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Discrimination and racial disparities in health: evidence and needed research

David R. Williams^{1,2} and Selina A. Mohammed³

David R. Williams: dwilliam@hsph.harvard.edu; Selina A. Mohammed:

¹ Department of Society, Human Development and Health, Harvard School of Public Health, 677 Huntington Avenue, 6th Floor, Boston, MA 02115, USA

² Departments of African and African American Studies and Sociology, Harvard University, Cambridge, MA, USA

³ Nursing Program, University of Washington Bothell, Bothell, WA, USA

Abstract

This paper provides a review and critique of empirical research on perceived discrimination and health. The patterns of racial disparities in health suggest that there are multiple ways by which racism can affect health. Perceived discrimination is one such pathway and the paper reviews the published research on discrimination and health that appeared in PubMed between 2005 and 2007. This recent research continues to document an inverse association between discrimination and health. This pattern is now evident in a wider range of contexts and for a broader array of outcomes. Advancing our understanding of the relationship between perceived discrimination and health will require more attention to situating discrimination within the context of other health-relevant aspects of racism, measuring it comprehensively and accurately, assessing its stressful dimensions, and identifying the mechanisms that link discrimination to health.

Keywords

Racism; Discrimination; Stress; Health disparities; Race; Ethnicity

This paper will provide an overview of the current evidence for and needed research on the role of perceived discrimination in health. It seeks to situate the research on personal experiences of discrimination within the larger literature on racism and health. It begins by describing some salient patterns in the large and persistent racial/ethnic variations in health that have provided an impetus to better understand the role of racism in health. It centrally focuses on recent research on perceived discrimination and health. It critiques the existing literature with an eye toward highlighting the needed improvements in the conceptualization and measurement of perceived discrimination that would advance our understanding of the potential role of race-related stressors in health.

Disparities and the added burden of race

Racial disparities in health in the U.S. are large and pervasive. For most of the 15 leading causes of death including heart disease, cancer, stroke, diabetes, kidney disease, hypertension, liver cirrhosis and homicide, African Americans (or blacks) have higher death rates than whites (Kung et al. 2008). These elevated death rates exist across the life-course with African

Americans and American Indians having higher age-specific mortality rates than whites from birth through the retirement years (Williams 2005). Other data indicate that almost 100,000 black persons die prematurely each year who would not die if there were no racial disparities in health (Levine et al. 2001). Another noteworthy characteristic of racial disparities is their persistence over time. Despite gains in life expectancy for both blacks and whites, the 7 year racial gap in life expectancy in 1960 was still 5.1 years in 2005 (National Center for Health Statistics (2007). Similarly, although infant mortality has declined over time for both blacks and whites, the relative gap between the races is much wider today than it was in 1950 (Williams and Jackson 2005; NCHS 2007). For some health outcomes, the disparities are worsening. Trend data for heart disease and cancer—the two leading causes of death in the United States—indicate that blacks and whites had comparable death rates for these conditions in 1950, but African Americans now have higher mortality rates than whites (Williams and Jackson 2005; NCHS 2007).

Research also reveals that pathogenic factors linked to race continue to affect health even when socioeconomic status (SES) is controlled. In national data there are residual racial differences in health at every level of SES for multiple indicators of health status, including self-rated health, heart disease mortality, hypertension and obesity (Pamuk et al. 1998). This pattern exists for a broad range of other outcomes. A striking example comes from national data on infant mortality by mothers' education for all women age 20 years and older. African American women with a college degree or more education have a higher rate of infant mortality than white, Hispanic (or Latino), and Asian and Pacific Islander women who have not completed high school (Pamuk et al. 1998). Further evidence of the markedly elevated disease risk for African Americans comes from national data on chronic disease risk factors for blacks, whites and Hispanics age 40 and over (Crimmins et al. 2007). This study assessed indicators of blood pressure risk (systolic, diastolic, and pulse rate), inflammation risk (C-reactive protein, fibrinogen, albumin) and metabolic risk (total cholesterol, HDL cholesterol, BMI and glycated hemoglobin). A summary indicator of total risk counted how many of these 10 risk factors were outside of the normal range. This study found that even after adjustment for income, education, gender and age, blacks had higher scores on blood pressure, inflammation, and total risk. Importantly, blacks maintained a higher risk profile even after adjusting for health behaviors (smoking, poor diet, physical activity and access to care).

These data suggest that there are added factors linked to racial status that adversely affect the health of disadvantaged minority populations in the United States. In seeking to understand these striking burdens of race, researchers are pursuing three lines of inquiry. First, the measures of SES are not equivalent across race. For example, compared to whites, college-educated blacks are more likely to experience unemployment, employed blacks are more likely to be exposed to occupational hazards and carcinogens even after adjusting for job experience and education, blacks have lower wealth at every level of income, and have less purchasing power because the costs of a broad range of goods and services are higher in Black communities (Kaufman et al. 1997; Williams and Collins 1995). Second, there is increasing attention to the need to capture exposure to health risks over the life course. Racial/ethnic differences in childhood SES and early life psychosocial and economic adversity are likely to be important contributors to racial disparities in adult health. Third, researchers are exploring the multiple ways by which racism can adversely affect health (Jones 2000; Williams 2004; Ahmed et al. 2007).

Perceived discrimination as a stressor

The term, racism, refers to an organized system that categorizes population groups into 'races', and uses this ranking to preferentially allocate societal goods and resources to groups regarded as superior (Bonilla-Silva 1996). Fundamental to racism is cultural racism that undergirds an

ideology of inferiority that ranks some racial groups as inherently or culturally superior to others and supports the social norms and institutions that implement this ideology (Jones 1997). Racism often leads to the development of negative attitudes and beliefs toward racial outgroups (prejudice), and differential treatment of members of these groups by both individuals and social institutions (discrimination). Importantly, because racism is deeply embedded in the culture and institutions of society, discrimination can persist in institutional structures and policies even in the context of marked declines in individual level racial prejudice and discrimination. Moreover, negative racial stereotypes that are deeply rooted in mainstream culture can serve as an additional source of discriminatory behavior even among persons who may not be prejudiced. Considerable scientific evidence indicates that discrimination persists in multiple contexts of American society including housing, labor markets, criminal justice and education (Blank et al. 2004; Fix and Struyk 1993). Targets of discrimination are aware of some of the discriminatory behavior directed at them and these perceptions of unfair treatment can generate stress (Clark et al. 1999).

Perceived racial or ethnic discrimination is one aspect of racism that is increasingly receiving empirical attention as a class of stressors that could have consequences for health and for understanding disparities in health. This is consistent with broader interest in the role of stress as a determinant of social disparities in health (Pearlin et al. 2005). Stress appears to accelerate cellular aging (Epel et al. 2006) and the chronic stressors triggered by multiple environmental assaults can lead to wear and tear on the body that can dysregulate multiple biological systems and lead to premature illness and mortality (Seeman et al. 2004). A word about terminology—in this paper, we use the terms discrimination, perceived discrimination, interpersonal discrimination and self reported discrimination interchangeably. We also use the term racial discrimination to refer to both racial and ethnic discrimination.

Prior reviews of the early research on discrimination and health have found an inverse association between discrimination and morbidity (Williams et al. 2003; Krieger 1999). Mental health status was the most frequently used health outcome and other self-reported indicators of health were widely used. Most early studies were U.S.-based and cross-sectional in design. To assess the current state of the empirical evidence on discrimination and health, we conducted a systematic review of the PubMed database to update the recent review by Paradies (2006) which covered the period of 2000–2004. We used the search terms racism, racial discrimination, race and discrimination, perceived discrimination, prejudice, racial prejudice, racialized prejudice, race discrimination, racialized discrimination, ethnic discrimination, social discrimination, racialized and racialization to identify relevant studies published between 2005 and 2007. Our search initially yielded 5,107 articles. These articles or their abstracts were individually reviewed to select only those published during the three year period 2005–2007 (epubs for 2008 publications were excluded), that empirically examined the association between a measure of perceived discrimination and an indicator of health status or healthcare utilization. One hundred and fifteen papers met our criteria (Table 1). We acknowledge that focusing only on PubMed does not provide a comprehensive picture of all of the published research on this topic since the work of some social scientists is not included in this database. It nonetheless serves to illustrate the growing scientific interest in this subject.

Trends in the recent literature

Studies of mental health continue to dominate the discrimination and health literature. Forty-seven studies are listed under the mental health category in Table 1 but several other articles that included a mental health measure are listed under the other summary categories because multiple indicators of health were utilized. A broad range of mental health outcomes has been examined in recent papers. These include studies that have examined the relationship between discrimination and schizophrenia among ethnic minorities in the Netherlands (Veling et al.

2007), burn-out in U.S. medical students (Dyrbye et al. 2007), daily moods among multi-ethnic U.S. adults (Broudy et al. 2007), cognitive impairment among black and white university students (Salvatore and Shelton 2007), and current rates of psychiatric disorders in a national sample of Asian Americans (Gee et al. 2007b). Discrimination has also been associated with homesickness among college students (Poyrazli and Lopez 2007) and conduct problems among adolescents (Brody et al. 2006). Other recent research has related perceived discrimination to multiple forms of violence (Choi et al. 2006). These include intimate partner violence (Waltermaurer et al. 2006) and violence among adolescents (Simons et al. 2006). Almost without exception, studies of discrimination and mental health find that higher levels of discrimination are associated with poorer mental health status. At the same time, almost all studies are cross-sectional leaving open the possibility that perceptions of discrimination are a consequence of mental health status. It is therefore noteworthy that the few published prospective studies (Brody et al. 2006; Greene et al. 2006; Simons et al. 2006; Schulz et al. 2006b), have found that there is a positive association between perceived discrimination and changes in mental health symptoms. This pattern is consistent with one earlier national study of African Americans which found that baseline depression and depressive symptoms were not associated with subsequent reports of discrimination (Brown et al. 2000).

There has long been interest in the relationship between discrimination and blood pressure (Williams and Neighbors 2001; Brondolo et al. 2003), as well as, cardiovascular disease more broadly (Wyatt et al. 2003). Table 1 lists eight recent studies that use laboratory experiments to expose individuals to analogues of racist events. The studies of cardiovascular reactivity find that acute experiences of stress continue to be related to increases in blood pressure reactivity in the laboratory setting. However, our understanding of the relationship between exposure to discrimination and the sustained elevation of blood pressure remains elusive. In recent studies, the patterns remain complex and unclear. While one study found a U-shaped association between discrimination and systolic blood pressure among Latinos and African Americans in New Hampshire (Ryan et al. 2006), some other studies have not found an association between perceived discrimination and blood pressure. This includes analyses of 3,300 middle-aged women in the MESA study (Brown et al. 2006). In a study of black and white adolescents, unfair treatment attributed to race was unrelated to ambulatory blood pressure, but unfair treatment due to physical appearance was (Matthews et al. 2005). Table 1 uses the term “conditional association” to indicate the absence of an association between discrimination and health in the overall sample, but with the existence of an association only for some sub-group. This pattern dominates the recent studies of discrimination and blood pressure. In analyses of 2,316 cases of incident hypertension in the Black Women’s Health Study (BWHS, Cozier et al. 2006), although discrimination was unrelated to incident hypertension in the total sample, it was positively related among women born outside of the U.S. In the Metro Atlanta Heart Disease Study, although discrimination was unrelated to blood pressure, high levels of stress due to discrimination were predictive of increased hypertension risk (Davis et al. 2005). Moreover, some of the conditional findings are counterintuitive. For example, in studies of black adolescents, discrimination was inversely related to blood pressure only among those who responded to discrimination with a passive coping style (Clark and Gochett 2006) or among those who were low on trait anger (Clark 2006a).

A broad range of physical health outcomes have been considered in the 21 recent studies listed in Table 1. Several large cross-sectional studies have found a positive association between discrimination and chronic health conditions or other self-reported indicators of ill-health. These include a national study of Asian Americans (Gee et al. 2007a), a study of Filipino Americans in San Francisco and Hawaii (Gee et al. 2006a), an African American sample in the CARDIA study (Borrell et al. 2006), and a national study in New Zealand (Harris et al. 2006b). In the New Zealand study a dose–response relationship was observed between perceived discrimination and each of the five indicators of health: self-rated health, physical

functioning, mental health, cigarette smoking, and self-reported cardiovascular disease (Harris et al. 2006b) Other cross-sectional studies have found self-reported discrimination related to abdominal fat (Vines et al. 2007), hemoglobin A1c (Piette et al. 2006), poorer sexual functioning (Zamboni and Crawford 2007), nutritional risk among Black men (Locher et al. 2005) less stage 4 sleep (i.e., “deep,” or slow-wave sleep) and physical fatigue (Thomas et al. 2006). Longitudinal analyses of the large cohort of the BWHS have found a positive association between discrimination and the incidence of uterine myomas (fibroids) (Wise et al. 2007) and the incidence of breast cancer (Taylor et al. 2007). Other prospective analyses indicate that perceived discrimination predicts coronary artery calcification (Lewis et al. 2006) and changes in self-rated health (Schulz et al. 2006a).

Table 1 list 19 studies that have examined the extent to which reported experiences of discrimination can shape health care seeking and adherence behaviors. Some studies have focused on perceived discrimination in general while others have attended to perceptions of bias within the health care context. While perceptions of racism were unrelated to delayed seeking of treatment in a small study of African Americans with an acute myocardial infarction (Banks and Dracup 2006), it has been associated with delays or failure to seek treatment for less severe conditions in the U.S. (Facione and Facione 2007; Van Houtven et al. 2005; Wagner and Abbott 2007; Casagrande et al. 2007) and Sweden (Wamala et al. 2007a). However, the findings have not been uniform with discrimination unrelated to cancer screening (Dailey et al. 2007; Hoyo et al. 2005) and the use of preventive care (Fowler-Brown et al. 2006) in some studies. Perceived discrimination has also been associated with the failure to seek preventative services such as cholesterol testing, hemoglobin A1c testing and eye exams for diabetes and flu shots (Trivedi and Ayanian 2006) and the use of alternative care instead of conventional care (Bazargan et al. 2005). Several studies have also found an inverse association between discrimination and satisfaction with care among African Americans and Whites (Benkert et al. 2006; Fowler-Brown et al. 2006) and Korean Americans (Jang et al. 2005).

Earlier research had also indicated an association between discrimination and cigarette smoking and alcohol use. Recent studies reveal that perceived discrimination is associated with an increased risk of multiple substances, such as marijuana, inhalants and cocaine among middle school students (Choi et al. 2006). In the CARDIA study of young adults, discrimination was associated with marijuana, tobacco and alcohol use, but not cocaine use, among black but not white participants (Borrell et al. 2006). Similarly, both chronic and acute racial discrimination were associated with prescription drug use, illicit drug use and alcohol dependence among Filipino adults in San Francisco and Honolulu (Gee et al. 2007a). Other U.S. studies continue to find positive associations between discrimination and tobacco (Landrine et al. 2006; Krieger et al. 2005; Bennett et al. 2005) and alcohol use (Terrell et al. 2006). Studies from South Africa also find that perceived discrimination is positively associated with cigarette smoking (Brook et al. 2006b) and HIV risk behavior (Kalichman et al. 2006).

Another striking pattern in the current research is the broader range of contexts that have been considered. The earliest studies of discrimination and health disproportionately focused on the African American population. Recent studies have included all of the other racial/ethnic populations in the U.S. with several studies focusing on Asian American populations (Gee et al. 2006a, 2007a, b, c; Lam 2007; Jang et al. 2005). In recent years, studies have also utilized national samples in New Zealand (Harris et al. 2006a, b) and Sweden (Wamala et al. 2007a). Studies from Australia continue to examine the association between discrimination and Aboriginal health (Larson et al. 2007) and studies from the U.K. have examined discrimination and health among African-Caribbean, Bangladeshi, and White adults (Wadsworth et al. 2007), British Muslims (Sheridan 2006), minority ethnic teachers (Miller and Travers 2005); and multiple ethnic immigrant adults (Bhui et al. 2005; Karlsen et al. 2005). Two studies from

South Africa have also examined discrimination in relation to adolescent risk behaviors (Brook et al. 2006b; Kalichman et al. 2006). Studies in Norway (Oppedal et al. 2005), Denmark (Montgomery and Foldspang 2007), the Netherlands (Veling et al. 2007; Stevens et al. 2005a), Spain (Pantzer et al. 2006), Bosnia, Croatia and Austria (Sujoldzic et al. 2006), Hong Kong (Lam et al. 2005) and Canada (Beiser and Hou 2006; Noh et al. 2007; Etowa et al. 2007) have examined the association between perceived discrimination and health for multiple immigrant groups.

It is also noteworthy that very few studies explicitly examine the role of discrimination in accounting for racial disparities in health. Some early studies provided evidence that discrimination makes an incremental contribution to SES in explaining disparities (Williams et al. 2003). A few recent studies find that perceived discrimination accounts for some of the racial disparities in health. This is evident for Maori-European disparities on four indicators of self-reported health in a national study of New Zealand (Harris et al. 2006a), Aboriginal–non Aboriginal variations in self-reported physical and mental health in Australia (Larson et al. 2007), and in U.S. studies for black-white differences in health care trust (Adegbembo et al. 2006), sleep quality and physical fatigue (Thomas et al. 2006) and Hispanic-white differences in PTSD symptoms (Pole et al. 2005).

There has also been concern regarding the extent to which subjective reports of discrimination are independent of other psychological characteristics. Three recent studies found that the association between discrimination and health remained robust after adjustment for social desirability bias (Gee et al. 2007b; Krieger et al. 2005; Pole et al. 2005). In addition, in a study of Latino and African American adults, Brondolo et al. (2005) found that the association between discrimination and negative emotions was independent of cynical hostility and positive and negative affect, while a study of multiethnic adults found that the relationship between perceived discrimination and mood was independent of trait anxiety, social desirability and cynical hostility (Broudy et al. 2007). A study of black, white and Bangladeshi adults in the UK found an association between discrimination and psychological distress after adjustment for negative affect (Wadsworth et al. 2007).

Research challenges

As evidence continues to mount suggesting that perceived discrimination is a risk factor for multiple health outcomes, there is increasing scientific interest in this area of research. For some, this has led to the routine, mechanical and a-theoretical addition of a discrimination scale to health studies without adequate thought regarding either the assessment of discrimination or the underlying mechanisms and processes by which discrimination would be presumed to affect health. We believe that the time has come for careful re-assessment of our current approaches to the study of discrimination and health with an eye toward investing in what is needed to improve our scientific understanding of this phenomenon and its health consequences. Perceived discrimination is a psychosocial stressor and there is much that can be learned from the larger literature on stress to advance the study of discrimination and health (Williams et al. 2003). Enhancing our understanding of discrimination and health will require more systematic attention to comprehensively and accurately measuring discrimination, assessing how it combines with other aspects of racism and other stressors to affect health and paying greater attention to the underlying pathways by which discrimination can affect health.

Measuring perceived discrimination comprehensively

There is no consensus on an optimal measure of perceived discrimination. A recent review evaluated 34 different measures of perceived discrimination (Kressin et al. 2008), but the current conceptualization and assessment of discrimination is limited. Recent studies of perceived discrimination and health tend to capture two domains of stressors, daily hassles and

life events. The most widely used measure in recent studies reviewed is the Everyday Discrimination Scale (Williams et al. 1997). The scale has several attractive features, including its brevity, good psychometric properties (Krieger et al. 2005), and its use in multiple racial/ethnic populations in the U.S. and its increasing use in international contexts such as South Africa (Williams et al. 2008). The scale attempts to capture aspects of interpersonal discrimination that are chronic or episodic but generally minor, somewhat analogous to the assessment of daily hassles in the stress literature. A few studies use it in conjunction with other indicators of discrimination but it is often used as the only measure of discrimination. Another very useful approach to capturing ongoing discrimination is the diary approach of Brondolo and her colleagues (Brondolo et al. 2005, 2008a, b; Broudy et al. 2007). However, there is a need for greater awareness that measures like the Everyday Discrimination Scale capture an important, but limited aspect of the phenomenon of self-reported discrimination.

Discriminatory experiences that are acute and observable and are analogous to life events in the stress literature are captured by many of the other commonly used measures of discrimination in recent studies. These include the Experiences of Discrimination scale (Krieger 1990), the Schedule of Racist Events (Landrine and Klonoff 1996), the Major Experiences of Discrimination scale (Williams et al. 1997; Kessler et al. 1999); the Racism and Life Experiences Scale (Harrell 1997), and the Index of Race-Related Stress (Utsey and Ponterotto 1996). Prior research has shown that failure to assess stress comprehensively leads to an underestimation of the effects of stress on health (Turner et al. 1995). The current assessment of discrimination tends to neglect the measurement of chronic stressors in major domains of life such as work. Chronic stressors refers to experiences that provide persistent negative exposure to threat or excessive demand (Baum et al. 1993). The stress literature indicates that although chronic stressors are difficult to measure, they are stronger predictors of the onset and course of the disease than acute life events (Cohen et al. 1995). It is noteworthy that capturing chronic exposure to discrimination over time, as assessed by the Everyday Discrimination Scale, was associated with subclinical cardiovascular disease (Lewis et al. 2006). The Perceived Racism Scale (McNeilly et al. 1996) captures some aspects of chronic discrimination but more effort is needed to comprehensively characterize chronic and ongoing experiences of discrimination, especially its multiple dimensions in the domain of work, a major site of discriminatory experiences in contemporary society.

Traumas are a class of stressful experiences that can have long-lasting negative effects on health (Stam 2007; Pearlin et al. 2005), that have been neglected in the discrimination literature. Traumas are distinct from life events in that they capture events that are extreme, overwhelming and horrific in impact. It is likely that traumatic experiences are reported on some of the life events-like measures of discrimination but inadequate detail is ascertained to distinguish them from less severe experiences. Carter (2007) has emphasized the importance of assessing race-based traumatic experiences as distinct from major experiences of discrimination. He argues that because there is likely to be intense emotional reaction to these severe, life threatening or dangerous experiences, they have great potential for psychological injury.

The stress literature has also recognized macro-stressors as one component of stressor exposure. These are large-scale system-related stressors such as economic recessions or natural disasters. They provide indirect exposure to stressors, that can have “collateral effects” on individuals (Yehuda et al. 2005). Research reveals that events such as earthquakes, terrorist attacks and the onset of war can trigger increases in acute symptoms of heart disease, increased hospital admissions and heart disease mortality (Bhattacharyya and Steptoe 2007). Highly publicized race-related traumatic events, such as extreme examples of police brutality could have similar effects. Some of the items on the Index of Race-Related Stress (such as references to racial abuses of the Jim Crow era) capture aspects of macro-stressors (Utsey and Ponterotto 1996) but comprehensively assessing the potential contribution of large-scale, race-related

traumatic events will require researchers to capitalize on emergent opportunities to assess the health consequences of macro-stressors. Such efforts could utilize some of the strategies used in the larger stress literature such as creatively using hospital admissions and vital statistics data. Future research needs to identify the extent to which major race-related stressors can initiate new disease processes or exacerbate existing disease. There is no agreement in the stress literature on the length of time from the emotional trigger from a macro-stressor to the onset of symptoms. However, some research suggests that cardiac mortality tends to be elevated for at least 6 months post-bereavement (Bhattacharyya and Steptoe 2007).

Researchers should also be alert to the possibility that macro-stressors that are ostensibly unrelated to race or ethnicity, can be racialized in ways that can generate increased discrimination for socially stigmatized groups. The terrorist attacks on 11 September 2001 are an example. These incidents had documented negative health consequences (DiMaggio et al. 2007), but they also triggered increased discrimination and harassment targeted to Arab Americans in the 6 months after the terrorist attacks (Lauderdale 2006). Lauderdale (2006) found that Arab American women in California had an increase in the rate of low birth weight and pre-term birth in the 6 months after September 11 compared to the 6 months before. Other women in California did not experience a change in birth outcome risk post September 11.

Assessing exposure to racial discrimination in its full complexity also requires attention to capturing the effects of discrimination on others and the potential intergenerational effects of racism. Few measures of discrimination ask questions about experiences of discrimination that occurred in the lives of family members and close friends of the respondent (Kressin et al. 2008). In contrast, the stress literature has long noted that vicarious experiences of stress can also adversely affect the individual (Cohen et al. 1995). One recent study found that the father's experience of workplace discrimination was positively associated with his depressive symptoms, as well as, those of his family members (Crouter et al. 2006). Recent research on the effects of historical trauma on the health of American Indians illustrates the importance of assessing this dimension of racism (Whitbeck et al. 2004; Brave Heart 2003; Brave Heart and DeBruyn 1998). The term historical trauma refers to the cumulative psychological wounding of an individual and his/her group due to the history of genocide and other atrocities that American Indians and other indigenous people experienced from European colonizers. The explicit attempt is to capture such exposure over the life-span of the individual and across generations. Research highlights the importance of assessing not only the actual experiences, but also the role that traumatic reminders of these experiences can play (Stam 2007). Assessment instruments with good psychometric properties have been developed to assess historical trauma and have found, for example, that some 50% of American Indians think regularly about these historical losses (Whitbeck et al. 2004). Empirical studies have also linked exposure to historical trauma to multiple health outcomes. This research is similar to studies of other generational group traumas, including studies of the health consequences of the Jewish Holocaust on survivors and their descendants. The assessment of these traumas in future research should be expanded to include other race-specific experiences such as the historic brutal lynchings of blacks and the internment and re-location of Japanese Americans during the Second World War.

Measuring discrimination accurately

Enhancing our understanding of discrimination and health will also require greater attention to identifying strategies to address the limitations of the currently used measures. Problems that have been identified with the reliability and validity of traditional life event scales also apply to most measures of discrimination (Monroe 2008). These problems include unreliability of recall, recall bias, criterion validity and construct validity have (Dohrenwend 2006). It is important to capture exposure to discrimination over the life course and the most common time

frame for the assessment of discrimination is lifetime exposure (Kressin et al. 2008). This is appropriate given the goal of capturing cumulative exposure over the life course. However, problems linked to recall are more severe when the recall period of stressors is longer and when the data are gathered from retrospective reports. Of particular concern are some studies of PTSD that suggest that recall bias can lead to an overestimation of a dose-responsive relationship between exposure and outcome (Dohrenwend 2006). Current mood affects memory retrieval and both depressed and PTSD patients have impaired retrieval in terms of memory (Harvey and Bryant 2002). A study of motor vehicle accident victims who provided symptoms one month after the incident and were asked to recall those symptoms two years later found that the severity of the stress and injury and the trajectory of recovery can lead to over reporting or under-reporting of symptoms (Harvey and Bryant 2000). While the majority correctly recalled most of the symptom clusters, persons with few symptoms two years later tended to omit symptoms that they had reported in the acute phase of the disease, and persons with high levels of symptoms at the two year interview were more likely to recall the presence of acute symptoms that they had not reported in the initial assessment.

Research reveals that severe events are recalled better than less severe events (Monroe 2008), so to the extent that the focus is on the assessment of severe discriminatory incidents the recall problem may be somewhat minimized. More importantly, the assessment tools for the assessment of discrimination need to be appropriate to the task. More research is needed on how experiences of racial discrimination are stored in memory and best accessed for recall. In the meantime, research studying lifetime exposure to discrimination should consider using an event history calendar. It is a procedure that has been developed by cognitive psychologists that capitalizes on current scientific understanding of the nature of autobiographical memory to assess experiences over the life course (Belli 1998). More generally, research by cognitive psychologists and survey methodologists provide many insights into how respondents understand, interpret, and respond to questions that would enhance the collection of data on discrimination (Schwarz 2007). We consider a few examples.

The sensitive nature of the topic of race and racial discrimination has implications for how the discrimination variable should be assessed and the accuracy of reports of discrimination (Williams et al. 2003). Recent research on race-of-interviewer effects indicates that blacks are reluctant to reveal their true racial beliefs on race sensitive questions when talking to white interviewers. Instructively, Krysan and Couper (2003) found that the strongest effect of blacks being deferent to a white interviewer was for perceptions of racial discrimination (compared to attitudes on four other categories of race-related questions regarding racial and race-associated policies, black politics and the pace of civil rights). This pattern held both for in-person interviews and for self-administered interviews with a digital video of the interviewer. Irrespective of the race of the interviewer, making race salient in the assessment of discrimination can lead to response bias compared to the use of neutral terminology (Gomez and Trierweiler 2001). Many questions used to assess discrimination explicitly ask respondents to report on “racial discrimination” or experiences of discrimination “because of your race.” In contrast, the approach of Williams and his colleagues (Williams et al. 1997; Kessler et al. 1999) frames the questions about discrimination in terms of unfair treatment and asks about attribution only after a behaviorally descriptive experience, without emotionally charged language, has been endorsed. This approach seeks to address not only the problem of the sensitivity of questions regarding discrimination but also concerns about the problem of attributional ambiguity. Respondents are often uncertain of the reason (or attribution) for a specific interpersonal incident. Thus, building attribution into the question is likely to underestimate discriminatory encounters for which the attribution is uncertain (Williams et al. 2003). Asking questions about both racial and non-racial discrimination may capture more of the potential pathogenic phenomenon of perceived unfairness, and also reduce some of the measurement error that can occur if questions are asked only of racial discrimination. However,

there is debate regarding optimal measurement approaches for perceived racial discrimination (Kressin et al. 2008), and limited empirical evidence on the effects, if any, that building discrimination and racial terminology into the assessment of perceived discrimination has on respondents' willingness and ability to recall and report these experiences.

An unresolved issue in the literature is the extent to which unfair treatment based on race may have effects that are distinctive from other forms of unfair treatment. Because of the centrality of race in American society, the salience of racial identity can affect the appraisal processes of some individuals in ways that could lead race-attributed experiences to be more impactful because they are especially threatening to an individual's sense of rights and opportunities (Pearlin et al. 2005). Some studies have found that perceptions of racial and non-racial discrimination are similarly related to health (Williams et al. 1999; Kessler et al. 1999). Recent neuroimaging research indicates that the experience of unfairness is associated with negative emotional responses and can activate regions of the brain involved with emotional regulation, suggesting that seeking justice and fairness may be a basic human impulse and its violation can trigger physiological consequences (Tabibnia et al. 2008). Accordingly, irrespective of attribution, the perception of unfair treatment may generate distress. For example, in the Whitehall study, perceived unfairness has been related to incident coronary events (De Vogli et al. 2007a), incident psychiatric morbidity (Ferrie et al. 2006), and metabolic syndrome (De Vogli et al. 2007b). These studies were not framed within the context of discrimination but unfairness is operationalized with measures similar to those used in the discrimination literature.

Lewis et al. (2006) recently reported that although Everyday Discrimination attributed to race was unrelated to coronary calcification for black women, a combined measure capturing racial and non-racial discrimination was positively associated with coronary calcification. On the other hand, one study found that black women who attributed chronic discrimination to race demonstrated greater blood pressure reactivity than those who attributed them to other social status categories (Guyl et al. 2001). Future research needs to more systematically assess the extent to which racial discrimination differs in its causes and consequences from other types of discrimination and the extent to which the approach to capturing attribution affects our understanding of the levels and health consequences of racial discrimination. Some limited evidence suggests that racial discrimination as a stressor may differ from other stressors, possibly because its threat may be more systematic, insidious and constant than other stressors (Stetler et al. 2006).

More generally, research on asking sensitive questions in survey research reveals that to the extent that respondents perceive questions regarding discrimination to be socially unacceptable or undesirable, they are likely to underreport those experiences (Tourangeau and Yan 2007). Research reveals that the mode of administration of sensitive questions makes a difference in terms of the response. In particular, the presence of others in the interview context adversely affects accurately collecting complete data. Thus, eliminating the presence of an interviewer by using a self-administered instrument and using "forgiving" or normalizing wording for sensitive questions can be helpful in addressing this issue (Tourangeau and Yan 2007).

Measuring discrimination accurately will also require researchers to not only capture the multiple domains of discrimination but to ensure that adequate questions are asked in each domain. In the assessment of multiple phenomena, survey methodologists find that multiple questions about components of a phenomenon will provide a more accurate level than a few global questions (Schaeffer and Presser 2003). Multiple questions are more likely to clearly convey what is being asked and to yield a more thorough search of memory. For example, researchers have found that population-based reports of alcohol consumption markedly underreport alcohol use compared to data on taxable alcohol available for consumption. However,

assessing alcohol use with detailed, within-location, beverage-specific questions (asking respondents whether they had consumed specific alcoholic beverages, at any of several specific locations and then about how much and how often they drank in each location) accounted for 94% of the taxable alcohol available for consumption compared to the 40–60% with standard alcohol use questions (Casswell et al. 2002). For each class of discriminatory experiences, similar attention should be given to ensuring that all relevant contexts and components are assessed.

A challenge to getting a valid measure of discrimination via self-report is that some individuals cope with stress by denying its occurrence. Studies reveal that among patients with cancer, four to 47% deny the diagnosis, 8–70% deny the impact and 18–42% deny affect (Vos and de Haes 2007). Related constructs include avoidance, distancing, suppression and repressive coping. Denial can reflect conscious or unconscious efforts to minimize the pain of negative experiences. It has been argued that the emotional pain of racism can render some individuals unable to recall specific events (Carter 2007). Vos and de Haes (2007) suggest that denial should be viewed not as a one-time event, but as a process in which there is a continuum from facts to ambiguous events. Accordingly, denial can be a passive escape strategy linked to poorer psychological function, or it can be part of a series of active distractive strategies that are adaptive and lead to lower levels of psychological distress. Getting a clearer sense of the levels and consequences of denial in research on discrimination should be a priority for future research.

One of the most impressive patterns in the recent literature on racial discrimination is the broad range of national contexts in which it has been studied. Undoubtedly, there are some commonalities to the manifestation of discrimination. However, as with other stressors, culture, history and social context can determine the kinds and categories of stressful experiences. As studies of discrimination continue to proliferate across racial, ethnic, cultural, national, and socioeconomic contexts, researchers should ensure that the assessments of discriminatory experiences are appropriate to the specific population group under study. National data for South Africa reveals that levels of chronic Everyday Discrimination and major acute experiences of discrimination are markedly lower than in the U.S. (Williams et al. 2008). It is currently unclear whether this variation reflects national or cultural differences in the levels of discrimination, the discourse about race, the willingness to report experiences of discrimination, the level of social interaction between dominant and non-dominant racial groups, or the applicability of measures of discrimination developed in the U.S. to a different context. Measuring discrimination comprehensively will require more explicit attention to assessing the relevant forms of its manifestation in specific contexts.

Assessing the stressful dimensions of discrimination

An important lesson from the stress literature for researchers studying discrimination is that exposure to most stressful experiences does not lead to illness. The overwhelming majority of persons exposed to even the most severe traumatic life experiences have transient symptoms in response to these problems (Yehuda et al. 2005; Baum et al. 1993; Cohen et al. 2007). While there are emotional reactions and symptoms in response to severe stressors, most of them are resolved in the ensuing weeks or months. For example, after a trauma most people recover from symptoms in a year and only 5–10% of those exposed to traumatic experiences go on to develop PTSD (Bryant 2003; Carter 2007). However, the relationship between stress and health status may vary by health outcome with an estimated 20–25% of people who experience major stressful life events developing major depression (Cohen et al. 2007).

The challenge then is to identify and assess those dimensions of discriminatory experiences that are likely to have long-term negative effects. The stress literature suggests that several

characteristics of stressors are important determinants of the long-term negative impact of stress. Stressors that are ambiguous, negative, unpredictable, and uncontrollable are particularly pathogenic (Carter 2007; Dougall et al. 1999). The intensity of the stressor also matters including how disturbing and upsetting it is (Dougall et al. 1999). The frequency and duration of stressors are also key determinants of their impact with chronic or repeated stressors or prolonged exposure being predictive of adverse effects. Such stressors or difficulties are likely to make continuing demands or pose ongoing threats (Dohrenwend 2006). The impact that the stressor has on the environment and social functioning of the individual is also important. Stressors that occur in central role areas of an individual's life, affect multiple areas, lead to loss of resources, have objective negative impact on the normal activities of the individual, and cause a lot of change, disruption or readjustment are likely to be very consequential (Dohrenwend 2006; Carter 2007). The presence of symptoms such as post traumatic or peritraumatic disassociation and of panic reactions appear to predict long term negative effects of exposure to traumas (Yehuda et al. 2005).

An important priority in the future assessment of perceived discrimination is to assess markers of the stressfulness of experiences. A central problem in the assessment of stress is what Dohrenwend (2006) calls "intracategory variability." That is, the categories on life events scales are typically so broad (death of a loved, unemployment, or serious illness or injury) that they capture experiences that can vary in their stressfulness and impact. Knowing that such an event occurs provides no information on how negative, unexpected, and undesirable, the event was. The same is true for measures of discrimination in employment, housing or in interaction with the police. Researchers studying discrimination should devote more attention to assessing the severity of discriminatory incidents by capturing the number, intensity, and duration of these experiences (Carter 2007).

The stress literature offers three options for assessing severity. First, the narrative-rating methodology is a labor intensive interview that gathers details about each potentially stressful experience so that trained researchers can then rate them on multiple dimensions of stressfulness (Dohrenwend 2006). This approach has been shown to be superior to standard checklists of stressful events but because interviewing and rating can take as much as 16 hours per individual interview (Dohrenwend 2006), it is too time consuming and expensive to be a practical option for most researchers. A second approach is to clearly define what kinds of experiences should be included in a category and/or spell out the inclusion or exclusion criteria for the target stressful experience (Dohrenwend 2006). For example, in the Traumatic Life Events Questionnaire (Kubany et al. 2000), instead of asking the respondent if s/he had been in a motor vehicle accident, the respondent is asked "were you involved in a motor vehicle accident for which you received medical attention or that badly injured or killed someone." Similarly, the question assessing the presence of childhood physical abuse is "were you physically punished in a way that resulted in bruises, burns, cuts or broken bones?" (Kubany et al. 2000). This strategy could be applied to questions about racial discrimination in which behaviorally descriptive language that avoided global and emotionally charged words could clearly specify the experiences that should be included. This approach can improve assessment but has the downside of potentially missing other important stressors that do not fall within the specified criteria (Dohrenwend 2006).

A third strategy involves subjective ratings by the respondent of the severity and negative impact of the stressful experience (Cohen et al. 2007). In the PTSD literature, respondents are often asked after reporting a particular event to indicate how much they had been affected by it and how upset they had been by it (Carter 2007). Similarly, a study relating caregiver stress to mortality had respondents indicate "how much of a mental or emotional strain" each reported caregiving task had been (Schulz and Beach 1999). A recent measure of hurricane-related stressors required respondents to provide a global rating of the 29 stressors ascertained by

indicating “how stressful overall” the experiences had been on a 0–10 scale, “where 0 means not at all stressful and 10 means the most stressful thing you can imagine” (Kessler et al. 2008). The researchers then compared respondents rating their stress as severe (9–10), serious (7–8), moderate (5–6) or mild (3–4) to those who did not rate it as stressful (0–2). Such approaches lead to stronger associations between life events and mental health in the general stress literature (Dohrenwend 2006), but this approach has been used in only a few studies in research on discrimination and health.

Analysis of data from the Metro Atlanta Heart Disease Study illustrates the promise of this approach. This study found that although perceived discrimination was unrelated to hypertension, both discrimination at work (Din-Dzietharn et al. 2004) and discrimination more generally (Davis et al. 2005) were associated with increased risk of hypertension, but only among persons reporting high levels of stress because of discrimination. In this study, if respondents reported experiences of discrimination they were asked to rank their general level of stress when they had those experiences from 1 = none to 5 = high. Several states participating in the annual Behavioral Risk Factor Surveys in the U.S. have included the Reactions to Race module, developed by Camara Jones, which includes questions that assess emotional and physical symptoms as a result of exposure to discriminatory experiences. This is a fertile opportunity to explore the contribution of ratings of severity to the association between discrimination and health. One limitation of obtaining appraisals of stressfulness is that for studies of mental health, respondents’ reports of stressfulness can lead to confounding between the measure of stress and the self-reported outcome (Dohrenwend 2006).

Other evidence suggests that two aspects of a discriminatory experience that can affect its stressfulness are the degree of ambiguity of the situation and the identity of the perpetrator. Limited evidence from the discrimination literature indicates that characteristics of the perpetrator can predict the degree of adverse impact with the effects being more negative when the perpetrator belongs to the same racial group as the target (Mays et al. 2007). The ambiguity surrounding an experience of discrimination can also be a determinant of its stressfulness, and greater attention should be given to assessing attributional ambiguity (Carter 2007). Several recent studies have noted stronger, more negative effects from subtle or ambiguous racial encounters than from blatant ones (Bennett et al. 2005; Stetler et al. 2006; Merritt et al. 2006). There may also be racial differences in the effects of ambiguity. A recent study of university students found that blacks experienced greater impairment in cognitive functioning when faced with ambiguous evidence of prejudice than when exposed to blatant prejudice (Salvatore and Shelton 2007). The opposite pattern was evident for whites. It may be that the socialization of blacks may enable them to cope better with blatant than subtle prejudice while the socialization of whites may lead them to fail to perceive subtle prejudice. Routinely assessing the extent to which racial attribution is uncertain appears to be an important priority in the future measurement of discrimination.

Measuring vigilance and anticipatory stress

Vigilance regarding the threat of discrimination and the anticipation of future occurrences of discrimination could be as predictive of the adverse health impact as the actual effects of past discriminatory experiences. The negative physiological effects of exposure to stressors are often triggered by the initial perception of threat which can occur long before the actual exposure to the stressor. Several researchers have emphasized that anticipatory coping and anxiety, heightened vigilance, and intrusive thoughts or images can play an important role in determining the negative effects of stressors on health (Yehuda et al. 2005; Pearlin et al. 2005; Carter 2007; Baum et al. 1993; Dougall et al. 1999). This may be especially important for the stress linked to racial discrimination because one’s racial status is a characteristic that

a respondent can do little about. Carter (2007) uses the term “cultural paranoia” to refer to a high level of vigilance that many minority group members maintain.

Brosschot and colleagues (2006) use the term “perseverative cognition” to capture worry, rumination and anticipatory stress. They review evidence from multiple sources that suggests that repeated or chronic activation of the cognitive imagery of one or more psychosocial stressors can serve to prolong the stress and exacerbate the negative effects of stress on health. These chronic cognitive processes can lead to “prolonged physiological activation.” The resulting anticipatory stress, reflected in chronic or sustained vigilance can lead to dysregulation of both emotional and physiological functioning. Considerable evidence suggests that prolonged physiological activation is a risk factor for multiple disease conditions (Brosschot et al. 2006). Thus, capturing the level of anticipatory stress, worry, rumination, regarding the threat of discrimination is an important priority for future research. Williams (1997) has suggested that the finding of elevated nocturnal blood pressure levels of African Americans during sleep could reflect a heightened vigilance and a failure to ever completely relax because of the constant threat of discrimination and other dangers linked to residence in hostile residential contexts. Recent research has shown that discrimination contributes to African Americans’ failure to display the expected nocturnal decline in blood pressure (Brondolo et al. 2008a). Despite its importance, issues of vigilance have seldom been addressed in the research on discrimination. Lindström (2008) recently reported that a single-item indicator of anticipatory ethnic discrimination was associated with lower levels of psychological health in a national sample of adults in Sweden. In a study of African American youth, Clark et al. (2006) found that a measure of racism-related vigilance was inversely related to large arterial elasticity (a preclinical index of cardiovascular function) for boys but not girls. The mean age of this sample was 12 years old suggesting that the processes may begin early in life and future research should attend to the potential gendered nature of these responses.

Perceived discrimination and the multiple mechanisms of racism

Perceived discrimination is a historically neglected race-related aspect of life that may adversely affect health. However, it does not comprehensively capture the effects of racism in society. Some researchers erroneously assume that a scale that assesses racial discrimination captures a respondent’s exposure to racism. Perceived discrimination, though important, is only one component of racism. We briefly consider some of the other pathways by which racism can affect health. Fully capturing the role of racism in health will require an understanding of how discrimination combines with other aspects of racism to increase the risk of disease.

Residential segregation

Arguably, the most decisive way in which racism can affect health is through institutional mechanisms of racism. The aspect of institutional discrimination most widely studied for its health implications has been residential segregation (Williams and Collins 2001; Acevedo-Garcia et al. 2003). This body of research indicates that residential segregation can shape SES and thus health by restricting access to education and employment opportunities, discounting the economic value of a given level of SES, and creating health-damaging conditions in residential environments. Historically, two pronounced patterns of residential segregation in the U.S. have been the geographic isolation of American Indians on reservations and the residential concentration of African Americans in poor urban areas. There is growing concern about the health consequences of the persisting segregation of blacks and American Indians and the increasing segregation of Latinos (Acevedo-Garcia et al. 2008). Although the majority of poor persons in the U.S. are white, poor white families are not concentrated in the ways that poor blacks and Latinos are. The critical determinant of the problems linked to segregation is

not racial composition per se but the concentration of economic and social disadvantage and the absence of an infrastructure that promotes opportunity.

Research has linked residential segregation to an elevated risk of illness and death (Williams and Collins 2001; Acevedo-Garcia et al. 2003). There are multiple pathways through which the concentrated poverty created by segregation can adversely affect health (Williams and Collins 2001; Schulz et al. 2002). First, the conditions created by poverty and segregation make it more difficult for residents to adhere to good health practices. The higher cost, poorer quality, and lower availability of healthy foods in economically disadvantaged neighborhoods can lead to poor nutrition. The heavy targeting of disadvantaged minority communities with advertising for tobacco and alcohol can encourage the use of these products. The lack of recreation facilities and concerns about personal safety can discourage leisure time physical exercise. Second, the concentration of poverty can lead to exposure to elevated levels of economic hardship and other chronic and acute stressors at the individual, household and neighborhood level. Third, the weakened community and neighborhood infrastructure in segregated areas can also adversely affect interpersonal relationships and trust among neighbors. Fourth, the institutional neglect and disinvestment in poor, segregated communities contributes to increased exposure to environmental toxins, poor quality housing and criminal victimization. Thus, perceived discrimination must be understood and assessed within the larger context of institutional racism which has created differential exposure to a broad range of stressors.

Differential access to societal goods and resources

Institutional and individual discrimination can also reduce non-dominant groups' access to a broad range of desirable goods and services. Medical care is one example. Discrimination can affect both access to care and the quality and intensity of medical treatment. U.S. research reveals that residential segregation can affect access to medical care by determining both the particular institutions where minorities access care and the type and quality of their health care providers. In segregated minority communities, health care facilities are more likely to close, pharmacies are less likely to be adequately stocked with medication, and residents are more likely to be treated by lower-quality physicians who are less able to refer to specialty care (Williams and Jackson 2005). In addition, there are large racial/ethnic differences in the quality and intensity of medical care with blacks and other minorities receiving fewer medical procedures and poorer quality medical care than whites (Smedley et al. 2003). This pattern persists even when differences in health insurance, SES, stage and severity of disease, co-morbidity, and the type of medical facility are taken into account. Cultural racism has led to pervasive negative racial stereotypes of racial groups regarded as inferior (Williams 2004). Some evidence suggests that unconscious discrimination based on these negative stereotypes of minorities is a likely determinant of this pervasive bias in the delivery of care (van Ryn 2002; Green et al. 2007).

Discrimination and other stressors

As noted, the experience of self-reported discrimination is not a magic bullet that captures all of the psychosocial stressors necessary to estimate the contribution of racism-generated stressors to disparities in health. Perceived discrimination is only one way by which racism generates stress. Institutional discrimination can generate multiple stressors that can adversely affect health. For example, institutional discrimination in employment and residential contexts can trigger elevated exposure to traditional stressors, especially those linked to social and economic deprivation, including unemployment and underemployment. A large federal survey found that even after adjustment for a broad range of demographic, SES, and health status factors blacks were more likely than whites to report six economic hardships (unable to meet essential expenses, pay full rent or mortgage, pay full utility bill, or had utilities or telephone

shut off or was evicted from one's apartment; Bauman 1998). Similarly, because of the distinctive residential environments created by segregation, racial minorities are also exposed to elevated levels of neighborhood stressors and violence. Taking institutional discrimination seriously will require renewed focus on racial differences in traditional stressors: violence, criminal victimization, neighborhood conditions, financial stress, and relationship stress. Relatedly, all racism-related stressors must be situated within the context of the total stress burden of respondents' lives with the recognition that racism (interpersonal and institutional) is only one source of stress. As a practical matter, researchers typically lack adequate information to determine the extent to which other stressors are race-related or not but must seek to characterize all stressors. Thus, understanding the potential contribution of stressful life experiences to racial disparities in health necessitates the assessment of perceived discrimination *and* a systematic effort to assess race-related and other social, psychological and environmental (physical and chemical) stressors that respondents face.

Pearlin et al. (2005) emphasized that the stressors that are patterned by social disadvantage are the "serious stressors" that capture major hardships, conflicts, and disruptions in life. These include disorderly transitional events which are role changes that are non-normative, undesired, involuntary and sometimes irreversible, such as teenage parenthood or school dropout. These stressors are concentrated among low SES groups and in addition to their negative emotional impact, they are critical in transmitting social disadvantage from one generation to the next because they tend to place low SES persons on trajectories of low education, low job prospects, and low income that lead to the proliferation of other stressors. Financial stressors, especially those that are characterized by continuity and repetitiveness over the life course are among the most powerful of stressful life experiences (Pearlin et al. 2005). Other sources of social and economic adversity, especially those that are chronic and recurring and that occur in major social domains such as the role of breadwinning, work, and family should also be assessed.

Discrimination should be assessed within this larger social context of the multiple stressful exposures within which it is embedded. Research is needed to elucidate, in careful longitudinal analyses, how perceived discrimination relates to other types of stressors and combines with them to produce patterns of cumulative exposure to multiple adversities that can adversely affect health status. The processes may be complex. Experiences of discrimination such as the loss of one's job can easily lead to "stress proliferation processes" in which the primary stressor of unemployment can give rise to multiple other types of secondary stressors, such as financial strain and family conflict (Pearlin et al. 2005). Traumas are among the most potent types of stressful experiences that can trigger stress proliferation with the secondary stressors that are triggered by traumas contributing more to later health than the primary trauma itself (Pearlin et al. 2005).

Understanding how discrimination relates to other stressors will require examining the ways in which multiple forms of psychosocial stress accumulate to adversely affect health. The stress literature suggests that one's ability to manage a new stressor is reduced by the burden and demands of preexisting stressors (Cohen et al. 2007). Moreover, stressors may combine not only in additive ways but also in interactive ways. Future research on perceived discrimination should pay special attention to potential interactions among stressors. This includes attention to environmental stressors linked to the physical, chemical, and built environment. Some limited evidence indicates that psychosocial stressors and environmental factors may interact with each other. One study found that high levels of air pollution were associated with distress among people with recent life events, but unrelated to distress among persons with no social stressors (Evans et al. 1987). Another study of an Indian sample, and two U.S. college student samples, found that social stressors adversely affected mental health only among persons living under the environmental condition of crowding (Lepore et al. 1991).

Future research needs to sensitively and thoroughly categorize the stressors in the social environments within which vulnerable populations live and work. These residential and occupational environments can be distinctive in the types and quantity of stressors to which individuals are exposed. Efforts are needed to catalogue and quantify exposures linked to the physical, chemical and built environment and assess how they combine with psychosocial stressors (including discrimination) and accumulate over the life course. Special attention should be given to the potential of differential effects of chemical exposures. Prior research indicates for example, that smoking has more negative effects on some vulnerable minority populations than on whites. Research also needs to explore biological profile differences across groups with the recognition that not all biological profile differences are driven by underlying genetics, but some could reflect complex interactions between exposure to disadvantaged environments and biology.

Internalized racism

Internalized racism or self-stereotyping is another mechanism by which the larger negative stereotypes about race can adversely affect health. One response of stigmatized racial populations to the categorical societal beliefs about their biological and/or cultural inferiority is to accept as true the dominant society's ideology about them (Pettigrew 1964). The internalization of negative cultural images by stigmatized groups appears to create expectations, anxieties and reactions that can adversely affect social and psychological functioning. Fischer et al. (1996) show that across multiple national contexts, such as Japan, India, the United Kingdom and Israel, groups that are socially regarded as inferior have poorer academic performance than their more highly regarded peers. U.S. research indicates that when a stigma of inferiority is activated under experimental conditions, performance on an examination was adversely affected (Steele 1997). African Americans who were told in advance that blacks perform more poorly on exams than whites, women who were told that they perform more poorly than men, and white men who were told that they usually do worse than Asians, all had lower scores on an examination than control groups who were not confronted with a stigma of inferiority (Steele 1997; Fischer et al. 1996).

A study of the elderly highlights the potential health consequences of positive and negative self-stereotyping for stigmatized groups (Levy et al. 2002). It found that positive self-perceptions of aging, assessed at baseline, were associated with a 7.5 year longer life expectancy in a 23 year follow-up. However, our current understanding is limited regarding the ways in which the acceptance of negative racial stereotypes can adversely affect health. Some evidence indicates that in addition to adversely affecting academic performance, the activation of the stigma of inferiority also leads to increases in blood pressure (Blascovitch et al. 2001). Similarly, Taylor and colleagues have found a positive association between internalized racism and alcohol consumption and psychological distress among African Americans (Taylor et al. 1991; Taylor and Jackson 1990, 1991). Other recent research indicates that high levels of internalized racism are associated with increased risk of overweight or abdominal obesity among black women in the Caribbean (Tull et al. 1999; Chambers et al. 2004; Butler et al. 2002), and with waist circumferences, diastolic blood pressure and fasting glucose among black women but not men in Africa (Tull et al. 2007). Racial stereotypes are only one source of self-stereotyping. Their influence needs to be combined with other sources of stigmatization, especially those that are more likely to be prevalent among socially disadvantaged populations. For example, there are elevated rates of obesity in many racial minority populations and evidence of both a stigma linked to obesity and discrimination targeted at overweight individuals (Carr and Friedman 2005). Future research needs to explore the extent to which elevated health risks are located at multiple intersections of stigmatization and discrimination. Understanding how experiences of racial discrimination relate to internalized racism and combine to affect health is also important (Carter 2007).

Understanding how discrimination might affect health

Much current research on discrimination and health gives scant attention to the mechanisms and processes by which this association might exist. The stress literature indicates that stress affects health through three principal pathways (Cohen et al. 1995). First, exposure to stress can give rise to negative emotional states. These responses can generate psychological distress that adversely affects health. Second, behavioral coping responses to manage stress can lead to the initiation of unhealthy behaviors such as tobacco use and alcohol abuse, the disengagement from health activities such as sleep and exercise and the neglect of adherence to medical regimens. Third, both the psychological and behavioral responses to acute and chronic stressors can lead to structural and functional changes in multiple physiological systems, including the neuroendocrine, autonomic, and immune systems. These changes in physiology and behavior can lead to changes in health. Importantly, stressors, including discrimination can play a role in the onset, progression, and severity of illness. Studies of discrimination and health need to devote greater thought to the conditions under which particular aspects of discrimination are more or less likely to affect specific points of the disease continuum.

Too often there is little consideration to identifying or thinking about the exposure and lag times that would be necessary for a relationship to exist between exposure to discrimination and subsequent illness. Most chronic illnesses such as cancer, CHD, diabetes, and hypertension develop over many years and are often diagnosed long after the disease process was initiated. Accordingly, recent exposure to stressors, including discrimination, should not be related to the onset of these conditions. At the same time, because stress can impact the course of disease, it is important to consider how stress might affect the trajectory of an illness. This is especially important given the large racial and SES disparities in the progression of disease. As noted earlier, some recent studies have begun to pay attention to the role of discrimination in the management of chronic illness, healthcare seeking behaviors and in adherence to medical treatment. This is a very promising area in the study of discrimination and chronic disease and is consistent with the literature on stress that indicates that one of the important ways in which stress affects health is by shaping behavioral management of disease and leading to particular health behaviors that can have negative health consequences (Cohen et al. 2007). In future research, increased attention should be given to outcomes that capture the management, course, progression, severity, and recurrence of illness.

The stress literature also suggests that the types of stressors and the aspects of stress that may be important in determining the risk of getting an illness may be different from those aspects that are determinants of the progression, course, and severity of the illness. That is, the factors that are linked to the onset of disease may be different from those that overwhelm the body's defenses in coping with illness. The distinction between chronic and acute discrimination may be important for the underlying pathways by which discrimination-induced stress can lead to disease. As with the general literature on stress, acute experiences of discrimination may trigger acute episodes of illness while chronic discrimination may exacerbate existing disease processes (Bhattacharyya and Steptoe 2007). In the absence of coronary disease, for example, severe emotional distress from acute stress can trigger acute cardiovascular responses and events that can lead to cardiovascular dysfunction. On the other hand, chronic stressors can accelerate the atherosclerotic processes and lead to more rapid progression of disease (Brotman et al. 2007). Similarly, mental health research reveals that major stressful life events (that require a lot of change in usual activities) lead to the onset of psychopathology, while minor stressful experiences play a role in the recurrence and severity of psychopathology (Dohrenwend 2006). Future research on discrimination and health needs to pay greater attention to matching the measure of discriminatory experience with the presumed disease process.

Research is also needed to elucidate the linkages between experiences of discrimination and processes of illness. Ackerman et al. (2002) examined the role of life events in exacerbating episodes of multiple sclerosis (MS). They followed 23 women with MS for a year and conducted a weekly assessment of stress. They found that life events served to rapidly precipitate the relapse and the progression of disease, occurring an average of 14 days before the exacerbation of MS. The study also found that a broad range of stressors were equally associated with the processes of exacerbating the disease. This type of intensive study can serve as a useful model for future research that can shed light on the pathways from discrimination to health.

Future research on discrimination and health could also profitably focus its attention on those outcomes where prior research has documented that stress in general is linked to health. It is not reasonable to expect to find effects of discrimination on health in areas where the stress literature has not shown an effect of stress. Stam (2007) has identified five physiological categories where severe stress has been shown to affect intermediate physiological symptoms. These are: the neuroendocrine system, the cardiovascular system (increased heart rate and blood pressure responses), the gastrointestinal system (gastrointestinal ulcers, irritable bowel syndrome), pain sensitivity and chronic pain and immune function (suppressed immunity). Brotman et al. (2007) also indicate that components of the metabolic syndrome are promising places to look for the effects of stress on cardiovascular disease.

Personal and social factors and discrimination

Research on discrimination and health should also attend to the personal & situational factors that might affect the underlying processes. Recent studies suggest that social factors can affect the prevalence and the impact of the discrimination. Borrell et al. (2006) found a positive association between perceived discrimination and SES. However, the larger literature is mixed on this topic (Paradies 2006). Pearlin et al. (2005) emphasize that the consequences of a stressor may vary by SES even if the prevalence of the stressor does not. Inadequate attention has been given to examining interactions between discrimination and SES. The expected patterns are unclear. Discrimination could be more severe for low SES groups because it may be harsher, more easily legitimized and invisible, or it could be more impactful for high SES groups because it could be perceived as a threat to their status (Jackson et al. 2006). Some limited evidence is consistent with higher costs of discrimination among high SES blacks (Forman 2003), but this finding deserves replication.

Gender is another social variable that might affect the relationship between discrimination and health. Consistent with the view that black men are more likely to be targets of discrimination than black women because of gendered stereotypes that view them as more threatening, men tend to report higher levels of discrimination than women (Carter 2007). Gender differences in the level and consequences of a stressor can be evident in opposite directions. For example, men report higher levels of exposure to traumas but PTSD is more prevalent in women (Stam 2007). One recent study found that gender moderated the association between discrimination and anxiety but not depression (Banks and Dracup 2006) while another found that the association between discrimination and physical and mental health was stronger for women than for men (Borrell et al. 2006). It is also important to explore the intersections of race, class and gender. One study found that race-related stress had larger negative effects on middle class than working class men, suggesting that the additional resources of the middle class did not protect them from the negative effects of stressors (Pieterse and Carter 2007).

The shade of skin color (or skin tone) is another marker of social status and a potential predictor of exposure to discrimination that has received inadequate research scrutiny (Krieger 1999). Research has long indicated that skin tone is a marker of social status and an important predictor

of access to socioeconomic opportunities and resources within the black population with the associations being stronger for women than for men (Keith and Herring 1991). Prior research has shown that skin tone is also a marker for discrimination, with darker skinned blacks reporting higher levels of discrimination than their lighter skinned peers (Keith and Herring 1991; Carter 2007). Similar patterns have been observed among Hispanics (Arce et al. 1987), and Jews (Kraus and Koresh 1992). It is not clear though, if this association exists in all contexts. For example, in the CARDIA study of African American young adults, skin color was unrelated to reports of discrimination (Borrell et al. 2007). Insufficient research attention has been given to the relationship of skin color to discrimination in recent research that would allow conclusions regarding either secular change in the association over time, or the identification of the conditions under which particular patterns are more or less likely to be evident. Some evidence indicates that skin tone continues to matter for the earnings of African Americans (Goldsmith et al. 2007), but it is unclear if there have been secular changes in its role as a marker for discrimination. Future research needs to examine the extent to which multiple social statuses combine to affect both the levels of exposure to discrimination and the effects that discrimination can have on health.

There is a broad range of personal and situational factors that are important in determining vulnerability and resilience to stressors. A full discussion of these is beyond the scope of this paper (see paper by Brondolo, this issue). However, understanding the complex ways in which psychosocial stressors get into the body to affect health will require future research to attend to and understand the large individual variation that exists in response to stressor exposure. There is broad recognition in the stress literature that the effects of the experience of a particular stressor combines with factors such as the presence of prior childhood and adult traumatic experiences, levels of social support, feelings of helplessness and perceived control, a family history of psychiatric disorders, psychological and behavioral coping responses, genetic vulnerability, and a range of other personal factors (Yehuda et al. 2005; Stam 2007; Baum et al. 1993; Carter 2007). These factors can directly mediate the negative effects of stressor exposure or interact with stress to buffer or exacerbate its effects on health. Research in the area of perceived discrimination and health needs to assess the role of these vulnerability and resilience factors.

Conclusions

The research on discrimination and health is continuing to grow rapidly. Although the discrimination variable has been operationalized in a variety of ways, the consistency of an inverse association between discrimination for an increasingly broad range of health outcomes, across multiple population groups in a wide range of cultural and national contexts is impressive, and lends credibility to the plausibility of perceived discrimination as an important emerging risk factor for disease. This paper has described many of the limitations of this work and outlined an ambitious research agenda so that the next generation of studies could provide more definitive evidence on the conditions under which exposure to discrimination can lead to changes in health status. It would also enhance our scientific understanding of the underlying mechanisms and processes that may be at work. Our review finds that failure to comprehensively and accurately characterize perceived discrimination and appropriately assess its association with health will lead to erroneous conclusions about the underlying relationship.

The research reviewed also raises larger questions for future research and policy regarding health and its determinants. The accumulating evidence emphasizes that health policy, across multiple societies needs to encompass the legacies of racial and ethnic inequality and the levels of intolerance, incivility and anti-immigrant sentiment. These factors appear to matter a lot for the health of targeted groups and as such require greater attention as a focus of health policy.

Racism and ethnocentrism may not be inevitable. In the U.S., there have been marked declines in racial prejudice and discrimination in the last several decades that have resulted from a broad range of interventions (Schuman et al. 1997). However, there is still considerable opportunity to improve relations among population groups defined by race, ethnicity, migration history and other stigmatized social statuses. There is also the need to more seriously begin to provide targeted relief to individuals suffering from exposure to discrimination. One recent study provided the sobering finding that a written disclosure intervention that has been shown to be successful in improving health outcomes such as immune functioning among persons exposed to various stressors was not effective when applied to persons dealing with racial discrimination (Stetler et al. 2006). This raises the possibility that conventional stress management strategies may not be effective in relieving the personal suffering linked to racial discrimination.

As a strategy for health improvement, more systematic research attention needs to be given to expanding our knowledge of the individual and especially organizational interventions that can be effective in reducing the levels, determinants and consequences of interpersonal and institutional discrimination (Paradies 2005). Moreover, there is substantial progress yet to be made in dismantling the institutional structures, processes, and policies that undergird societal racism. As research continues to accumulate evidence that perceived discrimination can lead to adverse changes in health, such efforts are an increasingly necessary component of comprehensive approaches to improving the health of all in racialized societies.

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Table 1Published research on discrimination and health in PubMed, 2005–2007^a

Study	Sample size	Design	Outcome variables	Findings
<i>1. Mental health</i>				
Banks et al. (2006)	570 Blacks	Cross-sectional	Anxiety & depressive symptoms	Positive association
Beiser and Hou (2006)	647 SE Asian refugees	Cross-sectional	Depressive symptoms	Positive association
Bhui et al. (2005)	2054 UK workers	Cross-sectional	Anxiety & depression	Positive association
Birman et al. (2005)	269 Soviet immigrant teens in US	Cross-sectional	Russian identity American identity	Positive association Inverse association
Brody et al. (2006)	714 Black adolescents	Longitudinal	Conduct problems & depressive symptoms	Positive association
Brook et al. (2006a)	210 Black and Puerto Rican elementary kids	Cross-sectional	Rebellious behavior	Positive association
Brondolo et al. (2005)	420 Blacks & Latinos	Cross-sectional	Emotions of threat, harm, & anger	Positive association
Broudy et al. (2007)	113 Multiethnic adults	Cross-sectional	Daily moods (anger, sadness & nervousness)	Positive association
Bynum et al. (2007)	247 Black freshmen	Cross-sectional	Psychological distress	Positive association
Crouter et al. (2006)	218 Mexican American families	Cross-sectional	Depressive symptoms	Positive association
Dyrbye et al. (2007)	3,080 U.S. medical students	Cross-sectional	Burnout, depressive symptoms, low QOL	Positive association
Gee et al. (2006b)	666 U.S. blacks, black & Latino immigrants	Cross-sectional	Mental Health	Inverse association
Gee et al. (2007b)	2,047 Asian American adults	Cross-sectional	Past year mental disorders	Positive association
Greene et al. (2006)	136 High school students	Longitudinal	Depressive symptoms self-esteem Self-esteem	Positive association Inverse association
Karlsen et al. (2005)	3,446 from 5 UK ethnic immigrants	Cross-sectional	Psychosis Anxiety or depressive disorder	Positive association Positive association
Khaylis et al. (2007)	91 Undergrad students	Cross-sectional	PTSD symptoms	Positive association
Lam (2007)	122 Vietnamese college students	Cross-sectional	Depression & anxiety symptoms	Positive association
Lam et al. (2005)	1,451 Teens in Hong Kong	Cross-sectional	Depressive symptoms Life satisfaction & purpose	Positive association Inverse association
Lincoln et al. (2007)	4,915 African Americans & Caribbean Blacks	Cross-sectional	Depressive symptoms	Conditional association
Major et al. (2007)	3 Samples of Latino students (n = 191)	Cross-sectional	Self-esteem	Inverse association
Miller and Travers (2005)	208 UK minority ethnic teachers	Cross-sectional	Psychological symptoms (GHQ) Job satisfaction	Positive association Inverse association
Montgomery and Foldspang (2007)	131 Middle Eastern refugees in Denmark	Cross-sectional	Internalizing symptoms Externalizing symptoms	Positive association No association
Noh et al. (2007)	180 Adult Korean immigrants, Toronto	Cross-sectional	Positive affect Depressive symptoms	Inverse association Positive association
Oppedal et al. (2005)	1,275 Immigrant 10th graders in Norway	Cross-sectional	Psychiatric problems	Positive association

Study	Sample size	Design	Outcome variables	Findings
Pantzer et al. (2006)	1,246 Native and immigrant adolescents in Spain	Cross-sectional	Health related quality of life	Inverse association
Pole et al. (2005)	668 Hispanic, white and black police officers	Cross-sectional	PTSD symptoms	Positive association
Poyrazli and Lopez (2007)	439 International & U.S. college students	Cross-sectional	Homesickness	Positive association
Romero et al. (2007)	519 Latino & non-Latino teens	Cross-sectional	Depressive symptoms, drug use & violence	Positive association
Salvatore and Shelton (2007)	250 University students	Laboratory	Cognitive functioning	Inverse association
Schulz et al. (2006b)	700 Black women	Cross-sectional	Depressive symptoms	Positive association
Sheridan (2006)	222 British Muslims	Cross-sectional	Depressive symptoms	Positive association
Siefert et al. (2007)	824 Black mothers	Cross-sectional	Probable depression	Positive association
Simons et al. (2006)	332 Black teen males	Longitudinal	Violent delinquency	Positive association
Smokowski and Bacallao (2007)	323 Latino teens	Cross-sectional	Internalizing problems and low self-esteem	Positive association
Steffen and Bowden (2006)	168 Hispanic-American immigrants	Cross-sectional	Depressive symptoms Sleep disturbance	Positive association Positive association
Stevens et al. (2005a)	1,127 Moroccan immigrant teens in Netherlands	Cross-sectional	Externalizing behaviors	Positive association
Stevens et al. (2005b)	1,127 Moroccan immigrant teens in Netherlands	Cross-sectional	Internalizing problems	Positive association
Umaña-Taylor and Updegraff (2007)	273 Latino adolescents	Cross-sectional	Depressive symptoms	Positive association
Utsey and Hook (2007)	215 Black college students	Cross-sectional	Psychological distress	Positive association
Utsey et al. (2006)	323 U.S. black adults	Cross-sectional	Quality of life	Conditional association
Veling et al. (2007)	459 Ethnic minorities in The Netherlands	Cross-sectional	Incidence of psychotic disorders	Positive association
Vines et al. (2006)	476 Black women	Cross-sectional	Negative emotions	Positive association
Wadsworth et al. (2007)	626 Blacks, whites, & Bangladeshis	Cross-sectional	Psychological distress	Conditional association
Wagner and Abbott (2007)	120 Diabetic blacks	Cross-sectional	Depression	Positive association
Waltermaurer et al. (2006)	88 Black women	Cross-sectional	Intimate partner violence	Positive association
Wamala et al. (2007b)	33,328 Swedish adults	Cross-sectional	Psychological distress	Positive association
Yoder et al. (2006)	212 American Indian youth	Cross-sectional	Suicidal ideation	Positive association
<i>2. Blood pressure/hypertension</i>				
Brown et al. (2006)	3,300 Multi-ethnic women	Cross-sectional	Systolic & diastolic BP	No association
Clark and Gochett (2006)	217 Black youth	Cross-sectional	Blood pressure	Conditional association
Clark (2006a)	234 Black high schoolers	Cross-sectional	Systolic & diastolic BP	Conditional association
Cozier et al. (2006)	2316 Black women	Longitudinal	Hypertension incidence	Conditional association
Davis et al. (2005)	356 Black adults	Cross-sectional	Hypertension	Conditional association

Study	Sample size	Design	Outcome variables	Findings
Matthews et al. (2005)	207 Black & white teens	Cross-sectional	Ambulatory blood pressure	Conditional association
Peters (2006)	162 Blacks	Cross-sectional	Chronic stress emotions Blood pressure	Positive association No association
Peters et al. (2007)	145 Black hypertensive patients	Cross-sectional	Blood pressure Satisfaction with care	Positive association Inverse association
Roberts et al. (2007)	1,110 Middle-aged blacks	Cross-sectional	Hypertension	Conditional association
Ryan et al. (2006)	666 U.S. blacks, blacks & Latino immigrants	Cross-sectional	Physical health Systolic pressure Diastolic pressure	Inverse association U-shaped association No association
<i>3. Reactivity</i>				
Clark (2006b)	110 Black college women	Lab experiment	Vascular reactivity	Positive association
Clark et al. (2006)	72 black men	Lab experiment	Cardiovascular reactivity	Positive association
Clark et al. (2006a)	153 Black youth	Lab experiment	Large arterial elasticity	Conditional association
King (2005)	115 Black college women	Lab experiment	Affective stress reactions	Positive association
Lepore et al. (2006)	80 black & white women	Lab experiment	Cardiovascular reactivity	Positive association
Merritt et al. (2006)	73 Normotensive black men	Lab experiment	Cardiovascular reactivity	Positive association
Richman et al. (2007)	165 Normotensive black & white adults	Lab experiment	Cardiovascular reactivity	Positive association
Thomas et al. (2006)	122 Employed blacks & whites	Lab experiment	Reactivity to phenylephrine	Positive association
<i>4. Other physical health</i>				
Borrell et al. (2006)	1,722 Blacks	Cross-sectional	Self-reported health (SF- 12) Depressive symptoms (CES-D)	Inverse association Positive association
Gee et al. (2007a)	2,095 Asian Americans	Cross-sectional	Chronic health conditions	Positive association
Gee et al. (2006a)	2,241 Filipino Americans	Cross-sectional	Chronic health conditions	Positive association
Harris et al. (2006a)	4,108 Maori & 6,269 Europeans in New Zealand	Cross-sectional	4 self-reported measures of ill health	Positive association
Harris et al. (2006b)	12,500 Adults in New Zealand	Cross-sectional	5 measures of self-reported ill health	Positive association
Larson et al. (2007)	639 Aboriginal & other Australians	Cross-sectional	Self-reported poor physical & mental health	Positive association
Lauderdale (2006)	15,064 Arab women	Cross-sectional	Low birth weight and prematurity	Positive association
Lewis et al. (2006)	181 Black women	Longitudinal	Coronary artery calcification	Positive association
Locher et al. (2005)	1,000 Elderly adults	Cross-sectional	Nutritional risk	Conditional association
Moody-Ayers et al. (2005)	42 Diabetic blacks	Cross-sectional	Glycosylated hemoglobin Self-rated health	No association No association
Piette et al. (2006)	810 Adult diabetes patients	Cross-sectional	Hemoglobin A1c Physical symptom burden Poor physical functioning (SF-12)	Positive association Positive association Positive association
Schulz et al. (2006a)	343 Black women	Longitudinal	Symptoms of depression Self-rated health	Positive association Inverse association
Sellers et al. (2006)	399 Well-educated black men	Cross-sectional	Physical health Mental health	No association Inverse association

Study	Sample size	Design	Outcome variables	Findings
Stetler et al. (2006)	48 Black participants	Longitudinal	Antibody response to flu vaccine	Inverse association
Sujoldzic et al. (2006)	1,282 Immigrant teens from Bosnia and Herzegovina residing in Bosnia, Croatia or Austria	Cross-sectional	Health problems Psychological well-being	Positive association Inverse association
Taylor et al. (2007)	49,161 Black women	Longitudinal	Breast cancer incidence	Positive association
Thomas et al. (2006)	93 Employed men & women	Cross-sectional	Sleep stage 4 Physical fatigue	Inverse association Positive association
Vines et al. (2007)	447 Black women (35–49 years)	Cross-sectional	Waist-hip ratio	Inverse association
Wise et al. (2007)	22,002 U.S. black women	Longitudinal	Incidence of uterine leiomyomata (fibroids, myomas)	Positive association
Young et al. (2005)	1,008 Illicit drug users	Cross-sectional	Mental health Chronic conditions	Inverse association Positive association
Zamboni and Crawford (2007)	174 Black gay/bisexual men	Cross-sectional	Sexual problems	Positive association
<i>5. Health care utilization</i>				
Adegbenbo et al. (2006)	924 Low-income blacks & whites	Cross-sectional	Health care trust	Positive association
Banks and Dracup (2006)	61 Blacks with MI	Cross-sectional	Delay in seeking treatment	No association
Bazargan et al. (2005)	287 Black and Latino adults	Cross-sectional	Alternative care use as substitute for conventional care	Positive association
Benkert et al. (2006)	145 Low-income blacks	Cross-sectional	Satisfaction with care	Inverse association
Casagrande et al. (2007)	1,408 Blacks & whites	Cross-sectional	Delays in seeking medical care Non-adherence to medical care	Positive association Positive association
Chen et al. (2005)	3,884 adults	Cross-sectional	Preferences for same race physician	Positive association
Dailey et al. (2007)	1,229 Black and white women	Cross-sectional	Mammography screening	No association
Etowa et al. (2007)	237 Black Canadian women	Cross-sectional	Access to healthcare	Inverse association
Facione and Facione (2007)	817 Latino, black & white women	Cross-sectional	Non-adherence to cancer screening & fewer provider visits	Positive association
Fowler-Brown et al. (2006)	3,694 Black & white rural southern adults	Cross-sectional	Satisfaction with care Preventative services use	Inverse association No association
Hoyo et al. (2005)	144 Adult black women	Cross-sectional	Adherence to pap smear screening	No association
Jang et al. (2005)	230 Korean elderly	Cross-sectional	Satisfaction with care	Inverse association
Malat and Hamilton (2006)	1,189 Blacks	Cross-sectional	Preference for same race physician	Positive association
Malat and van Ryn (2005)	1,189 Blacks	Cross-sectional	Preference for same race physician	Positive association
Nápoles-Springer et al. (2005)	163 Blacks, Latinos & whites	Cross-sectional	Perceptions of the quality of medical encounters	Inverse association
Sohler et al. (2007)	523 Adults	Cross-sectional	Poor quality of healthcare	Positive association
Trivedi and Ayanian (2006)	54,968 Respondents	Cross-sectional	Received: cholesterol test, eye exam, hemoglobin A1c & flu shots	Inverse association No association

Study	Sample size	Design	Outcome variables	Findings
			Received: aspirin, PSA test	
Van Houtven et al. (2005)	545 Black, Latino & white adults	Cross-sectional	Delay of filling prescriptions Delay of treatments	Positive association Positive association
Wamala et al. (2007a)	31,851 Swedish adults	Cross-sectional	Refraining from seeking treatment	Positive association
<i>6. Substance use & health behaviors</i>				
Bennett et al. (2005)	2,129 Black college students	Cross-sectional	Tobacco use	Positive association
Borrell et al. (2007)	1,507 Blacks & 1,813 whites	Cross-sectional	Lifetime crack, speed, heroin Alcohol, tobacco use Lifetime cocaine & marijuana	No association Positive association Positive association
Brook et al. (2006b)	731 South African teens	Cross-sectional	Cigarette smoking	Positive association
Choi et al. (2006)	2,082 Middle school (multi & monoracial)	Cross-sectional	Ever substance use & frequency Violent behavior	Positive association Positive association
Gee et al. (2007a)	2,217 Filipino Americans	Cross-sectional	Prescription medication use Illicit drug use Alcohol dependence	Positive association Positive association Positive association
Gibbons et al. (2007)	889 Black families	Longitudinal	Subsequent drug use	Positive association
Kalichman et al. (2006)	2,122 Black and Coloured South Africans	Cross-sectional	HIV risk behavior	Positive association
Krieger et al. (2005)	159 Blacks, 249 Latinos & 208 whites	Cross-sectional	Cigarette smoking Psychological distress	Positive association Positive association
Landrine et al. (2006)	1,569 Black, Latino, Asian, and White adults	Cross-sectional	Cigarette smoking & psychiatric symptoms	Positive association
Terrell et al. (2006)	134 Black adolescents	Cross-sectional	Alcohol consumption	Positive association

^a Conditional association = discrimination is unrelated to health in the overall sample, but an association exists only for some sub-group