aspirations for the future is further shaped by the media and by formal and informal educational experiences.

These internal representations of the self, others, and the world—and the expectations that derive from these representations—are called *schemas*. Schemas are not simply ideas or cognitions. They are composed of a network of interconnected thoughts, feelings, attitudes, images, and sensations that may be instantiated through neural networks in the brain (Ghosh & Gilboa, 2014; Landau, Meier, & Keefer, 2010). The depth and breadth of these connections may permit schemas to have a wide influence over behavior and psychophysiological response.

The information contained in these schema networks provides an interpretative context for processing experiences (Markus & Wurf, 1987). For example, depending on life experiences, individuals may develop schemas about the self that incorporate ideas, feelings, and images associated with being acceptable (vs. rejectable) and competent (vs. incompetent); schemas about other people that reflect experiences of being treated with warmth (vs. coldness) and acceptance

In their daily interactions . . . individuals form ideas and develop expectations about other people and relationships, and the world at large

(vs. rejection or hostility); and schemas about the world that reflect experiences of safety (vs. threat) and fair treatment (vs. injustice; Baldwin, 1992; Beck, 1987; Miranda, Andersen, & Edwards, 2013). Racial or ethnic stereotypes can be considered schemas about the characteristics associated with membership in a racial or ethnic group (Maris, Claes, Van Damme, & Hoorens, 2016).

There are clear SES differences in the types of schemas individuals develop. For example, low SES has been associated with a range of negative schemas about the self, including low self-esteem (Twenge & Campbell, 2002) and reduced perceptions of personal control and autonomy (Haushofer, 2013; Kraus et al., 2012). Lower SES is also associated with negative schemas about others, including less trust and higher levels of hostile attributions about other people’s intentions (Chen, Langer, Raphaelson, & Matthews, 2004). Low SES is also linked to more negative schemas about the world,

including more intense perceptions that the world is threatening and lower expectations that life is meaningful (Ewart, Elder, & Smyth, 2014; Haushofer, 2013).

Data on race differences in schemas about the self, others, and the world at large are more limited, and the findings highlight the ways in which influences from the larger social context shape individual-level schemas. For example, meta-analyses indicate that Black individuals have higher levels of overall self-esteem in comparison to White individuals, whereas Hispanic and Asian individuals have lower levels of self-esteem. However, the Black advantage in self-esteem did not emerge until the 1980s, after a period of tremendous social change and increase in civil rights (Twenge & Campbell, 2002).

The development of negative schemas is likely to be a function, at least in part, of the specific stressors that more commonly face low-SES individuals and members of racial and ethnic minority groups (M. B. Spencer, 2006). The effects begin early in the lifespan, as children develop schemas reflecting the contexts in which they develop. For example, childhood maltreatment can generate negative self-schemas reflecting themes of worthlessness and unacceptability. These early stressors may also generate negative schemas about other people, reflecting experiences and expectations of interpersonal harshness (Halvorsen, Wang, Eisemann, & Waterloo, 2010; Lumley & Harkness, 2007). Witnessing violence appears to generate anticipation of social constraint, schemas reflecting the notion that others will not validate or support one’s perceptions or feelings (Kliewer & Lepore, 2015). Even relatively low levels of violence can generate negative schemas about the safety of the

Childhood maltreatment can generate negative self-schemas reflecting themes of worthlessness and unacceptability

world and create schemas about the acceptability of violent or coercive solutions to problems (Huesmann & Kirwil, 2007).

Employment difficulties may foster schemas about perceived job insecurity (i.e., schemas reflecting the notion that one's employment is under threat and continued employment is less predictable or controllable). Individuals who face more objective difficulty finding and maintaining employment—including individuals who are Black or who have lower levels of education—report more perceived job insecurity (Rubin, 2014) and less optimism about their future (Boehm, Chen, Williams, Ryff, & Kubzansky, 2015).

There is consistent evidence that racial and ethnic discrimination can foster negative schemas about others (see Brondolo et al., 2016, for a review). These schemas reflect individuals' expectations

that others will judge them, reject them, mistreat them, or invalidate their experiences because of their race/ethnicity. These schemas have been measured with assessments of stereotype confirmation concerns (Contrada et al., 2000) and race-based rejection sensitivity (Mendoza-Denton, Downey, Purdie, Davis, & Pietrzak, 2002), among other measures. Discrimination has also been associated with negative schemas about the world, including cynicism (Brondolo et al., 2008; Hunte, King, Hicken, Lee, & Lewis, 2013) and beliefs in an unjust world (Borders & Liang, 2011).

Schema Activation

At any given moment, triggers in the environment or in the individual's own thought processes can activate schemas and automatically activate connec-

tions to related memories and emotions (Schmader & Croft, 2011). Minor cues can be effective in activating schemas related to issues of race and discrimination. For example, investigators conducting priming studies activated schemas related to discrimination and stereotype threats simply by asking individuals to indicate their race on academic test forms (Steele & Aronson, 1995).

The prevalence of negative messages about race and SES in daily life make it likely that schemas about race- and class-related social threats are frequently activated. A wide range of non-verbal or situational cues (e.g., a weak smile, a classroom of students of a different race) may activate schemas related to social rejection or race-related threat. These cues may be sufficient to signal the potential for social threat, even when



Substantial research suggests that social disadvantage, particularly low SES, can affect cognitive control processes from childhood onward

individuals are not conscious of their own perceptions or the threat appraisals (Goodwin, Williams, & Carter-Sowell, 2010; Marien, Custers, Hassin, & Aarts, 2012; Richeson & Shelton, 2007).

STRESS AND COGNITIVE CONTROL PROCESSES

Cognitive Control Processes

To modulate responses to these threats, individuals rely on a wide range of underlying neuropsychological functions involved in cognitive control (see Hackman & Farah, 2009). Cognitive control processes include the capacity to focus attention, change perspective, organize and update relevant information, and plan for goal-directed action. These cognitive control processes can be subsumed under the larger construct of executive functioning (Diamond, 2013).

Cognitive control processes are necessary for stress regulation and problem solving (Diamond, 2013; Hofmann et al., 2012). The ability to switch the focus of attention can help regulate the intensity of threat appraisals and emotional responses when situations are intense (Chen & Miller, 2012). The capacity to control the focus of attention can help individuals remain focused on long-term goals (see Joormann & Gotlib, 2010; Kof-

farnus, Jarmolowicz, Mueller, & Bickel, 2013).

Substantial research suggests that social disadvantage, particularly low SES, can affect cognitive control processes from childhood onward (Evans & Schamberg, 2009; Hackman & Farah, 2009; Hofmann et al., 2012). For example, mothers who have more education and more economic resources are better able to support children's learning experiences by reducing stress as children learn new skills. In particular, they are able to help their children to shift attention and perspective as needed during learning (Hackman, Gallop, Evans, & Farah, 2015). The negative effects of low SES on cognitive function are worse for individuals facing early and more prolonged poverty (Evans & Schamberg, 2009; Hackman & Farah, 2009). Decreases in income are associated with declines in working memory and other aspects of executive function (Hackman et al., 2015). Low SES is associated with greater decreases in cognitive function among the elderly (Rosso et al., 2016).

The stressors facing members of racial and ethnic minority groups are also associated with effects on cognitive control processes. Acute exposure to discrimination may reduce cognitive flexibility, including the capacity to keep two different ideas in mind and to switch the focus of attention and processing as needed (Murphy, Richeson, Shelton, Rhenschmidt, & Bergsieker, 2012). When experiences of exclusion are frequent and persistent, as is the case for stigmatized minority group members, it is both more difficult and more exhausting to engage cognitive control mechanisms to manage these threats (Themanson, Khatcherian, Ball, & Rosen, 2013).

Relationship of Stress to Social Cognition May Be Bidirectional

Negative schemas can potentiate the experience of threat and maintain stress even when the actual threat has diminished. The effects of existing threats may be sustained because negative schemas may activate negative expectations about future experiences or trigger rumination about past events. The effects

of stress on cognitive control processes may make it more difficult to regulate these stress responses.

The data on the effects of discrimination on social cognition support these ideas. Discrimination appears to be associated with the development of negative schemas about others and one's relationships with others. These schemas may make the anticipation of interactions with others (both same- and other-race individuals) more threatening, particularly in ambiguous situations (Brondolo et al., 2016). Targeted individuals may become more vigilant in their interpersonal interactions in an attempt to protect themselves from harm (Lewis et al., 2015; Ruiz, 2014). Memories of past events may trigger rumination about injustice or one's own difficulties in addressing discrimination (Borders & Liang, 2011; Hicken, Lee, Ailshire, Burgard, & Williams, 2013). Other schemas, including unjust world beliefs or cynicism, may promote disengagement and withdrawal and ultimately contribute to depression (Lench & Chang, 2007). Over the long run, discrimination-related schemas appear to undermine a broad range of interpersonal relationships, including marriage and relationships with friends and colleagues (Brondolo et al., 2012; Mendoza-Denton et al., 2002; Simons, Simons, Lei, & Landor, 2012).

STRESS AND PHYSIOLOGICAL STRESS MEDIATORS

Experiences and appraisals of threat trigger rapid activation of physiological processes throughout the body. But appraisals are not simply a reflection of the demands of the moment. They are influenced by schemas that form in response to the individual's prior experiences, including his or her responses to earlier threats (Wells, Scarpa, & Waldron, 2015). The effects of threat appraisals on physiological processes also reflect the functioning of cognitive control mechanisms. These cognitive control mechanisms play an important role in interpreting events and modulating responses to threats (Hofmann et al., 2012).

Threat appraisals and the speed with which they affect physiological responses are the end product of complex brain processes, many of which are only beginning to be understood (Gianaros & Wager, 2015; McEwen & Gianaros, 2010). The speed with which threat appraisals are formed and are capable of evoking psychobiological stress responses is plausibly a product of the ways in which schemas are instantiated in the brain. One possibility is that schemas are represented in multiple and distributed neural networks (Ghosh & Gilboa, 2014). These networks facilitate rapid communication among different brain systems responsible for processing and combining different types of information (e.g., the sensory, affective, contextual, and meaning-related aspects of an experience; Van Kesteren, Ruitter, Fernández, & Henson, 2012).

Cognitive control processes are also integrated throughout the brain. Many underlying processes associated with executive functions, including attentional shifting and inhibitory control, are hypothesized to involve areas in the prefrontal cortex (Yuan & Raz, 2014). The ventromedial prefrontal cortex may be an area responsible for integrating multiple inputs from different brain regions to yield an integrated emotional response capable of triggering physiological activation (Roy, Shohamy, & Wager, 2012).

The processes involved in appraising potential threats involve a close web of connections in the brain between areas in the prefrontal cortex and subcortical regions (e.g., the amygdala). These subcortical regions initiate a wide range of physiological responses that enable the body to prepare for meeting demands and responding to threats (Gianaros & Wager, 2015). Specifically, brain systems engaged in appraisal processes communicate with other systems (e.g., the amygdala and areas in the brainstem) that more directly control stress responses throughout the body, which are mediated by the autonomic nervous system (comprising both the sympathetic-adrenomedullary [SAM] and parasympathetic branches) and the hypothalamic-pituitary axis (HPA).

Stress exposures may produce changes to gene expression that have widespread effects on neurobiological structures and processes

Activation of the SAM and the HPA triggers the release of hormones and other chemical messengers (e.g., adrenaline, cortisol), which rapidly mobilize the resources necessary to prepare for “fight or flight” or other responses to stress. Both the SAM and the HPA axes send signals to the immune system to prepare bodily defenses by increasing (or decreasing) inflammatory and other immune-function processes (Adam et al., 2010; Lutgendorf & Sood, 2011). There may also be effects on the microbiome in the gut (Bharwani et al., 2016).

In the laboratory, stress reactivity (i.e., the physiological response triggered by stress) is evaluated by assessing changes in measures of cardiovascular, neuroendocrine, and immune function (e.g., blood pressure, cortisol, or measures of inflammation) in response to difficult laboratory tasks. Ambulatory monitoring studies have been used to assess physiological activation in response to everyday stressors. The type, intensity, and duration of the psychophysiological response depends not only on the physical demands of the stressor but also on the individual’s appraisals of the psychological demands and the resources available to respond to the demands. For example, the pattern of cardiovascular activation depends on whether the individual is highly engaged in the task and exerting effort to perform well or is feeling threatened and trying to defend against harm (Blascovich, 2013).

Some threats, particularly social threats, are specifically linked to activation of the HPA and the release of cortisol (Dickerson & Kemeny, 2004; Gianaros & Wager, 2015). Many of the major stress-

ors associated with low SES and racial minority status, including financial strain, violence exposure, and discrimination, are associated with physiological stress reactivity and recovery across physiological systems, but the direction of the effects varies depending on the stressor and the context (see, e.g., Brondolo et al., 2017; Browning & Soller, 2014; Gooding, Milliren, Austin, Sheridan, & McLaughlin, 2015; Grossi, Alexander, Lundberg, & Soares, 2001).

The direction, magnitude, frequency, and duration of physiological reactivity to stressors are regarded as potential markers for vulnerability to disease (Lovallo & Gerin, 2003). Cardiovascular reactivity in the laboratory has been linked to the development of CVD, independent of other known risk factors (Carroll et al., 2012). Disruptions to diurnal cortisol release have been linked to increased risk for tumor progression (Sephton et al., 2013), CVD, and all-cause mortality (Kumari, Shipley, Stafford, & Kivimaki, 2011).

Chronic Stress Interrupts the Regulation of Stress Systems

A critical feature of each of these physiological systems is the feedback loops that return the systems to baseline levels of functioning once the threat has passed. These systems operate through bidirectional pathways between the brain and the physiological systems. Some connections between cortical and subcortical regions serve to up-regulate activation; others serve to down-regulate responses (Gianaros & Wager, 2015). Cortisol release initiates a feedback process, which inhibits the further release of cortisol (Tyrka, Ridout, & Parade, 2016).

The feedback loops that govern both activation and recovery of these systems permit a return to homeostasis and the prevention of cellular damage (McEwen & Gianaros, 2010).

But chronic or severe stress exposure interferes with the processes that regulate the functioning of these systems, including their self-regulatory capacities (C. Blair & Raver, 2012; Kendall-Tackett, 2014; McEwen & Gianaros, 2010; Shonkoff et al., 2012; Teicher & Samson, 2016; Tyrka et al., 2016). These stress exposures may produce changes to gene expression that have widespread effects on neurobiological structures and processes (Joëls & Baram, 2009). In broad terms, the research suggests that stress affects the formation of connections between brain cells and consequently influences both the structure and function of brain circuitry. In general, cell-to-cell connections are conserved between brain regions that facilitate the processing of information related to the most important (or threatening) demands (C. Blair & Raver, 2012; Liston, McEwen, & Casey, 2009).

For individuals living in threatening environments, brain circuits that facilitate attention to threat may be conserved over those that modulate threat responses (Teicher, Samson, Anderson, & Ohashi, 2016; Tyrka et al., 2016). Although the evidence is not complete, these findings and others raise the possibility that threatening environments create changes in the brain, and these changes can both potentiate and blunt responses to new stressors and impair stress recovery (C. Blair & Raver, 2012; Teicher et al., 2016; Tyrka et al., 2016).

Studies using functional magnetic resonance imaging to investigate the neural effects of social disadvantage support this notion. For example, in comparison to high-SES participants, low-SES participants who faced greater social threat not only demonstrated greater activation in threat detection systems, they also had less functional connectivity between areas of the brain responsible for threat detection and response (i.e., amygdala nuclei) and areas of the brain engaged in cognitive control (i.e., nuclei

Impairments in sleep may be a critical driver of difficulty in physiological recovery across systems

in the medial prefrontal cortex), potentially capable of attenuating threat responses (Javanbakht et al., 2015).

Stressors that disproportionately affect low-SES individuals also have effects on the brain even early in life (or possibly in the prenatal period). Studies of the neurobiological effects of child maltreatment (a stress exposure more likely to occur to low-SES participants) provide support for the notion that both abuse and neglect have significant effects on brain structure and functional connectivity (Teicher et al., 2016). For example, individuals who have suffered from maltreatment in childhood show greater amygdala reactivity to threat. Childhood maltreatment is also related to structural changes—including reductions in the size and density of areas involved in working memory, executive function, and self-awareness (Heim & Binder, 2012; Teicher & Samson, 2016). These neural adaptations may permit faster and more automatic detection of threats.

Childhood maltreatment is also associated with changes to the functioning of the parts of the brain (e.g., the striatum) that are involved in responding to rewards. Prolonged stress makes individuals more sensitive to immediate benefits and less responsive to delayed rewards (Teicher et al., 2016). As a consequence, individuals may be less likely to accumulate the cognitive and self-regulatory resources that can enable them to better manage and avoid threat over the long term.

A Special Focus: Discrimination and Stress Reactivity

Discrimination-related threats modeled in the laboratory have been accompanied by acute increases in stress reactivity (e.g., increases in blood pressure)

among targeted group members (Armstead, Lawler, Gordon, Cross, & Gibbons, 1989; D. C. Cooper, Thayer, & Waldstein, 2014; Sawyer, Major, Casad, Townsend, & Mendes, 2012). Past exposure to discrimination may influence reactivity to other daily stressors. For example, in one ambulatory monitoring study, cortisol levels were higher when individuals reported negative affect. However, the within-person relationship of negative affect to cortisol was seen primarily for individuals who had reported high levels of prior discrimination (Doane & Zeiders, 2014). Most ambulatory blood pressure monitoring studies indicate that discrimination is associated with higher levels of blood pressure during the day as individuals engage in daily activities (for review, see Brondolo et al., 2011).

Discrimination is also associated with poorer recovery from stress exposure. Most but not all studies have indicated that discrimination is associated with higher levels of blood pressure

Resources, including warm and responsive caregiving, can buffer the effects of some stressors on stress regulation

during the night, suggesting poorer recovery from daily stress and disruptions to circadian rhythms (see reviews by Brondolo et al., 2011; Dolezsar, McGrath, Herzig, & Miller, 2014). Similarly, persistent discrimination has been associated with disruptions in the normal circadian rhythm, expressed as flatter diurnal cortisol slopes in cross sectional (Huynh, Guan, Almeida, McCreath, & Fuligni, 2016) and prospective studies (Adam et al., 2015), although not all studies have reported these effects (for inverse effects, see Doane & Zeiders, 2014; Fuller-Rowell, Evans, & Ong, 2012).

The relationship of discrimination to both nocturnal ambulatory blood pressure and disruptions in diurnal patterns of cortisol release may also be a function of the effects of discrimination and other uncontrollable stressors on sleep quality and quantity. Discrimination has been consistently associated with sleep impairments (Grandner et al., 2012; Slopen, Lewis, & Williams, 2016). Impairments in sleep may be a critical driver of difficulty in physiological recovery across systems (Faraut, Boudjeltia, Vanhamme, & Kerkhofs, 2012).

The effects of race- and SES-related stressors on psychophysiological reactivity may be partly mediated by social cognitive processes. For example, greater psychological resources (e.g., optimism, better social support) were associated with better recovery following stressful laboratory tasks among men who had low SES in childhood (Boylan, Jennings, & Matthews, 2016). Black adolescents who did not (vs. those who did) have supportive family relationships experienced a stronger association of discrimination to allostatic load over time. Family support may encourage the development of positive schemas about others, and these schemas may buffer reactivity to other stressors (Brody et al., 2014).

Bidirectional and Multilevel Effects

Stress reactivity and recovery are functions of a complex interplay between the social environment, the brain, and the neuroendocrine, immune, and autonomic systems involved in mediating the physiological responses to the envi-

Self-reported levels of stress exposure, as well as heightened stress reactivity and impaired recovery, have been implicated in the onset and maintenance of smoking, unhealthy eating, and substance use

ronment (Gianaros & Wager, 2015). Epigenetic and other changes triggered by stress alter cell-to-cell signaling, permitting very rapid changes in psychological and physiological responses across systems (Joëls & Baram, 2009). Over the long run, these processes are involved in making more persistent changes to the physiological structures and processes that govern health (McEwen & Gianaros, 2010).

Repeated threats—a combination of current, anticipated, and recollected threat exposures—may change the nature of psychophysiological stress reactivity in day-to-day life. Over time, some threats may result in blunted physiological responses to stress, depriving individuals of the physiological resources they need to respond. In other cases, repeated threat exposure may lead to intensified physiological responses and disruptions to stress recovery, increasing wear and tear (Grandner, Hale, Moore, & Patel, 2010; Huynh et al., 2016).

The effects of stress on physiological functioning, gene expression, and subsequent health outcomes vary depending on gender, the age of exposure, and the duration of stress, among other factors. The effects also vary depending on the type of threat—including differences based on neglect and loss versus abuse (Tyrka et al., 2016). Prenatal exposures to stressors are also associated with changes to HPA functioning and gene expression that affect the stress response over the lifespan (Glover, O'Connor, & O'Donnell, 2010).

But there is also substantial research

showing that resources, including warm and responsive caregiving, can buffer the effects of some stressors on stress regulation. Close attachment relationships are specifically associated with modulation in the functioning of the neuroendocrine system and the patterns of gene expression that influence the effects of stress on the brain and body. However, the capacity to form and sustain caring relationships is also influenced by stress, compounding the negative effects (Brody et al., 2001; Kendall-Tackett, 2002; Tyrka et al., 2016). The quality and availability of resources may influence the types of social cognition and cognitive control processes that develop in response to social threats and consequently shape the intensity and duration of stress reactivity. Taken together, the data suggest that a better understanding of the psychophysiological mechanisms linking stress to health will require a more detailed understanding of both the individual and the context in which he or she experiences stress.

STRESS AND HEALTH BEHAVIOR

Stress may also play a role in disparities in health through its effects on health-promoting and health-impairing behaviors (see N. E. Adler & Stewart, 2010). There are SES and race differences in health behavior, including behaviors related to diet, physical activity, substance use, risky behavior, and adherence to health-promoting regimens (Cockherham, Bauldry, Hamby, Shikany,



& Bae, 2017; Flegal, Kruszon-Moran, Carroll, Fryar, & Ogden, 2016). Unhealthy behaviors (e.g., high levels of consumption of fats and sugars, physical inactivity) and related outcomes (e.g., obesity) are closely linked to the onset and course of many diseases, including cardiovascular disease and cancer (Mozaffarian et al., 2016), as well as cognitive decline in aging (Dong, 2015).

A broad range of economic factors as well as aspects of the local environment (e.g., access to healthy food, the availability of recreational facilities) affect health behaviors (N. E. Adler & Stewart, 2010; Chen & Miller, 2013). A review of these factors is outside the scope of this report. Instead, we focus on the role of stress and social cognition as contributors to disparities in health-impairing and health-promoting behaviors.

Self-reported levels of stress exposure, as well as heightened stress reac-

tivity and impaired recovery, have been implicated in the onset and maintenance of smoking, unhealthy eating, and substance use (Bongard, Al'Absi, & Lovallo, 2012; J. S. Jackson et al., 2010). Specific sources of stress that affect our target groups, including childhood maltreatment, financial strain, and discrimination, have been consistently associated with a wide variety of negative health behaviors. Even early in life, childhood maltreatment has been associated with obesity, greater risk of smoking, and excess drinking (Gooding et al., 2015). Black Americans who report more financial strain have a higher body mass index and are less likely to engage in physical activity than those with less strain (Advani et al., 2014; Moore-Greene, Gross, Silver, & Perrino, 2012).

Race differences in health behaviors and outcomes are complex and highlight the importance of considering

the intersections of race, social status, and gender as they affect health outcomes (Pope et al., 2015; D. R. Williams et al., 2016). Among U.S. adults, rates of smoking are highest among Native Americans, followed by Black and White adults. Lower rates are seen among Hispanic and Asian individuals. Black adults have significantly greater exposure to secondhand smoke than other groups (Centers for Disease Control and Prevention, 2017).

White and Mexican adult men are more likely to be obese than Black men; however, Black and Mexican women are more likely to be obese than White women. All three groups are more likely to be obese than most groups of Asians, with the exception of Filipinos. In general, physical activity levels are lower for Black and Hispanic adults than they are for White adults (Go et al., 2014).

A Special Focus: Discrimination and Health Behaviors

Exposure to discrimination is associated with a wide range of unhealthy practices. Discrimination has been associated with less healthy eating choices and more frequent food consumption (Cozier et al., 2014). More consistent data indicate that discrimination predicts higher rates of smoking (see review in Brondolo et al., 2015) and binge drinking (Gibbons et al., 2014; see also review in Pascoe & Richman, 2009). Longitudinal analyses from the Family and Community Health Study provide particularly compelling evidence. In a study of Black parents and children, experiences of discrimination were linked over time with reports of substance (tobacco, alcohol, illicit drugs) use and abuse for both the children/young adults and the parents (Gibbons et al., 2014).

Effects of Stress on Social Cognition May Influence Health Behavior

There are multiple psychobiological mechanisms that may explain the effects of stress on health behavior. Stress exposure and accompanying distress may heighten the perceived benefits of substance use (e.g., in terms of stress reduction or pleasure). Stress may exacerbate the discomfort associated with cravings and consequently reduce the ability to resist substance use (Eisenberg & Thomas, 2004). The effects of stress on social cognition may modify health beliefs, changing individuals' attitudes toward the costs, benefits, and feasibility of engaging in health-promoting behavior (Richman, Blodorn, & Major, 2016).

For example, SES may influence the calculations individuals make as they estimate the effort required to achieve health promotion goals (Brondolo et al., 2011). Higher SES individuals are more likely to live in environments with physical resources (e.g., easy access to healthy foods and recreational resources) and social resources (e.g., others who engage in healthy behavior and health-promoting social norms) that support healthy behavior (Hiscock, Bauld, Amos, Fidler, & Munafò, 2012; Kwate, 2008; Leach et al., 2016). In contrast, without access to

these resources, low-SES individuals must draw on personal resources (e.g., motivation, autonomy, and problem-solving ability) to achieve behavior change. Yet, low SES undermines many of these personal assets. Chronically higher levels of negative mood sap motivation (Gallo & Matthews, 2003); greater economic and social interdependence undermine autonomy (Kraus et al., 2012); and chronic stress impairs the development of the cognitive control processes needed for effective problem solving (Hofmann et al., 2012). With fewer personal, social, and material resources, low-SES individuals may view themselves as lacking the resources to meet the demands of engaging in health promotion goals.

Racial and ethnic discrimination also may change the calculations of minority group members through effects on social cognition. Health-promoting activities may be accompanied by increased threats to social and personal identity (Oyserman, Smith, & Elmore, 2014; Richman et al., 2016). Cultural stereotypes communicated via the media and other methods pair racial and ethnic identity with negative health behaviors or outcomes (Contrada et al., 2001; Oyserman, 2008; Richman et al., 2016; Rivera & Paredes, 2014). These presentations can influence the characteristics minority group members incorporate into their personal identity. Some studies suggest that Native American and African American women are more likely than White women to incorporate some unhealthy behaviors (e.g., being overweight, eating certain foods, having low levels of physical activity) into their racial/ethnic identity, and they experience those behaviors as enhancing a sense of belonging to the group (Oyserman, Fryberg, & Yoder, 2007; Richman et al., 2016).

Discrimination from majority group members increases the salience of membership in one's racial/ethnic group (i.e., increases racial and ethnic centrality; D. L. Lee & Ahn, 2013). Consequently, actions that might threaten group belonging (i.e., changing health behaviors) may be appraised as threatening, even if they would benefit the individual (see also Oyserman et al., 2014). Further, individuals

may be concerned that they will confirm negative stereotypes about their group if they attempt to change their behavior and fail (Contrada et al., 2001).

These identity-related concerns may also undermine individuals' beliefs in their own capacity for change. When specific health behaviors or characteristics (e.g., a slimmer figure) are not depicted as part of the norm for one's group, these characteristics may be rejected, considered irrelevant, or viewed as outside of one's control (Hebl, King, & Perkins, 2009; Steele, 1997). Some experimental evidence suggests that changes in identity-based motivation can make a difference in behavior (Hebl et al., 2009; Oyserman, 2015).

Discrimination also undermines the cognitive control processes needed to self-regulate unhealthy behaviors. For example, acute episodes of social exclusion and race-related discrimination have been associated with greater consumption of snack foods (Inzlicht & Kang, 2010), greater accessibility of substance-related thoughts (Stock, Gibbons, Walsh, Gerrard, & Gerrard, 2011), and greater willingness to use alcohol or drugs (Gerrard et al., 2012).

Taken together, the stressors associated with low SES and discrimination may undermine the personal resources and motivation needed to engage in health-promoting behavior. Limitations to cognitive control mechanisms may reduce the capacity to shift perspective and view health behavior in a different context (Inzlicht, McKay, & Aronson, 2006). Discrimination and disadvantage increase the degree of social threat that accompanies the choice of health-promoting goals (Oyserman et al., 2014). Heightened stress reactivity can drive unhealthy behaviors (e.g., smoking, substance abuse) aimed at regulating stress response (J. S. Jackson et al., 2010).

SPECIFIC APPLICATIONS

STRESS AND DISPARITIES IN DEPRESSION, CVD, AND CANCER

In the next section, we examine the drivers of disparities in depression, CVD, and cancer. We use these three examples to illustrate the ways in which biopsychosocial processes contribute to health disparities. For each condition, we present data on differences in the prevalence of the disorders by race, ethnicity, and SES and examine the mechanisms through which stress exposures may contribute to these differences in risk.

STRESS AS A CONTRIBUTOR TO DEPRESSION

Children and adults with low SES have higher rates of depressive symptoms and more persistent symptoms than those with higher SES (Lorant et al., 2003; Nobles, Weintraub, & Adler, 2013; Reiss, 2013). In contrast, the relationship of racial/ethnic minority status to depression is mixed, with several population-based studies indicating that non-Hispanic Black adults, and in some cases Hispanic adults, had a lower lifetime prevalence of diagnosed mood disorders when compared to non-Hispanic White adults (N. Breslau et al., 1998; Kessler et al., 2003; Kessler & Zhao, 2010; Riolo, Nguyen, Greden, & King, 2005; D. R. Williams et al., 2007). However, there is evidence suggesting that race differences may emerge in the persistence and severity of the symptoms and vary based on specific periods within the lifespan (Liu & Tronick, 2013, 2014). Specifically, population-based data indicate that Black and Hispanic Americans have a higher rate of dysthymia, a persistent negative mood disorder, even though they have a lower overall prevalence of major depressive disorder (Riolo et al., 2005). Black and Hispanic populations are also more likely than non-Hispanic White populations to characterize their own symptoms as severe (Kessler et al., 2005). Asian/Pacific Islanders show a higher rate in both postpartum depression diagnoses

and anhedonia relative to other minority groups (Liu & Tronick, 2013, 2014).

Stress is likely to contribute to the onset and course of depression (Hammen, 2005). The major stressors we have examined, including financial strain (Zimmerman & Katon, 2005), discrimination (Paradies et al., 2015), and child abuse (Nemeroff, 2016), are all known to be depressogenic. Racial/ethnic discrimination is consistently and positively associated with depression across ethnicities and even among children and adolescents (Paradies et al., 2015; Pascoe & Richman, 2009).

Social cognitive models of depression (e.g., Beck, 2005) highlight the importance of negative schemas and interpersonal stressors in the development and maintenance of depressive symptoms. These models suggest that social and environmental stressors shape the development of negative schemas, which affect mood and motivation (see Brondolo et al., 2016, for review; see also Brody et al., 2013; Chen & Miller, 2013). Compounding these effects, negative schemas about others—schemas that may increase the anticipation of social threat—predict increased

Major stressors . . . including financial strain, discrimination, and child abuse, are all known to be depressogenic

exposure to greater interpersonal stress (Conway, Slavich, & Hammen, 2015; Hammen, 2005). Depression itself may trigger and maintain negative schemas and interrupt interpersonal relationships (Beck & Haigh, 2014; Hammen, 2005; Joorman & Gotlib, 2010).

The biological effects of stress may also contribute to depression through effects on cognitive control processes. Both stress and depression inhibit neuronal growth factors, such as brain-derived neurotrophic factor, impairing neurogenesis (i.e., the generation of new neuronal connections; Egeland, Zunszain, & Pariante, 2015). The effects of stress and depression on stress hormones, including cortisol, can be neurotoxic. As a consequence, depression may play a role in inhibiting the development of neuronal connections that support working memory and executive function, among many other capacities, and protect against depression (Mahar, Bambico, Mechawar, & Nobrega, 2014).

There are also significant racial disparities in utilization of mental health services for depression, with Blacks (and in some studies, all minority group members) significantly less likely than non-Latino Whites to receive any mental health care (Alegria et al., 2008; Roy-Byrne, Joesch, Wang, & Kessler, 2009; see also Richman, Kohn-Wood, & Williams, 2007). While systemic barriers must be addressed (Alegria et al., 2015), the stigma of obtaining mental health care held by minority groups must also be considered (Corrigan, 2004).

The evidence suggests that African Americans display resilience to the development of major depressive disorder despite significant levels of stress exposure (N. Breslau et al., 1998). Some evidence suggests that factors related to identity and spirituality may provide buffering effects, but the evidence is complex and not fully consistent (D. C. Cooper et al., 2014). Understanding the biopsychosocial sources of this resilience is a critical area of research, both for understanding the nature of major depressive disorder and for identifying factors that can effectively reduce disparities in other areas of health.

Low-SES populations are more likely to engage in the types of unhealthy behaviors associated with risk for CVD . . . and low-SES individuals demonstrate higher levels of all cardiovascular risk factors

STRESS AS A CONTRIBUTOR TO CVD

There are substantial socioeconomic and racial disparities in the incidence and course of CVD. Essential hypertension (HTN) is much more prevalent among Black Americans: About 40% of Black Americans are diagnosed with HTN in comparison to 27% of White Americans. Black Americans are more likely to have a first stroke and more likely to die from this stroke. Native Americans die from heart disease much earlier than the general population, with 36% of CVD-related deaths occurring under 65 years of age in comparison to 17% for the U.S. population as a whole (American Heart Association & American Stroke Association, 2010). Overall, Hispanic adults have lower mortality from CVD in comparison to White Americans (Mozaffarian et al., 2016; Ruiz, Steffen, & Smith, 2013).

Risk factors for most CVDs include health behaviors and their outcomes, such as smoking, consumption of a high-fat diet, low physical activity, and excess alcohol use, as well as outcomes such as diabetes, obesity, hyperlipidemia, and markers of inflammation (Mozaffarian et al., 2016). Psychological stress and increased reactivity of the sympathetic nervous system have long been implicated in the pathogenesis of hypertension and other CVD outcomes. Interventions to reduce CVD have targeted both stress and cardiovascular reactivity (Esler et al., 2006, 2008; Guyenet, 2006; Joyner, Charkoudian, & Wallin, 2008; Sved, Ito, & Sved, 2003).

Low-SES populations are more likely to engage in the types of unhealthy behaviors associated with risk for CVD (e.g., smoking, low levels of physical activity), and low-SES individuals demonstrate higher levels of all cardiovascular risk factors (Mozaffarian et al., 2016). Neighborhood disadvantage may play a significant role, as resources in the neighborhood have highly specific influences on access to a healthy diet and opportunities for physical fitness (Leach et al., 2016) and may also affect norms for health behavior (Hiscock et al., 2012). SES and racial disparities in CVD risk factors emerge early in childhood, with low-SES children more likely to be obese than those from families with higher incomes, and Black and Hispanic children more likely to be obese than White children (Cunningham, Kramer, & Narayan, 2014).

Data on race/ethnicity differences in cardiovascular risks factors highlight the importance of considering the intersectionality of race, ethnicity, nativity, gender, and SES. For example, although Hispanic individuals have poorer risk profiles, they do not show the same association between risk factors and CVD outcomes as do Whites (Ruiz et al., 2013). Risk factors for CVD in Asian populations vary by subgroup. Among Asian Indian adults, rates for heart disease and diabetes are higher, whereas among Japanese and Filipino adults, rates for hypertension are higher (Barnes, Adams, & Powell-Griner, 2008).

The specific stressors that disproportionately affect some racial and ethnic minority groups and/or low-SES individuals are likely to contribute to heightened



risk for CVD. For example, environmental pollution, financial strain, job insecurity, and unemployment have been associated with increased risk for hypertension (Spruill, 2010); financial strain has been associated with recurrent cardiovascular events among women (Georgiades, Janszky, Blom, László, & Ahnve, 2009). Childhood maltreatment and exposure to violence have been associated with risk for HTN (see Ford & Browning, 2014; Gooding et al., 2015). The effects of racial and ethnic discrimination on blood pressure are complex, but consistent evidence indicates an association of discrimination to elevated daytime and nocturnal ambulatory blood pressure (Bron-dolo et al., 2011; Dolezsar et al., 2014). Discrimination has been associated with incidents of CVD across groups (Ever-

son-Rose et al., 2015). These stressors may also influence the onset and course of CVD and other significant illness through their effect on health care and access (Shavers et al., 2012).

As is the case with depression, the effects of stress on hypertension are bidirectional. Hypertension has widespread effects on the brain, with concomitant effects on cognitive function. Cognitive effects include specific impairments in short-term memory and executive function (Kuo & Lipsitz, 2004; Manolio, Olson, & Longstreth, 2003; Robbins, Elias, Elias, & Budge, 2005; Waldstein et al., 1996; Waldstein, Manuck, Ryan, & Muldoon, 1991). The effects of hypertension on the brain may also contribute to impairments in stress recovery (P. G. Williams, Suchy, & Rau, 2009).

Understanding disparities in CVD can help guide the development of effective culturally adapted multilevel interventions that can address both the contextual drivers of stress exposure and the consequences of attempts to change stress processes in high-risk populations.

STRESS AS A CONTRIBUTOR TO CANCER

Racial and ethnic disparities have been documented across the cancer trajectory, as evidenced by differences in cancer incidence and prevalence rates, cancer survivorship, and cancer mortality (Alexander et al., 2007; Chornokur, Dalton, Borysova, & Kumar, 2011; Grenade, Phelps, & Villalona-Calero, 2014; Luckett et al.,

2011; Willsie & Foreman, 2006). African Americans continue to have the highest overall cancer mortality rates for the four most common cancers in the U.S.: prostate, colon, lung, and breast cancers. Breast cancer is the most common cancer diagnosed in the U.S. Overall, Caucasian American women are more likely to develop breast cancer in their lifetime in comparison to other groups. However, African American women are more likely to die from the disease (Swanson, Haslam, & Azzouz, 2003).

The prevalence of other cancers depends in part on exposure to infectious agents. Cancer is the leading cause of death for Asian Americans, Native Hawaiians, and Pacific Islanders (AANHPI; American Cancer Society, 2016). Compared to other ethnic groups, AANHPI are more likely to be diagnosed with cancer of infectious origin, including liver cancer, cervical cancer, and stomach cancer (McCracken et al., 2007). For example, the most common cause of liver cancer is exposure to the Hepatitis B virus. Among the AANHPI living in the U.S., 70% were born (or their parents were born) in a country with high rates of Hepatitis B. Currently, they make up more than 50% of individuals living with Hepatitis B in the U.S. (American Cancer Society, 2016).

Hispanics are less likely than non-Hispanic Whites to develop new cases or to die from breast, prostate, lung, and colorectal cancers, which are the most common types of cancer in the U.S. However, they are more likely to develop and die from cancers affecting the

stomach, liver, and gallbladder (Siegel, Naishadham, & Jemal, 2012).

There are also disparities in the quality of life following diagnosis. For example, low (vs. higher) SES is associated with a greater report of anxiety and depression in cancer patients (Simon & Wardle, 2008); breast cancer survivors living in impoverished neighborhoods had worse physical functioning than those in middle-class neighborhoods (Schootman, Deshpande, Pruitt, & Jeffe, 2012). Studies examining longitudinal changes in quality of life in patients newly diagnosed with cancer have shown worse emotional and physical functioning in ethnic minority patients compared to White patients (Bradley, Rose, Lutgendorf, Costanzo, & Anderson, 2006; Lubeck et al., 2001; Paskett et al., 2008).

Stress may interfere with participation in preventive cancer screening. Specifically, chronic stress is associated with lower adherence to screening guidelines in low-SES individuals, potentially resulting in diagnoses at more advanced cancer stages (Von Wagner, Good, Whitaker, & Wardle, 2011). The most consistent findings regarding stress and cancer concern the role of stressful events and adverse outcomes (Lutgendorf & Sood, 2011; Powell, Tarr, & Sheridan, 2013), including cancer recurrence and mortality (Chida & Steptoe, 2008; Hamer, Chida, & Molloy, 2009; Palesh et al., 2007; Pinguart & Duberstein, 2010a, 2010b; Sprehn, Chambers, Saykin, Konski, & Johnstone, 2009).

New models and research are helping to identify the mechanisms through which socioenvironmental factors, in-

cluding experiences of stress, influence cancer progression. Under normal conditions, natural killer cells help to prevent the spread of tumors. Under chronic stress, for some cancers, stress hormones suppress the activity of natural killer cells and disrupt a cascade of processes, which inhibits the destruction of tumor cells and other processes (Powell et al., 2013). Specifically, stress-related changes to the release of catecholamines and glucocorticoids can promote tumor angiogenesis, in which tumors send signals to nearby blood vessels, stimulating the growth of new vessels and capillaries. This allows for the delivery of blood and nutrients to the tumor, which are necessary for tumor growth (Lutgendorf & Sood, 2011; Sapolsky, Romero, & Munck, 2000). Stress also has effects on cell organelles, including the endoplasmic reticulum and mitochondria, and these changes also have downstream effects on tumor growth and antigrowth processes (Dicks, Gutierrez, Michalak, Bordignon, & Agellon, 2015). Understanding these mechanisms can help investigators target prevention and intervention efforts.

Racial and ethnic disparities have been documented across the cancer trajectory, as evidenced by differences in cancer incidence and prevalence rates, cancer survivorship, and cancer mortality

STRESS REDUCTION INTERVENTIONS

Ameliorating the deleterious effects of disadvantage and discrimination on health is not a simple process. A wide range of different types of interventions may be needed. In this section we describe approaches to reducing and managing stress. We begin by identifying interventions at the individual level, as the bulk of stress reduction efforts have been done on this level. Other interventions have been designed to reduce health disparities by improving dyadic relationships critical to health care (e.g., between patients and health care providers). Still other interventions focus on improving parent–child relationships to decrease stress reactivity and improve recovery. Finally, a wide range of different types of interventions is aimed at decreasing health disparities by decreasing community-level threats (e.g., crime, discrimination) and improving access to needed resources (e.g., income, education, nutrition, recreation, and medical services; A. E. Clark et al., 2016; Cook, Purdie-Vaughns, Meyer, & Busch, 2014; D. R. Williams et al., 2016).

This is not a comprehensive review; instead, we provide selected examples of the types of interventions that may be needed to address race, health, and socioeconomic differences in stress exposure and stress-related outcomes to reduce health disparities. We focus primarily, but not exclusively, on programs that have included measures of stress, stress reactivity, or health in the outcomes assessment. This review is intended to illustrate effective strategies and to highlight the complexity of the findings, identifying possible side effects or contextual factors that may influence the outcome. The literature in this area is still very new, and identifying benefits and costs of different approaches can guide future research.

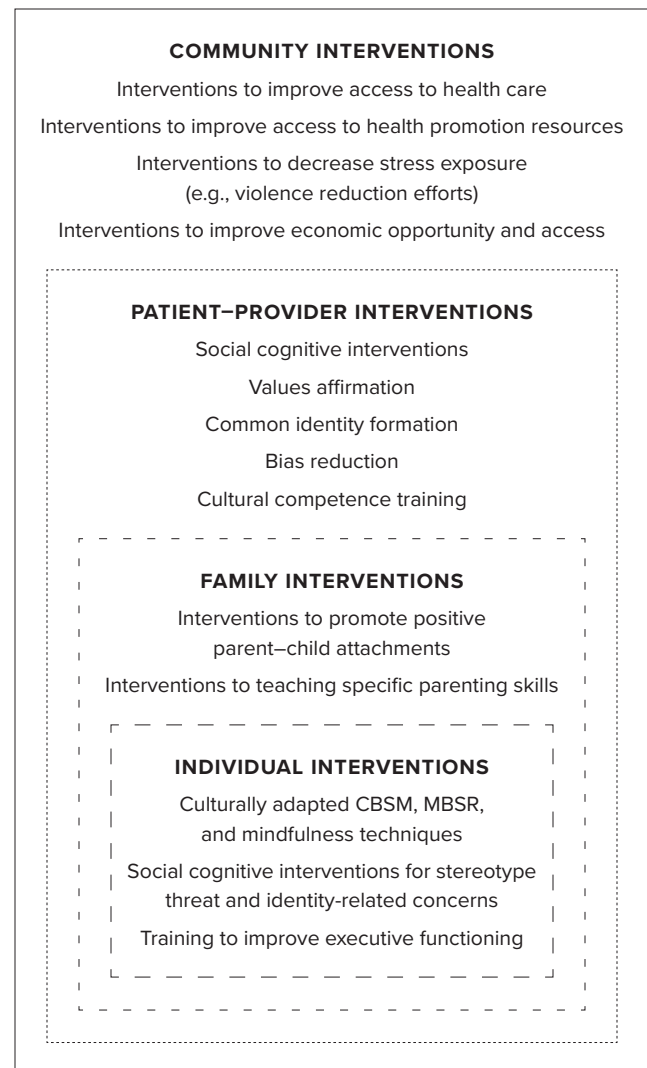
INDIVIDUAL-LEVEL INTERVENTIONS

Stress Management

Individual-level stress management interventions have often been employed to assist persons in managing symptoms of

FIGURE 4

Interventions for reducing and managing stress



Note: CBSM = cognitive-behavioral stress management; MBSR = mindfulness-based stress reduction.



Individuals benefit when interventions are adapted to employ the language, customs, metaphors, and symbolism common to members of the group; reflect a recognition of [their] social and environmental contexts . . . and incorporate the values of [their] culture

stress by improving individual-level coping resources, decreasing individual-level threat exposure, and decreasing physiological activation in response to threats (Antoni et al., 1991). These interventions employ a wide range of approaches (e.g., cognitive-behavioral stress management approaches, mindfulness-based stress reduction programs, and yoga). Assessments focus on changes in perceived stress, quality of life, and stress mediators (e.g., stress reactivity and health behaviors). Cultural adaptations of some of these interventions have also been developed.

Cognitive-behavioral stress management (CBSM) techniques include multiple components targeted at cognitive, affective, behavioral, and physiological responses to stress (Antoni et al., 1991). Common components include psychoeducation, self-monitoring, exposure-based interventions, problem-solving and communication skills building, and relaxation exercises. Traditional cognitive-behavioral therapy and CBSM interventions have been culturally adapted for different racial and ethnic minority groups.

Although there is no clear consensus on the criteria to follow when adapting interventions for different cultural groups, some theoretical work suggests that individuals benefit when interventions are adapted to employ the language, customs, metaphors, and symbolism common to members of the group; reflect a recognition of the social and

environmental contexts in which group members live; and incorporate the values of the culture of the group members (T. B. Smith, Rodriguez, & Bernal, 2011). Several meta-analyses have highlighted the benefits of cultural adaptation of treatments for mental health concerns (e.g., Benish, Quintana, & Wampold, 2011; Hall, Ibaraki, Huang, Marti, & Stice, 2016; T. B. Smith et al., 2011; Van Loon, Van Schaik, Dekker, & Beekman, 2013) and the benefits of cultural adaptations of self-help materials (Shehadeh, Heim, Chowdhary, Maercker, & Albanese, 2016). However, one meta-analysis suggested that the benefits of cultural adaptation are not seen as strongly for African Americans (T. B. Smith et al., 2011). The existing meta-analyses have not focused specifically on adaptations of CBSM approaches.

Some recent work has aimed at cultural adaptation of CBSM interventions for different racial and ethnic groups in the context of integrated care for medical illnesses (Lechner et al., 2013; Townsend, Hawkins, & Batts, 2007). These interventions included opportunities to acknowledge significant stressors, including discrimination; to support interdependence and collective efforts; and to provide training in physical stress reduction and relaxation skills. Some interventions embedded their approaches within an Afrocentric cultural orientation (Kelly, 2006). Data from several studies on cultural modifications to a CBSM approach for African American women indicate that

these interventions are as effective as standard evidence-based care in demonstrating improvements in self-report measures of well-being, psychological stress, and distress (Lechner et al., 2013, 2014; Townsend et al., 2007).

Interventions loosely categorized as mind-body interventions include mindfulness-based stress reduction, yoga, progressive muscle relaxation, biofeedback, autogenic training, guided imagery, diaphragmatic breathing, and transcendental meditation, among other methods (Burnett-Zeigler et al., 2016). The primary components of these mind-body interventions are directed at improving management of physical reactions to stress, providing guidance in reducing muscle tension, and regulating respiration, among other strategies. The cognitive components of these approaches focus more on self-compassion rather than modifying cognitions or directed problem solving.

In a review of these approaches and their efficacy in addressing mental health symptoms among members of disadvantaged groups (i.e., individuals who belonged to racial/ethnic minority groups or who were incarcerated), Burnett-Zeigler et al. (2016) reported that, overall, mind-body interventions were acceptable and showed some evidence of efficacy on indices of substance use, some mental and physical health symptoms, and quality of life. The reviewed studies demonstrated high retention rates for mindfulness-based stress reduction and interventions employing related techniques (e.g., yoga, meditation, guided imagery)—about 60%–70% retention across studies. Participants consistently practiced techniques on their own, and findings from some of the investigations suggested that offering services such as childcare and transportation increased participant engagement (Burnett-Zeigler et al., 2016). These findings are also consistent with data suggesting that mindfulness-based stress reduction interventions are culturally congruent for African Americans and consistent with spiritual beliefs and worldviews (Woods-Giscombé & Gaylord, 2014).

To date, there is still a very limited body of research on the effectiveness of these interventions among minority clients. Burnett-Ziegler et al. (2016) included only 18 investigations. Many of the reviewed studies had significant methodological limitations, including small sample sizes, the absence of a control group, and limited ability to examine diversity in effects among groups of individuals of varying ethnicity. However, a recent randomized control trial found statistically significant reductions in psychological stress in African American adults who completed a mindfulness-based intervention compared to others who did not receive training in mindfulness (Woods-Giscombé & Gaylord, 2014). Nevertheless, it is clear that more research in this area is needed.

Improving Social Cognition and Cognitive Control

Individual-level interventions have been developed to reduce the negative effects of race- or SES-related stress on social cognition. Many of these interventions have focused on reducing stereotype threat effects (i.e., impairments in performance or mood resulting from concerns about being stereotyped or behaving in stereotypical ways because of group membership). Interventions to reduce stereotype threat have included components such as psychoeducation about the effects of stereotype threat (Johns, Schmader, & Martens, 2005); role models to offer counter-examples to negative portrayals of group members; interventions to increase cognitive complexity and perspective taking; and modifications to theories about personal characteristics, including intelligence (S. J. Spencer, Logel, & Davies, 2016).

Values affirmation approaches have also been employed to interrupt stress processes that can deteriorate performance and health (G. L. Cohen, Garcia, Purdie-Vaughns, Apfel, & Brzustoski, 2009). Values affirmation approaches involve asking participants to identify and confirm core personal values. These interventions may work by altering the capacity, even in the short term, to view situations from a different perspective and

by strengthening a positive self-identity (Sherman & Hartson, 2011). Interventions to develop a range of possible self-identities and to thereby expand personal goals have also been shown to improve academic performance and decrease depressive symptoms (Oyserman, Bybee, & Terry, 2006).

The bulk of this research has focused on decreasing the effects of stereotype threat or stereotype confirmation concerns on academic performance (Schmader & Croft, 2011; Steele & Aronson, 1995). However, many of the methods employed in these studies may have applicability for other outcomes. Values affirmation approaches have been demonstrated to improve health behavior (Sherman & Hartson, 2011). A small body of research suggests that these approaches have also been successful in improving health behavior and health-related outcomes among racial and ethnic minority groups. For example, a brief values affirmation approach improved self-reported health and reduced doctor visits over a 3-year period among African American college students (Walton & Cohen, 2011). A values affirmation intervention was effective in decreasing the link between stigmatization and overweight for Latino students and resulted in reductions in overweight status (Cook et al., 2014).

Patient–provider communication is at the heart of health care, but there are significant racial disparities in the quality of patient–provider relationships

Cognitive control processes, including the capacity for attention and inhibitory control, have been linked to improved health. Specifically, these “shift and persist” strategies are linked to improved regulation of autonomic, immune, and neuroendocrine systems involved in the stress response (Chen & Miller, 2012) and they have been linked to health behaviors (Koffarnus et al., 2013). A wide variety of interventions has been developed to improve executive functioning/cognitive control abilities among young children. Interventions embedded within social and physical activities have generally been successful in helping young students improve their ability to maintain focus and persist in reaching their goals, with significant gains in executive control and related mental health outcomes demonstrated among low-income children and adolescents (for review, see Diamond & Lee, 2011; Fishbein et al., 2016).

PATIENT–PROVIDER INTERVENTIONS

Improving Trust and Communication

Patient–provider communication is at the heart of health care, but there are significant racial disparities in the quality of patient–provider relationships. Generally, minority group members report poorer quality of communication; however, there are variations among patient groups and providers and across medical disorders in reports of problems in patient–provider communication (Burgess, Van Ryn, Dovidio, & Saha, 2007; L. A. Cooper et al., 2012; Palmer et al., 2014; Penner et al., 2010; Schoenthaler, Allegrante, Chaplin, & Ogedegbe, 2012; Van Ryn, 2002; White et al., 2016).

At least a portion of the difficulties with communication may stem from the effects of discrimination on both the patient and provider (I. V. Blair, Steiner, & Havranek, 2011; Clarke et al., 2013; Dovidio et al., 2008). Bias communicated through cultural messages may influence the schemas providers hold about patients. Experiences of discrimination at all levels and in health care may change the schemas that patients hold about provid-

ers, increasing mistrust for both groups (Dovidio et al., 2008). As a consequence, the evidence suggests that providers have briefer and less warm communications with minority patients, and minority patients are less likely to ask questions during patient–provider discussions (L. A. Cooper et al., 2012; Dovidio et al., 2008).

Researchers have applied principles from social cognitive theory to improve the quality of communication, particularly in cross-race interactions (i.e., interactions in which the race of the patient and provider is not the same). We provide selected examples of these interventions. Stereotype confirmation concerns among patients (i.e., concerns that providers would see them in a negative light) may lead patients to anticipate that providers may invalidate their concerns or judge them for being unable to properly care for themselves. These negative schemas may undermine the patients' ability and willingness to engage in more direct and open communication with their providers. Values affirmation interventions may counter these stereotype confirmation concerns. In these interventions, patients are asked to identify important personal values prior to meeting with their physician. Havranek et al. (2012) reported that patients in the values affirmation group (vs. a control condition) requested and provided more information about their medical condition, and observer ratings of the quality of communication indicated the communication was more respectful and engaged and less depressed. However, the intervention did not improve visit satisfaction, trust, or stress among African Americans in racially discordant medical primary care visits.

There is evidence of bias in pain management treatment, with White patients receiving higher levels of pharmacological pain treatment compared with Black patients (Drwecki, Moore, Ward, & Prkachin, 2011). These biases may reflect schemas about others, including schemas that reflect stereotyped ideas about the pain tolerance of individuals different from oneself. Empathy-enhancing and perspective-shifting interventions may remedy disparities in pain management (Drwecki et al., 2011). In these interven-

There is evidence of bias in pain management treatment, with White patients receiving higher levels of pharmacological pain treatment compared with Black patients

tions, participants viewed videos of Black patients experiencing pain and were asked to imagine the effects of this pain on the individual's life. Once they had completed the intervention, participants who received the empathy-enhancing and perspective-taking intervention showed no evidence of bias in pain treatment and no evidence of a racial bias in empathy.

When patients and providers come from different racial groups, prejudice toward the out-group and strong in-group identity may drive social distance, undermining patient–provider communication (L. A. Cooper et al., 2012; Hausmann et al., 2011; Richman et al., 2007). Interventions to shape the physician's and patient's sense of common identity have also been shown to be effective in improving satisfaction and adherence over the long run among African American patients. Penner et al. (2013) developed a set of prompts and other materials (e.g., same-color wearable buttons) to promote a sense of common identity between patients and providers. Posters in the exam rooms encouraged a team approach and were intended to foster a shared identity.

In comparison to an educational intervention, the team building intervention did not modify physicians' perceptions of the interaction, but the intervention was associated with improvements over time in the patients' reports of trust and adherence to physician recommendations.

Other social cognitive interventions focus on improving the cultural competency of providers. These interventions include many different types of components, including interventions that include training in the language and culture of diverse groups of patients, information and training in cross-cultural communication, and general methods to improve perspective taking. Although there has been insufficient high-quality research, the data suggest that all these social cognitive interventions have some promise but have thus far demonstrated limited effectiveness in terms of patient health outcomes (see Clarke et al., 2013; Lie, Lee-Rey, Gomez, Berecknyei, & Brad-dock, 2011).

FAMILY-LEVEL INTERVENTIONS

Improving Parenting

There has been a wealth of research documenting the benefits of supportive parenting on children's stress exposure, stress tolerance, and physical and mental health outcomes (Masarik & Conger, 2017). Supportive parenting may facilitate the development of positive (or at least less negative) schemas about other people. More positive schemas may buffer the effects of subsequent life stressors on the development of negative schemas, interrupting recursive cycles of interpersonal stress that may undermine health (Simons et al., 2006; Walton & Cohen, 2011).

Many different types of parenting interventions have been developed for high-risk families, including those with low levels of income as well as those at risk for child maltreatment. Some of these interventions, including those based on the child–parent psychotherapy models (Cicchetti, Rogosch, Toth, & Sturge-Apple, 2011), explicitly address social cognitive

Changes to the larger social environment may be necessary to initiate and sustain the individual-level changes in social cognition, motivation, and behavior required to produce health effects

processes. These interventions promote the development of positive parent–child attachments with a goal of developing positive schemas about caregivers. They directly and indirectly address the negative schemas that may have developed in parents who were themselves victims of maltreatment (Mortensen & Mastergeorge, 2014). Other interventions, including the psychoeducation parenting intervention, focus on developing specific parenting skills. These programs also address social cognitive processes as they modify parents’ perceptions of their children and their children’s motivations.

Reviews of the literature suggest that parenting interventions targeted at low-income families show significant benefits in terms of improving supportive parenting, although the overall effect sizes are fairly small (Mortensen & Mastergeorge, 2014). Data are very limited on the effects of these programs on health. However, a multilevel intervention program aimed at improving supportive parenting and developing psychosocial competencies in youth transitioning to high school reduced stress, improved health behaviors, and decreased inflammation, a key mediator of the relationship of stress to health (Miller, Brody, Yu, & Chen, 2014). Parenting interventions, including those based on child–parent psychotherapy and psychoeducation parenting intervention, reduced parenting stress (Toth, Sturge-Apple, Rogosch, & Cicchetti, 2015) and also appeared to normalize children’s daily cortisol responses, an index of stress reactivity (Cicchetti et al., 2011).

COMMUNITY-LEVEL INTERVENTIONS

Reducing Threats and Increasing Resources

Changes to the larger social environment may be necessary to initiate and sustain the individual-level changes in social cognition, motivation, and behavior required to produce health effects. To address these needs, investigators and advocates have designed and implemented multilevel interventions to reduce health disparities (Chin et al., 2012; Clarke et al., 2013; D. R. Williams & Mohammed, 2013). Some of these interventions have been directed at reducing objective stress exposures and examining subsequent effects on health. Other multilevel interventions have been implemented to reduce disparities by strengthening the resources of patients (and their families), including their capacity to access and engage in treatment (e.g., Allen, et al., 2016; Miller et al., 2014). Here we present selected examples to illustrate different types of multilevel interventions.

Programs providing additional resources in the form of housing, income,

and other financial benefits have produced changes in health, although the effects vary over time and across health outcomes (D. R. Williams & Mohammed, 2013). For example, Moving to Opportunity (Ludwig et al., 2013) involved a national randomized control trial in which individuals were offered vouchers to move to more resourced communities. Over a 2-year period, there were reports of improved physical health among parents and sons. After 10–15 years, there were reduced rates of severe obesity and diabetes and improved mental health (Ludwig et al., 2013). As reviewed in D. R. Williams and Mohammed (2013), programs that offer cash support (including state and federal earned income tax credit programs) and programs that provide nutrition education and nutritional support for low-income women are associated with higher infant birth weight, with stronger effects among individuals with less education. Native American communities have also used cash incentive programs involving the distribution of earnings from casino operations to tribal members. The levels of psychiatric and psychological symptoms among young adult tribal members were significantly reduced following the payments.

New approaches to stress reduction in health disparity communities have included systemic interventions to decrease threats associated with violence and discrimination. One approach focused on reducing barriers to financial equity and achievement—acknowledged drivers of violent crime—by fostering the development of business improvement districts in low-income communities. This intervention was associated with an 8% reduction in violent crime (Masseti & David-Ferdon, 2016). Data are not yet avail-

New approaches to stress reduction . . . have included systemic interventions to decrease threats associated with violence and discrimination

able on health effects. Other intervention programs have been aimed at reducing crime and exposure to violence by supporting police–community relations (Graziano et al., 2014) or reducing gang-related violence (Gebo, 2016; McDaniel, Logan, & Schneiderman, 2014). Violence prevention programs show some evidence of effectiveness, but investigators have not yet examined the effects of these interventions on community health disparities.

There have been many different types of interventions designed to reduce discrimination, although the benefits are limited, and some side effects or unintended consequences have been noted (see reviews by Abrams, 2010; A. E. Clark et al., 2016; Cook et al., 2014; Paluck & Green, 2009). Limited positive results of efforts to change implicit bias have been obtained using methods such as offering counter-stereotypical ex-

amples and invoking positive emotions during cross-race interactions. School- or community-based programs that provide opportunities for actual or vicarious cooperative social interactions with others of a different race and programs that model social norms reflecting tolerance show some efficacy. Narrative approaches using books, movies, or radio programs that depict others of a different race/ social group in a sympathetic context or engaged in positive cross-group interactions have been shown to influence the expression of prejudice and perceptions of social norms concerning expression of prejudicial behavior. Cooperative learning programs in which students of different backgrounds work together to solve problems have shown some effectiveness, particularly in improving positive peer interactions and attitudes. A recent meta-analysis of diversity training initiatives in educational or employment

settings provided some limited support for these initiatives, although the effects were dependent on the setting, employees, and a host of factors related to other types of institutional supports for diversity and inclusion (Bezrukova, Spell, Perry, & Jehn, 2016).

There is increasing evidence that there are important moderators of interventions to reduce prejudice (Abrams, 2010; Bezrukova et al., 2016). Factors associated with the individual, including personality characteristics and prior exposure to different racial or ethnic groups, may moderate the outcomes (Abrams, 2010). Factors associated with the setting in which interventions are delivered, including the degree to which the institution as a whole is committed to diversity efforts, also influence outcomes, with stronger institutional support associated with better outcomes (Bezrukova et al., 2016). Investigators working with police



and community members to reduce disparities in policing have also highlighted the importance of institutional support for these endeavors (Graziano et al., 2014).

Other community-based interventions are targeted more directly at improving access to resources to improve health behavior (Glik et al., 2016). For example, some programs have used community leaders (e.g., local lay advisers, barbershop staff) to implement the intervention components. These local leaders may change social norms about health behavior by providing positive role models for community members, challenge negative stereotypes about the relationship of culture to health behavior, and shift underlying links between identity-based schemas and health behavior. Specifically, investigators have successfully implemented hypertension screening programs in barbershops, training barbers to deliver educational materials and monitor blood pressure to improve hypertension control among African American men (Victor et al., 2011).

Some of these interventions have incorporated community-based participatory research approaches and worked collaboratively with community stakeholders, including community members and business and political leaders, to identify policy changes that were perceived as feasible and most likely to change health behavior in the local community (e.g., increasing walkability, changing advertisements or the quality of food offerings in schools; for reviews, see Clarke et al., 2013; Glik et al., 2016). For example, in a community in southern California with many Mexican American

residents, a university–community partnership worked to improve access to and consumption of healthy foods. Researchers, community members, and students worked closely with local merchants to refurbish local stores to present more healthy foods in a more easily accessible manner (and display unhealthy foods in less accessible locations). Students in local schools participated in developing and implementing a wide variety of social marketing campaigns to provide information about health and nutrition and motivation to engage in healthier behavior (Ortega et al., 2015).

All cultural groups have resources for resilience that are part of their culture and reflect strengths gained over time, including strengths gained from adversity (Theron, Liebenberg, & Ungar, 2015). Some intervention programs are designed to strengthen and extend existing sources of resilience in different communities. For example, among American Indian/Native American groups, researchers have used traditional modes of storytelling to support resilience among elders (Grandbois & Sanders, 2012). Other approaches have included developing educational programs to improve youth employment and programs to support cultural practices (see Tighe, 2014, for review). Some investigators have used approaches that involve identifying community and personal sources of support (Kouyoumdjian, Guzmán, Garcia, & Talavera-Bustillos, 2017; Rhodes et al., 2012).

CHALLENGES TO INTERVENTION EFFECTIVENESS

Although each of these different types of interventions has had some success, there have also been some unintended consequences or side effects. For example, although distribution of casino revenue to Native Americans was associated with improved mental health, the distribution of funds was also associated with increases in alcohol use and obesity (D. R. Williams & Mohammed, 2013). Media and other interventions designed to decrease prejudice can, under some circumstances, increase prejudice or evoke backlash (Abrams, 2010). One limited self-affirmation intervention conducted with minority patients prior to a visit with a physician lowered self-esteem and did not influence patient–provider communication (Burgess et al., 2014).

Recent studies of individual-level social cognitive interventions also suggest that even when individuals make efforts to change their thoughts, feelings, and actions, the social environment may constrain the benefits of their efforts. For example, successful programs targeted at cognitive control processes among low-SES and minority-group youth have resulted in changes to social cognition and self-regulation on an individual level, but recent data suggest that in some populations, these benefits are accompanied by side effects including signs of physiological dysregulation, such as increases in blood pressure and signs of epigenetic aging (see Brody et al., 2013; Miller et al., 2014).

Individual-level treatments intended to help youth gain cognitive control skills may not directly address the environmental demands and threats that initially limited the ability to develop or deploy these skills. New cognitive control processes developed in these interventions may not be congruent with the existing environmental demands (e.g., the presence of acute threats) and resources (e.g., a lack of peers who have similar skills). More research is needed to better understand strategies for deployment of these effective interventions and to iden-

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tify circumstances under which these interventions generate unintended consequences.

Minority (vs. majority) group members and individuals of low SES are more likely to face stressors that are not necessarily a function of their own making but instead originate from persistent social and economic disadvantages, including exposure to discrimination. As a consequence, approaches that focus solely on individual-level efforts to identify and monitor stress triggers and stress reactions may be problematic. In recognition of this difficulty, many cultural adaptations of interventions, particularly for Black individuals, have included opportunities to discuss discrimination and other stressors (Kelly, 2006; Lechner et al., 2014; Townsend et al., 2007).

However, acknowledging discrimination and other disadvantages may lead to unintended consequences or side effects. When individuals consider the possibility that discrimination is responsible for exposure to potentially debilitating stressors (e.g., a job loss, a conflict with a child's teacher), they may experience a subjective increase in perceptions of threat. Specific stressful events are now paired with the more pervasive and systemic threat of discrimination. Individuals may conclude they are not independently able to address these systemic threats.

The requirement to make individual-level changes that require unavailable resources may add to the burden of anger and frustration. There is still insufficient evidence to provide best practices for helping individuals conceptualize exposure to discrimination-related stressors or to facilitate a personal awareness of injustice without undermining agency or hope. Different approaches may be of benefit at different points in time as individuals face and manage stressors (Walsemann, Ailshire, Bell, & Frongillo, 2012).

Interventions that support connection to a larger group may be of benefit when addressing stressors that are a function of group-based exposures. For example, there is evidence that religious coping may offset some of the deleterious effects of discrimination on stress for African Americans (Bierman, 2006; D. C. Cooper et al., 2014). Culture-specific consciousness-raising efforts to understand historical and current forces that affect the group as a whole as well as the individual may also be beneficial. In these contexts, the awareness of stressors and their consequences can be seen as a way to remind individuals of their connection to others who have fought against injustice (Gone, 2013). Activating a sense of belonging and pride may buffer some of the negative effects of exposure to past trauma (D. L. Lee & Ahn, 2013). A primary focus of stress reduction efforts for groups facing systemic stressors could include efforts to improve collaboration, strengthening the capacity for collective problem solving.

However, many clinicians do not have training in the types of interventions necessary to develop these collaborative communication skills. In addition, the evidence on the benefits of social support as a strategy for ameliorating the health effects of discrimination is mixed (Brondolo et al., 2009). Studies are needed to better understand the costs and benefits of accessing social support for episodes of discrimination and to identify the best practices for developing collaborative communication skills.

Cultural competency interventions to improve provider effectiveness may need to explicitly focus on stress and

coping. The coping strategies employed by low-SES individuals may be markedly different from the strategies employed by those charged with providing stress management interventions. When the approach to stress reduction used by low-status individuals (e.g., avoiding threats and decreasing demands) differs substantially from those used by high-status individuals (e.g., increasing resources), the differences between groups are accentuated. High-status groups, who place a premium on autonomy and achievement, may have a limited understanding of the approaches to stress used by low-status groups (Kraus et al., 2012). The manifestations of these differences can shape or confirm stereotypes (e.g., laziness, lack of resourcefulness) and drive further discrimination. Negative stereotypes about members of isolated groups can become more persistent and more resistant to change when targeted individuals are segregated in economic and social worlds (Gee et al., 2009; Pager et al., 2009).

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Stress management interventions may need specific components to address the psychobiological consequences of violent trauma exposure, given the elevated rates of exposure to violence in health disparity populations

Stress management interventions may need specific components to address the psychobiological consequences of violent trauma exposure, given the elevated rates of exposure to violence in health disparity populations. More sustained interventions may be needed to effectively address the sequelae of trauma exposure (S. Kim & Cardemil, 2012). Similarly, sustained exposure to violence and other significant stressors may modify neural processes to facilitate threat detection but hamper the development of cognitive control. Some data suggest that these neural effects are reversible, but deliberate and more sustained intervention may be needed (Liston et al., 2009; Tyrka et al., 2016).

Most important, there is insufficient high-quality data on the effectiveness of any of these programs (Glik, 2016; Paluck & Green, 2009; S. A. Smith & Ansa, 2016). In many cases, the community-based studies are still in early stages. Interesting and positive findings from laboratory studies have not yet been tested in community-based studies (Paluck & Green, 2009). Many efforts to reduce prejudice and discrimination in the workplace have not been adequately evaluated (Abrams, 2010). Multilevel health interventions often have not included indices of changes in individual-level social cognitions, including changes in identity and schemas, nor have they determined if changes to these processes mediate changes in health behavior and health outcomes (Brondolo et al., in press). Culturally

adapted interventions have demonstrated benefit (for review, see Hall et al., 2016; S. A. Smith & Ansa, 2016), but it remains unclear which types of problems are most likely to require adapted interventions and which are addressable through approaches developed for majority populations composed of middle-class participants.

Despite the challenges, there is reason for great optimism. The sheer range of different types of interventions and different types of outcomes suggests that in the near future much more evidence will be available to understand what works, for whom, on what dependent measures. There has been a national commitment to reducing racial disparities and investment in this research. Healthy People 2020 (U.S. Department of Health and Human Services, 2016b) set national priorities to reduce health disparities. The National Institutes of Health has made substantial investments in research on health disparities in each of its institutes and through the National Institute of Minority Health and Health Disparities. With continued investment and rigorous methodology, efforts to improve the health of all can make great strides.





RECOMMENDATIONS

Our review of the literature on the role of stress in health disparities suggests that reducing stress and stress-related illnesses experienced by individuals facing social and economic disadvantage related to SES and race/ethnicity would benefit from attending to the following factors.

Disparities in threat exposure

Social and economic disadvantage exposes individuals to stress across a variety of domains. Low (vs. high) SES individuals report more stress (e.g., S. Cohen & Janicki-Deverts, 2012; Sternthal et al., 2011) and face more threats to safety, including exposure to violence (e.g., Ulmer et al., 2012). Members of racial or ethnic minority groups report higher levels of discrimination and are exposed to more discrimination-related stressors (Sternthal et al., 2011), and they face more barriers to occupational advancement (Li, 2014; Pager et al., 2009). Black and Hispanic individuals are also at greater risk for occupational injuries (Meyer et al., 2013). At least some of the racial disparities associated with threats to safety, including those associated with exposure to violence, are a function of low SES at both the individual and community level (Browning et al., 2017) and the types of employment accessible to members of marginalized minority groups (Leong et al., 2012).

Disparities in resources

Racial and ethnic minority group members and low-SES individuals have fewer social and material resources (Pollack et al., 2013; D. R. Williams & Jackson, 2005). Low levels of individual resources are compounded by low levels of community resources, and these gaps in resources are likely to change health trajectories across the lifespan (Massey, 2013). The deficits in individual, family, and community resources can make even minor threats more serious.

Social and physical environment-driven stress exposure

Residential racial and economic segregation remains a significant threat for many African Americans and low-income individuals of all races (Kramer & Hogue, 2009). Neighborhood segregation, particularly economic segregation, drives exposure to many of the other stressors we have discussed, with the exception of discrimination. More important, neighborhood disadvantage deprives individuals of access to many of the social and material resources that can buffer stress exposure (Thorpe et al., 2008; D. R. Williams & Jackson, 2005). These gaps are particularly acute for African American and Native American children (Drake & Jonson-Reid, 2014; Sarche & Spicer, 2008).

Changes to social cognition

Social stressors have sustained effects on social cognition, changing the way people think and feel about themselves, others, and the world at large (Brondolo et al., 2016). In turn, changes to social cognition can undermine relationships, self-regulation, and stress recovery across the lifespan (Simons et al., 2006, 2012).

A vicious cycle

The effects of environment on the brain and stress physiology

Highly threatening environments produce changes to the brain and systems involved in stress physiology. Those adaptations may increase the capacity for quickly detecting threats, but they may also impair other aspects of coping and self-regulation, making it more difficult to prevent and recover from stress (C. Blair & Raver, 2012; Tyrka et al., 2016).

Variations in resilience

The importance of considering intersectionality

As the literature has grown, it is becoming increasingly clear that resilience to stress effects varies substantially depending on the health outcomes measured. Stress exposure and resilience also vary depending on a wide range of social status variables, including gender, immigration status, and region of the U.S., among other factors. For example, although Hispanic Americans have fewer economic resources compared to White Americans and more adverse cardiovascular risk factor profiles, they show lower levels of morbidity and mortality than White Americans (Ruiz et al., 2013). Similarly, Black Americans, despite facing very high levels of social threat, show reduced risk for major depressive disorder compared to White Americans (J. Breslau, Kendler, Su, Gaxiola-Aguilar, & Kessler, 2005).

A need for culturally appropriate multilevel interventions

Interventions are needed to reduce individual- and community-level threat exposures, increase individual and community resources, and mitigate the effects of stress on health. Investigators and clinicians must also consider both person-level and context-level factors. Interventions that do not adequately address the antecedents of stress (e.g., the environmental drivers of stress exposure) or the consequences of behavior change (e.g., costs to identity or belonging) may incur side effects or fail to sustain improvements. Outcomes are generally improved when interventions are culturally appropriate and adapted to the local environment (T. B. Smith et al., 2011).

The following are key summary action recommendations in research, education/practice, public awareness, and policy that APA and others can undertake to reduce stress and stress-related health disparities.

RESEARCH

Multilevel Barriers to Health

Individuals facing social disadvantage encounter multilevel barriers to achieving good health. Social disadvantage creates residential and social environments that influence health in multiple ways: by creating barriers to obtaining healthy foods or accessing recreational facilities (Kwate, 2008); by generating social norms that undermine health-promoting behavior (Oyserman et al., 2007); by fostering changes to social identity that undermine motivation (Richman et al., 2016); by exposing individuals to threats that result in impairments to the cognitive control processes needed to set and achieve health promotion goals (Murphy et al., 2012); and by activating or altering the responsibility of the psychophysiological systems that mediate stress and provide the physiological resources needed to support health promotion (Adam et al., 2010). Addressing any one of these factors without considering the effects of others may not yield sustained changes in health for populations living in threatening and underresourced social environments. Finally, although there has been substantial research on the relationship of stressors to health, there has been very limited research on the degree to which stress accounts for disparities in health.

RECOMMENDATION 1

Provide support for multidisciplinary research programs capable of examining the interrelationships among barriers to health that operate at the individual, family, community, and national level. Longitudinal research in this area can identify the chain of relationships among these variables and the bidirectional ways in which features of the political, social, and physical environment shape individual-level outcomes. Research should examine macro-level variables, including governmental policies, workplace regulations, and cultural trends, and investigate their effects on community and family functioning and individual-level processes that may influence risk and resilience. It will be important to support multidisciplinary research, combining historical, economic, environmental, social, and physiological factors to understand the ways in which public policies in economics, social justice, and health care have long-term effects on health.

For an in-depth understanding of the effects of the social environment on health disparities, the research would benefit from the use of a wide range of ecological momentary assessment methods to illuminate daily experiences, interactions, and actions and the addition of methods from neuropsychology and neurobiology to provide insight into the role of cognitive control processes. The use of data across levels (i.e., from the macro level to micro-processes within the individual) can permit investigators to test hypotheses about the mediators of the relationship of the broader social environment to health disparities. Research is also needed to investigate a wide variety of moderators—from region of the country to specific genetic markers—that may affect the relationship of the social environment to stress exposure and to health. More research is needed to explicitly test hypoth-

eses about the ways in which variations in stress exposure (i.e., variations in the frequency, intensity, type, or duration of stress) account for disparities in health.

Complex Effects of Discrimination

Discrimination against individuals and groups because of race, ethnicity, and SES (among other variables) is a significant public health problem (Lewis et al., 2015). Discrimination has well-documented effects on a wide range of processes involved in health promotion and health outcomes (Paradies et al., 2015). But interventions to reduce discrimination have yielded mixed findings and some evidence of side effects (e.g., backlash; Abrams, 2010). Although gains are being made, decreasing discriminatory attitudes and behaviors remains a challenge. Multimodality interventions—delivered in interpersonal contexts, through the media, and in communities and institutional settings—may be necessary. Political and institutional support for these interventions may be needed.

Similarly, there is limited research on strategies to reduce the effects of discrimination on health (D. R. Williams & Mohammed, 2013). The side effects of interventions may include the individual's pain when recalling unjust experiences. The costs and benefits may vary depending on the individual's own experiences and resources (Abrams, 2010). There may be many important moderators of the effects of these stress reduction interventions, including SES, past trauma, and discrimination, among other variables, as well as the modality of the intervention. Strategies for predicting side effects or backlash from these interventions are also needed.

New research also suggests that interventions that are brief, highly targeted, and delivered at optimal moments in the development of new behaviors or at moments of change in an individual's life (i.e., "wise interventions") can reduce the negative effects of discrimination (Walton, 2014). The design and deployment of these interventions rely on a detailed mechanistic understanding of the sequence of social, cognitive, affective, behavioral, and physiological responses to particular events. This knowledge is used to facilitate the timing and nature of the intervention so that its deployment interrupts cycles of maladaptive responses that could undermine health over the long run.

RECOMMENDATION 2

Support research to identify the best strategies to reduce prejudice and discrimination and to identify moderators of responses to strategies to reduce race-related stress. This will allow clinicians and policymakers to identify what works best, and whom it works for. The best approach may vary across the lifespan and by the type of setting (e.g., school, work, religious institution, community) or the modality and intensity of the intervention. The value of employing multiple different modalities, including approaches drawn from the arts and arts education, should be explored.

Neighborhood and Community Effects

Residential racial and economic segregation are fundamental causes of health disparities through their effects on stress exposure and other factors (D. R. Williams & Collins, 2001). However, there are also data suggesting benefits to living in areas dense with others of a similar ethnic or racial background (Shaw et al., 2012). The connections among individuals of the same race and culture can provide significant support and potentially decrease exposure to discrimination. And yet, for some minority groups, the high levels of ethnic/racial density are also accompanied by intense deprivation (Bécares, Cormack, & Harris, 2013).

Efforts to decrease segregation and integrate communities are driven by complex political, legal, social, and economic forces (Rothstein, 2013). Building communities when residents have very different experiences of stress over the life course and across generations is a complex task. The process may require individuals to be able to communicate clearly about their own cultures, experiences, and expectations. A wide range of support and educational services may be needed to facilitate effective integration. Integration may threaten identity, and addressing these threats to collective identity may be a critical component of any successful intervention to improve economic and social resources in a community and decrease health disparities.

RECOMMENDATION 3

Support research to determine the kinds of social and psychological resources that are needed to facilitate efforts to desegregate and integrate neighborhoods and institutions within neighborhoods. In particular, this research must include efforts to identify the most effective strategies to reduce bias among community members and to promote effective and positive interracial exchange during everyday interactions.

Modeling Risk and Resilience

There is a need for new models to help us conceptualize the ways in which stress can affect health. We can learn from research models in other areas, including environmental science and meteorology, to understand the ways in which factors at different levels can work in concert to have significant and catastrophic effects on health. Models from these fields have helped explain the complexity of relationships among risk factors. In some cases, specific risk factors may not have consistent deleterious effects. Instead, some factors serve to increase susceptibility to illness and others may decrease resilience to disease. The effects of these factors accumulate over time, each one subtly altering the demands individuals face and the resources they have to protect their health and engage in the work of life (Dennis & Kemp, 2016).

Multiple factors have conspired to create the kinds of striking health disparities we see today, including among others the recent and very sharp increase in mortality among less educated White individuals as well as the persistence of Black–White disparities in longevity (Case & Deaton, 2015). Some stressors may have direct effects on health (e.g., violent assault, workplace injuries). But other stressors increase susceptibility to disease by changing stress reactivity and cognitive control. These effects may manifest as symptoms of depression or pain, unhealthy behavior, escalated risk taking, or exhaustion. Some stressors undermine resilience, as they drive family conflict and create barriers to educational achievement—depriving individuals of the resources they need to respond to other stressors in their lives.

RECOMMENDATION 4

Support new research to develop the complex models and statistical methods to understand the effects of stress on susceptibility and resilience. We need to understand how the relationships among these stressors operate in different populations. Developing new models of the relationships among stressors with both direct effects and indirect effects on susceptibility and resilience over time will help us to develop the best models for prevention and intervention. New methods in biostatistics may be needed, and more readily available training in biostatistics may be helpful.

RECOMMENDATION 5

Enhance long-term investment in research needed to reduce health disparities by increasing the availability of fellowships for early career researchers committed to health disparities research. This research requires interdisciplinary knowledge and complex modeling approaches. The development of modules for curricula in behavioral medicine and health statistics would be beneficial.

EDUCATION/PRACTICE

The stressors facing disadvantaged groups come from more than just personal sources—they emerge from a wide variety of cultural, institutional, and community sources. Addressing the stressors requires having complex and difficult discussions (Blanchett, Klingner, & Harry, 2009; Wallerstein, Yen, & Syme, 2011). Clinicians may need training in the skills required to discuss larger social issues or to provide advocacy in situations involving injustice. These conversations often raise moral issues, including fundamental concerns about fairness and belonging. Affirmation of shared values can be a critical component of these discussions. But sharing one's own thoughts, feelings, and values can run counter to many types of clinical training. These interventions may require skills in alliance building and intervention different from those commonly deployed in psychology training programs.

Clinicians who have experienced social disadvantage and discrimination may find their own concerns and pain are evoked by the client's discussion. Clinicians who come from different racial or social backgrounds may find discussing unjust social circumstances disturbing and disorienting. They may find it difficult to challenge their own assumptions about fairness and justice, and these difficulties may erode the therapeutic alliance (Bron-dolo & Jean-Pierre, 2014). Discussion about race and injustice may require clinicians to make additional efforts to care for themselves. APA Ethics Code 2.06 requires psychologists to attend to personal problems that may interfere with their ability to adequately perform their professional responsibilities.

RECOMMENDATION 6

Improve the capacity of psychology training programs to train clinicians to discuss and address the effects of inequality and injustice on individual health. Training may also be required to help clinicians maintain a therapeutic alliance in cross-race or cross-class situations when issues related to disadvantage or injustice emerge. Training may also be needed to help psychologists work collaboratively with other professionals who work with clients to address systemic stressors both on the individual and collective levels (e.g., social workers, housing officials, medical staff). Training may be needed to help psychologists facilitate cross-race/cross-SES communication among community members to support collective problem solving. Similar training may be needed to help clinicians work on site in a variety of venues, including health care, education, and housing, to improve communication between residents and institutional staff members. Different interpersonal, cognitive, and behavioral skills are required to develop collaborative efforts, and specialized training in these communication and consultation strategies may be needed.

RECOMMENDATION 7

Provide graduate and continuing education training to all psychologists and other health care providers working with racial/ethnic and low-SES populations to ensure that they are highly competent and skilled in approaches that have been proven to be the most effective in attending to minority and culture-related stress. Training in self-care may also be needed. As the body of research on disparities, stress mechanisms, and health becomes increasingly established, web-based continuing education approaches may be more feasible and useful.

RECOMMENDATION 8

Integrate multidisciplinary work (e.g., from the perspectives of organizational psychology, sociology, anthropology, and other disciplines) to develop strategies for improving collaboration and problem solving among diverse groups. The bulk of the research suggests that contact with and exposure to members of other groups is an effective method for improving understanding, but more research is needed to maximize the benefits of this contact (Abrams, 2010). In practice, experiential exercises can facilitate communication and collaboration. Insights from social cognitive theory have been applied to improving medical education and can be more widely incorporated into medical training (Burgess et al., 2007).

PUBLIC AWARENESS

Disparities in both stress and health may not be visible to those who have more advantages or have relatively limited direct contact with racial or ethnic minority individuals or those with low SES. Efforts to communicate a broader understanding of the ways in which the antecedents of stress exposure (e.g., factors related to the political process, the social and physical environment, and racial bias) contribute to health disparities are needed. A well-informed community is critical to improving the health of racial/ethnic and poor communities. Individuals can make a difference in their everyday lives, and they can communicate their concerns to their leaders. Greater efforts to learn from and communicate with more rural or isolated communities may be particularly critical. As we recommend efforts to increase public and community awareness, we adopt a broad definition of community to include family, peers, teachers, religious leaders, schools, the media, civic associations, community groups, fraternities and sororities, and employers.

RECOMMENDATION 9

Partner with community-based organizations and other professional organizations to plan strategic collaborative efforts to disseminate information on stress, stress disparities, and their implications for health. Public education programs may benefit from collaboration with national organizations (e.g., the Boys and Girls Club, YMCA). Collaboration with state, provincial, and territorial psychological associations (SPTAs) is recommended. SPTA committees on public education in psychology could be used to promote public education on stress and health disparities. Partnership with and dissemination of this information to teachers of psychology in secondary schools could ensure that public education about stress and health disparities begins in secondary schools.

RECOMMENDATION 10

Develop and support a media campaign to help the public, policymakers, clinicians, communities, and individuals understand stressors and their impact on health priority populations. Continued efforts to produce materials disseminating information and recommendations about health disparities would be beneficial. Explicitly address the stress-inducing implications of persistent exposure to implicit biases, microaggressions, racism/discrimination, and classism. Continued efforts to disseminate information via the APA website would be useful. For example, APA's website includes materials such as "Fact Sheet: Health Disparities and Stress" (<http://www.apa.org/topics/health-disparities/fact-sheet-stress.aspx>) and "Physiological & Psychological Impact of Racism and Discrimination for African-Americans" (<http://www.apa.org/pi/oema/resources/ethnicity-health/racism-stress.aspx>). Additional materials and an effort to continually update resources as new findings become available would be an important goal.

POLICY

There are substantial disparities in access to the social, educational, and material resources that enable individuals to mitigate threat exposure and reduce the effects of stress on health. Resources are necessary to provide individuals with the experiences and skill-building activities that can promote self-efficacy and positive relational schemas. These resources are also critical to the development of cognitive control capacities required to develop the self-regulatory skills necessary for health promotion. Racial and SES disparities in health are also the result of long-term inequities in access to appropriate, quality care. Advocacy is needed to support programs that can match specific resources to the individuals and communities in need to reduce health disparities.

To leverage social and material resources to provide the maximum benefit, research is needed to understand the type and intensity of interventions that effectively prevent threat exposure and increase personal and community resources and decrease health disparities. Comprehensive evaluation programs are needed to understand the risks and benefits of stress reduction interventions at all levels. Barriers to health care access need to be identified and removed, as health care equity also relies to a great degree on having policies in place that require that quality care is available and accessible to all. Strong advocacy is needed to ensure that the social, educational, and health needs of racial/ethnic and low-SES populations are a priority agenda item (within APA and with policymakers) and to keep key political stakeholders aware of the impact of stress on their long-term health and quality of life.

RECOMMENDATION 11

Advocate for the research funding needed to identify the antecedents and consequences of disparities in stress exposures and to develop and evaluate stress reduction interventions for health disparity populations. Advocacy is needed to support research to identify key targets for interventions in different health priority populations. Mechanistic research can identify the factors that trigger or maintain stress in different populations and can help optimize the benefits of intervention efforts. Advocacy is needed for research funds to permit high-quality evaluation of a full range of outcomes (e.g., genetic, psychological, interpersonal, economic) of existing stress prevention and reduction interventions at the individual, family, and community levels. More extensive evaluations can help identify benefits and costs to interventions to enable safer and more effective implementation.

RECOMMENDATION 12

Advocate for increased access to high-quality and evidence-informed programs to manage stress. Funds are needed to improve training for health care personnel and develop new programs capable of addressing the stress management needs of diverse groups. It is critical to support efforts to increase access to evidence-informed health care for all.

GLOSSARY

Acute stressor. Stressor involving a brief, time-limited exposure.

Allostatic load. The stress responses across many parts of the major body systems—particularly over the long term.

Appraisal. The evaluation of the salience of an experience and calculation of whether the experience is a threat or a challenge to be overcome.

Approach. A process that involves advancement toward a certain outcome.

Audit study. A study that matches individuals on all observable characteristics except for the characteristic thought to be the target for discrimination.

Avoidance. The act of withdrawing or refraining from engaging in an activity.

Cancer. A serious disease due to one or more tumors in a part or parts of the body due to the uninhibited division of abnormal cells.

Cardiovascular diseases (CVD). Conditions of the heart that often involve diseased or blocked blood vessels. Such diseases include stroke and coronary heart disease.

Chronic stressor. Stressor involving a persistent and pervasive exposure to stressful event sequences.

Cognitive control processes. The facets of working memory and executive function involved in regulating attention, shifting perspective, and integrating and organizing information.

Cortisol. Steroid hormone produced by the body.

Cultural discrimination. The dissemination of attitudes about the relative rights, privileges, and status that should be afforded to different groups.

Daily stressors/hassles. Routine demands that tax coping resources (e.g., being stuck in traffic).

Depression. Serious mood disorder that contributes negatively to an individual's well-being and a risk factor for stress and health issues.

Diabetes. A disease in which the individual's biological functions are unable to produce any or enough of the hormone insulin, which results in high levels of sugar or glucose in the blood.

Emotional demands. Demands in regard to emotions or emotional reaction management.

Epigenetic changes. Changes triggered by stress that alter cell-to-cell signaling, permitting very rapid changes in biological and physiological responses across systems.

Ethnicity/race. Refers to various groupings of individuals based on race or culture of origin.

Financial demands. Demands that involve monetary burdens.

Goal orientation. The degree to which individuals are motivated to achieve/work toward a focused objective.

Health disparities. Health outcomes closely linked with social, economic, and/or environmental disadvantage.

Health inequities. Unnecessary and avoidable circumstances that are “shaped by the distribution of money, power and resources at global, national and local levels” (WHO, 2013, para. 1) and determine people's risk of illness and the actions taken to prevent them becoming ill or treat illness when it occurs.

Historical traumatic events. Stressors such as slavery, genocide, overt and severe discrimination, or resettlement, particularly salient for members of ethnic/racial or sexual minority groups.

Hypertension. High blood pressure.

Institutional discrimination. Specific policies and/or procedures of institutions (governments, churches, schools, etc.) that consistently result in unequal treatment for particular groups.

Intellectual demands. Demands associated with mental abilities.

Interpersonal demands. Demands in regard to relationships between people.

Interpersonal discrimination. “Directly perceived discriminatory interactions between individuals whether in their institutional roles or as public and private individuals” (Krieger, 1999, p. 301).

Network stress. Stress experienced as a function of nontraumatic events that occur to family or friends.

Physical demands. Demands that must be met in regard to the physical environment.

Racial animus. Intensely negative and visceral attitudes toward Black Americans.

Racial discrimination. “The beliefs, attitudes, institutional arrangements, and acts that tend to denigrate individuals or groups because of their phenotypic characteristics or ethnic group affiliation” (R. Clark et al., 1999, p. 805).

Resources. A supply of tangible or intangible assets that are used when available (such as money). Can be classified as either internal resources (e.g., biological and psychological characteristics and functioning) or external resources (e.g., access to material and social assets).

Schemas. Mental structures and processes that reflect and influence the ways in which individuals think, feel, act, and modulate their physiological responses to stress exposure.

Self-esteem. The confidence or respect one has in one's own worth or capabilities.

Social capital. The interpersonal skills and social networks at the individual, family, and community levels.

Social cognition. The mental structures and processes that mediate the interpretation of and responses to the social world as well as influence individuals' appraisals of events, their choice of goals, the motivation and ability to achieve these goals, and their psychophysiological and behavioral responses to stress.

Social exclusion. The denial of individuals' rights, opportunities, and resources that are normally available to members of a different group.

Socioeconomic status (SES). The combined economic and sociological measure of an individual's social standing, gauged through education, income, and occupation.

Stress. The experience resulting from facing a stressor.

Stress clustering. The magnification of an individual stress due to stressful events occurring together.

Stress response/physiological reactivity. A reaction of a physiological nature that transpires in response to situational information.

Stressful event sequences. A series of stressful events that occur over a period of time following an initiating event.

Stressor/demand. A situation or one's perception of the situation as presenting demands that exceed one's available resources to cope with the demand.

Technical demands. Demands based on standards/abilities and knowledge to accomplish tasks.

Vicarious/secondary trauma. Stress experienced in response to trauma to a member of one's close social network or as a function of exposure in the workplace.

World Health Organization (WHO). A specialized branch of the United Nations that focuses on international public health.

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