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The pathways from perceived discrimination to self-rated health: An investigation of the roles of distrust, social capital, and health behaviors

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Abstract

Although there has been extensive research on the adverse impacts of perceived discrimination on health, it remains unclear how perceived discrimination gets under the skin. This paper develops a comprehensive structural equation model (SEM) by incorporating both the direct effects of perceived discrimination on self-rated health (SRH), a powerful predictor for many health outcomes, and the indirect effects of perceived discrimination on SRH through health care system distrust, neighborhood social capital, and health behaviors and health conditions. Applying SEM to 9,880 adults (aged between 18 and 100) in the 2008 Southeastern Pennsylvania Household Health Survey, we not only confirmed the positive and direct association between discrimination and poor or fair SRH, but also verified two underlying mechanisms: 1) perceived discrimination is associated with lower neighborhood social capital, which further contributes to poor or fair SRH; and 2) perceived discrimination is related to risky behaviors (e.g., reduced physical activity and sleep quality, and intensified smoking) that lead to worse health conditions, and then result in poor or fair SRH. Moreover, we found that perceived discrimination is negatively associated with health care system distrust, but did not find a significant relationship between distrust and poor or fair SRH.

Keywords

USA; self-rated health; perceived discrimination; health care system distrust; neighborhood social capital; structural equation model

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Introduction

Racial discrimination can occur in all aspects of life and could be generally classified into two types: interpersonal and institutional discrimination (National Research Council, 2004). The former refers to an individual's discriminatory behaviors against people of minority groups, which can be directly perceived (e.g., verbal abuse or physical attack). The latter indicates the discriminatory actions embedded in social structures and may not be visible, such as policies, norms, and practices that lead to either unintended or intended unequal access to resources and power across racial groups. Wellman (2007) suggested that racial discrimination could be regarded as a process where Whites accumulate resources at the expense of other minorities, and is related to the superior White race framing (Feagin, 2009). Although in the past few decades, interpersonal discrimination in the United States has been declined, the white-oriented norms or decision-making embedded in social organizations or institutions may pass on the so-called "white privilege" (Wellman, 2007; Flagg, 1993). That is, despite the Civil Rights Act of 1964, racism/discrimination has not disappeared. Instead, racial discrimination has been hidden or transformed into other subtle existence (Quillian, 2006).

Following the transformation in racial discrimination, it is difficult to precisely detect and/or measure discrimination. Audit studies have been argued to be the most appropriate approach to measure discrimination (Bertrand & Mullainathan, 2004). However, the audit method has its limitations (Heckman & Siegelman, 1993) and may not be applicable particularly when collecting observational data (Quillian, 2006). In this study, we do not attempt to fully capture or measure the discrimination behaviors that an individual may encounter. Instead, we endeavor to understand if the subjective discriminatory experience has negative implications for an individual's health. The underlying assumption of this study is that an individual's well-being is subject to his/her life experience.

Our assumption above follows recent research that focused on an individual's experience with discriminatory actions (i.e., perceived discrimination) (Acevedo-Garcia et al., 2013; Karlsen & Nazroo, 2002; Larson et al., 2007). The negative consequences of perceived discrimination have been identified in the housing market (Pager & Shepherd, 2008), and health care (Griffith et al., 2007). Lately, the focus has shifted to the exploration of how perceived racial discrimination affects individual health outcomes. For example, it has been found that people who experienced racial discrimination are more likely to engage in risky behaviors (Pascoe & Richman, 2009) and to have more depressive symptoms (Schulz et al., 2006) and higher blood pressure (Karlsen & Nazroo, 2002) in contrast to their counterparts without perceived discrimination. The relationships between perceived discrimination and a range of health measures hold even after controlling for individual sociodemographic features (Harris et al., 2006). Extending from these recent studies, this study aims to investigate the association between perceived discrimination and self-rated health (SRH), a powerful predictor for future mortality and/or occurrence of diseases (Idler & Benyamini, 1997; Jylhä, 2009).

Almost a decade ago, several scholars strongly encouraged the studies that explicitly examine the association between SRH and racial discrimination (Boardman, 2004; Williams

et al, 2003). Many research projects, since then, have reported that poor or fair SRH is associated with perceived racial discrimination (Borrell et al., 2006; Chae & Walters, 2009; Larson et al., 2007; Schulz et al., 2006) with few exceptions (Krieger et al., 2011). Although these studies generally established the relationship between perceived discrimination and SRH, the etiologic mechanisms through which perceived discrimination affects SRH remains underexplored (Borrell et al., 2006). The goal of this study is to fill this gap by proposing and examining a conceptual framework that explains how racial discrimination is related to SRH.

The conceptual framework of this study is basically built upon two recent knowledge streams related to discrimination. The first is focused on *health care system distrust that is related to institutional discrimination*. As discussed previously, discrimination may exist in organizations or institutions. For example, Gee (2002) found that discrimination against Chinese Americans among loan associations negatively affected minority health. A study further showed that the knowledge of institutional discrimination (e.g., Tuskegee Study) increase the distrust of the health care system (Shavers et al., 2002). A recent report has shown that experiencing discriminatory behaviors was positively related to individual health care system distrust (Armstrong et al., 2013). Based on these findings, we argued that perceived discrimination would further exacerbate distrust.

Furthermore, the literature on the determinants of SRH has suggested that a high level of health care system distrust is related to poor or fair SRH, net of other explanatory covariates such as education, poverty status, and neighborhood social conditions (Armstrong et al., 2006; Mohseni & Lindstrom, 2007; Yang et al., 2011). One explanation is that people with high health care system distrust tend to be less likely to seek medical advice, to adhere to medication, or to utilize preventive health services than those with low levels of distrust (LaVeist et al., 2009; Musa et al., 2009; Yang & Matthews, 2012). The lack of these health behaviors may contribute to the assessment of poor or fair overall health status. Coupled with the fact that discrimination is positively associated with distrust, one proposed mechanism from discrimination to SRH is that perceived discrimination first increases health care system distrust and then leads to a poor or fair SRH.

The second pathway emphasizes the role of *social capital that is associated with interpersonal discrimination*. As demonstrated in the literature (Finch et al., 2001; Karlsen & Nazroo, 2002; Larson et al., 2007; Schulz et al., 2006), perceived interpersonal discrimination is a major source of depression and a barrier to health. More explicitly, perceived discrimination would not only affect an individual's health but also influence his/her social interactions. Note that the concept of social capital could be operationalized as an ecological factor (Putnam, 2000) or an individual's asset (Lin, 1999). The former has been widely used in health research but relatively little attention has been paid to the latter (Song et al., 2010). In this study, we adopted the individual perspective as perceived discrimination may directly affect an individual's social behaviors. When an individual experiences discriminatory behaviors, s/he may tend to limit her/his social interactions with others to avoid the recurrence of racial discrimination, which may in turn constrain her/his social involvement and lead to reduced social capital. Another potential explanation is that when experiencing racial discrimination, individuals may seek social support from her/his

social network to cope with stress, which is a type of taxing resources and may not be recovered (Folkman et al., 1986). As a result, an individual's social capital may be decreased due to racial discrimination. When one has a reduced social capital, s/he may have insufficient support to maintain a good health status (Fujiwara and Kawachi, 2008; Nieminen et al., 2010). Therefore, we propose that perceived discrimination would sabotage an individual's social capital because of the minimized social interactions or over-taxing of existing resources/social support. Consequently, the reduced social capital may lead an individual to report poor or fair overall self-rated health.

Conceptual Framework and Hypotheses

Built around the two mechanisms above, the conceptual framework of this study is demonstrated in Figure 1. In addition to the four major variables discussed previously (i.e., discrimination, health care system distrust, social capital, and SRH), we include an individual's sociodemographic characteristics, health behaviors, and health conditions into the framework. The variables in rectangles indicate manifest variables; whereas those in ovals are latent variables. We further explain why these variables are important in this study as follows.

Sociodemographic characteristics have been argued to be fundamental determinants of health (Link & Phelan, 1995; Rogers et al., 1999). Specific to SRH, factors such as low educational attainment, poverty, and low income are all associated with poor or fair SRH (Nieminen et al., 2010; Yang et al., 2011). Having a partner or being at the early stage of the life course increases the likelihood of reporting better SRH in contrast to those without a partner or old (Subramanian et al., 2005). As these sociodemographic characteristics are associated with all aspects of life, we include them to control for the potential confounding effects of these factors on other concepts in the framework.

Furthermore, an individual's health behaviors, such as diet and physical activity, may be related to discrimination. Specifically, societal discrimination may lead minority groups to live in the residential areas with limited access to public services or quality living environments (Nazroo, 1998), which in turn discourages healthy behaviors. For example, smoking and substance use are more prevalent among people who perceived discrimination than those who did not (Gibbons et al., 2004; Landrine & Klonoff, 2000). Discrimination, as a stressor, will also induce poor sleep quality and physical fatigue (Thomas et al., 2006). These findings suggest that in order to have a clear picture of whether discrimination is associated with SRH, it is crucial to consider health behaviors in the analysis.

Finally, as SRH is an overall assessment of an individual's health status, it has been found to be directly associated with an individual's health condition, such as chronic diseases. Recent studies have shown that people with known health issues are more likely to report poor or fair SRH, even after taking other explanatory variables into account (Manderbacka et al., 1999; Yang & Matthews, 2012). More importantly, our argument that discrimination exerts its impact on SRH through social capital was drawn from the mental health literature. Without controlling for mental health measures, the conclusions and findings of this study

would be compromised. Therefore, in the conceptual framework, individual's health conditions are considered.

According to the conceptual framework and discussion, we contend that perceived discrimination is directly and negatively associated with SRH as the literature suggested (Borrell et al., 2006; Chae & Walters, 2009; Larson et al., 2007; Schulz et al., 2006) and propose the following research hypotheses:

- Hypothesis 1** Beyond the direct and positive impact of perceived discrimination on poor or fair SRH, discrimination has an indirect impact on poor or fair SRH through health care system distrust. Specifically, (H1a) perceived discrimination is positively related to high health care system distrust, and (H1b) health care system distrust is associated with poor or fair SRH.
- Hypothesis 2** After controlling for other covariates, perceived discrimination is indirectly connected to SRH via social capital. Explicitly, (H2a) low social capital is a consequence of perceived discrimination and (H2b) low social capital contributes to the negative assessment of SRH.
- Hypothesis 3** Discrimination relays its negative impact to SRH via health behaviors and health conditions. That said, (H3a) discrimination is negatively related to healthy behaviors, and (H3b) the lack of healthy behaviors is associated with the occurrence of health conditions. Eventually, (H3c) poor health conditions lead to poor or fair SRH.

The subsequent sections are organized as follows. We will first elaborate on the data used in this study, followed by the explanation for the statistical method. Then, we will examine the hypotheses with the analytic results. Finally, we will discuss the findings and limitations of this study, and conclude with policy implications and suggestions for future research.

Methods

Data

This study used the Public Health Management Corporation's (PHMC) 2008 Southeastern Pennsylvania Household Health Survey to test the research hypotheses. The PHMC conducted interviews with 10,007 adults living in five counties of the Philadelphia metropolitan area (PHMC, 2008). Specifically, the study area was stratified into 54 service areas that were developed by PHMC on the basis of ZIP codes. Each service area has approximately 30,000 to 75,000 adult population (in 2008) and a computerized telephone random digit dialing method was applied to select households in a service area. Within each selected household, the Last Birthday Method was utilized to choose the adult participant for the interview where the information on health status, health behaviors, experience with health care, and access to health services was collected. If necessary, the interview was conducted in Spanish (PHMC, 2008).

Using the criterion # 3 of the American Association for Public Opinion Research (AAPOR, 2004), the response rate of the 2008 PHMC survey was 25%. Though the response rate

seems to be low, the quality and representativeness of the PHMC survey have been found to closely match other surveys conducted by Federal agencies. For instance, the socioeconomic conditions, such as poverty rate and percent of minority population, reported in the 2008 PHMC survey were comparable with those collected in the American Community Survey (U.S. Census Bureau, 2010). Several health indicators drawn from the PHMC data (e.g., utilization of preventive health services and the prevalence of obesity) also corresponded to the measures based on the 2008 Behavioral Risk Factor Surveillance System (BRFSS) data in Philadelphia (CDC, 2008). The concern about low response rates is mainly driven by the fears of nonresponse bias. Nonetheless, this common wisdom has been challenged lately by many studies and little evidence was found to support the assumption that significant biases may be resulted from low response rates (Keeter et al., 2006; Holbrook et al., 2007; Groves et al., 2004; Curtin et al., 2005).

To address the sampling and nonresponses biases, the PHMC provided weights that give additional weight to underrepresented segments of the target population and reduce weight to overrepresented segments. These weights are called balancing weights because they retain the actual sample size of the survey and can be applied to multivariate statistical analyses (PHMC, 2008). We used the balancing weights in this study to adjust for the potential biases that are associated with the sampling framework. Despite the use of balancing weights, the findings of this study should not be generalized to other populations or regions. To examine the hypotheses, we used the data reported by the adult respondents (age 18 and above) and we described how we measured the key concepts in Figure 1 as follows.

Measures

The end outcome variable, poor or fair SRH, was obtained by asking respondents to rate their health status, in general, as poor, fair, good, or excellent. We further dichotomized SRH as 1 when reporting poor or fair health status, otherwise 0.

Following the research framework, other variables could be categorized into six groups, namely discrimination, health care system distrust, social capital, sociodemographic features, health behaviors, and health conditions.

Discrimination was a dichotomous variable indicating “whether the respondents had experienced discrimination, been prevented from doing something or been hassled or made to feel inferior when getting medical care or housing because of their race, ethnicity, or color.” Those who reported perceived discrimination were coded as 1, otherwise 0. This approach to measuring discrimination experience was validated and adopted in previous studies (Armstrong et al., 2013; Krieger et al., 2005). While there were other situations (e.g. at school, getting a job, at work, etc.) where respondents could be exposed to discrimination, perceived discrimination when getting medical care and housing was particularly pertinent to the two latent constructs (i.e., health care system distrust and neighborhood social capital) that mediate between perceived discrimination and poor or fair SRH.

The latent *distrust* construct was comprised of nine items assessing how respondents evaluate the various conducts of the health care system. Specifically, nine statements were presented to the respondents, whose level of agreement for each statement based on a 5-

point Likert-scale was recorded, with 1 being strongly disagree and 5 being strongly agree (Shea et al., 2008). The nine statements were as shown in Table 2 and note that *Distrust1*, *Distrust3*, *Distrust6*, and *Distrust7* were reversely coded in our analysis in order to correctly capture the concept of distrust. As a result, all the nine items were rated on a scale of 1 to 5 with higher values indicating higher levels of distrust. The nine items of health care distrust had an internal reliability of 0.83, and removing any of the nine items would reduce Cronbach's Alpha Coefficient.

Four scales were used to measure the latent *neighborhood social capital* construct. As shown in Table 2, *willingness to help* was enquired by the question "how likely people in your neighborhood are willing to help their neighbors with routine activities such as picking up their trash cans, or helping to shovel snow?" And answers were coded from 1 (never) to 5 (always). *Neighborhood improvement* was a dichotomous variable based on the answer to the question "Have people in your neighborhood ever worked together to improve the neighborhood? For example, through a neighborhood watch, creating a community garden, building a community playground, or participating in a block party." *Sense of belonging* and *trust* were measured on a 4-point Likert-scale responding to the statements "I feel that I belong and am a part of my neighborhood," and "Most people in my neighborhood can be trusted," respectively. The same questions for *willingness to help* and *trust* were being asked in Los Angeles Family and Neighborhood Survey (Carpiano, 2007), but exact measures of neighborhood social capital varied slightly across previous studies on the association between neighborhood social capital and health due to different survey questions (Carpiano, 2007; Folland, 2007; Mohnen et al., 2011). The four measures of neighborhood social capital in this study have been coded in the way that higher values reflect higher levels of neighborhood social capital in each dimension. They had a Cronbach's Alpha Coefficient equal 0.66. We provide two potential explanations for this relatively low reliability measure. First, one indicator is binary, which is distinct from others. While removing it slightly increases the reliability, we are hesitant to do so due to the confirmatory factor analysis results (discussed below). Second, Cronbach's Alpha is related to the number of indicators. In contrast to distrust, neighborhood social capital only has four indicators, which contributes to the relatively low, yet acceptable, reliability.

A set of sociodemographic characteristics were included in the model as control variables in each structural equation. *Age* was a continuous variable. *Gender* was a dichotomous variable with 1 being male, and 0 being female. *Marital status* was a dichotomous variable with married or living with a partner versus other statuses (e.g., single or divorced). Income was classified into four levels, including *low income*, *medium-low income*, *medium-high income*, and high income (reference group) approximately corresponding to the quartiles of the income level variable ranging from 1 to 19. Educational attainment was based on the answer to the question of the last grade of school the respondent had completed, and it consisted of four dummy variables including *high school graduate*, *some college*, *college graduate*, and *post-college*, with less than high school graduate as the reference group. Race/ethnicity was divided into five dummy variables, including *Black (not Latino)*, *Latino*, *Asian*, *Biracial/Multiracial*, and *Native American*, with White (not Latino) as the reference group.

There were four indicators of health behavior in the model. *Physically active* was a dichotomous variable created from the answer to the question “In general, would you say that you are physically active on a regular basis?” Respondents were asked to rate their *quality of sleep* in the week before the survey on a 5-point scale with 1 being restless and 5 being restful. Respondents were also asked to report the *number of servings of fruits and vegetables* they ate on a typical day, and they were provided with the measure of one serving which is equivalent to a medium apple, half a cup of peas or half a large banana. *Smoking intensity* was used to measure the respondents’ frequency of smoking at the time of the survey from 1 (never smoked) to 4 (everyday).

Finally, *chronic diseases*, *high blood cholesterol*, and *depression* were three dichotomous variables for health conditions corresponding to the three questions asking respondents whether they had a health problem or condition that required medical treatment or hospitalization on a regular basis, whether they had ever been diagnosed with high cholesterol, or clinical depression, respectively. Yang and Matthews (2012), for example, adopted similar measures of health conditions as predictors of SRH.

Analytic Model and Strategy

To test our framework in Figure 1, a structural equation model (SEM) with latent variables is a better choice than other techniques such as binary logit and ordinal regression, because SEM allows us to accommodate the three hypotheses simultaneously in one model. The SEM with latent variables can be understood as having two components including a measurement portion and a structural portion (Anderson & Gerbing, 1988; Bollen, 1989). The former in this study is used to access the relationships between the previously identified nine and four observed measures for health care system distrust and neighborhood social capital and their underlying constructs, respectively, allowing for correlations between the two constructs. The latter specifies the relations among the latent constructs as well as other variables according to theoretical findings and/or assumptions. Eleven structural equations were specified with each variable on the left-hand side of the equation corresponding to one of the eleven key endogenous variables identified in the conceptual framework depicted in Figure 1.

While the two portions of SEM can be estimated in one step, this study followed a two-step estimation procedure suggested by Anderson and Gerbing (1988). In the first step, confirmatory factor analysis was used to establish an acceptable measurement model. In the second step, the modified measurement model and the structural equations were estimated simultaneously. We employed the mean- and variance-adjusted weighted least squares (WLSMV) with listwise deletion of missing values as the method of estimation in both steps and implemented the analysis with Mplus Version 5.2 (Muthén & Muthén, 1998–2010). When categorical outcome variables or a mixture of binary, ordered categorical, and continuous outcome measures are included in SEM, analyses are usually based on polychoric/polyserial correlations. Simulation studies show that under the assumption of missing at random with respect to exogenous variables, WLSMV with listwise deletion yields unbiased estimates for both parameters and their standard errors (Asparouhov & Muthén, 2010); and it generally performs well in terms of model-data fit, unless the

underlying latent response variables are severely skewed (Lei & Wu, 2012). In addition, sample balancing weights provided by PHMC were used to adjust for sampling errors and other potential biases.

There has been no universal rule as to which model fit indices should be chosen since different indices perform differently given the sample size, model complexity, estimation method, and/or whether the multivariate normality and variable independence assumptions are satisfied (Byrne, 2009). This study followed Muthén and Muthén (1998–2010) to report three indices including the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI) and the Root Mean Square Error of Approximation (RMSEA). We improved model fit during the estimation process by freeing covariances between error terms of the nine measures of health care system distrust based on their modification indices.

Results

Descriptive Statistics

Table 1 provides an overall summary of all the manifest variables in the SEM, and the statistical comparisons between those with discrimination experience and their counterparts. More than 9 percent of the respondents indicated that they had experienced discrimination when getting medical care or housing and, on average, they had significantly worse health status than did those without discrimination experience. Particularly, chronic diseases and depression were more prevalent among discriminated participants in contrast to others. As expected, respondents with discrimination experience had higher health care system distrust and lower neighborhood social capital than those without discrimination experience. Respondents reporting discrimination were featured with a lower percentage of people being physically active, having poorer sleep quality, having fewer servings of fruits and vegetables per day, and having higher smoking intensity levels on average.

We also found significant differences in sociodemographic characteristics between the two groups. Specifically, the average age of respondents with discrimination experience was almost 6 years younger than those without. More than half of the discriminated participants were Black, which was more than twice higher than that among non-discriminated respondents. The same pattern was also observed for Latino and Biracial/Multiracial groups. Discrimination was more likely to be reported by females, those who were not married or with a partner, those whose incomes were below the median level, and those without a high school diploma.

SEM Results

Following the two-step analytic strategy, we first established the measurement model and the associated confirmatory factor analysis results were presented in Table 2. Several important findings are noted. First, several model fit statistics (see Table 2) indicated a good model fit of the measurement model. Specifically, the RMSEA estimate (0.044) for our measurement model was lower than 0.05, and the values of CFI (0.980) and TLI (0.985) were higher than 0.95, suggesting good fit of the model (Hu & Bentler, 1999).

Second, the standardized factor loadings along with their respective t-values were included in Table 2. All factor loadings were nontrivial and highly significant ($P < 0.001$), and removing any of the paths would lead to a significant increase in the chi-square statistic of the model based on the Wald tests. Therefore, none of the paths could be dropped from the model.

After establishing a well-specified measurement model, we modeled a full SEM. That is, the measurement portion and structural portion of the SEM were estimated all at once, though only standardized path coefficient estimates for the structural portion were presented in Table 3. The numbers in the first row of Table 3 correspond to those in Figure 1 and they are variables on the left-hand side to be captured/explained by the eleven structural equations. Accordingly, variable names on the right-hand side of the equations are presented in the first column. Similar to the measurement model, the model fit statistics (e.g., CFI, TLI, RMSEA) suggest that the full SEM model fits our data well (see Table 3). We summarized the substantive findings as follows.

Echoing our descriptive statistics, perceived discrimination was related to income and race. Individuals with medium-low incomes were significantly more likely to experience discrimination than did high income respondents. Those who identified themselves as Blacks, Latinos, Biracials/Multiracials, or Native Americans were more likely to report discrimination experience in getting medical care or housing compared to Whites. In particular, the magnitude of the path coefficient for Blacks was significantly higher than coefficients for other variables in the equation. Due to space constraints, we opted not to discuss substantially the effects of sociodemographic characteristics in each equation hereafter.

Regarding health care system distrust, our findings are largely consistent with previous studies on the relationships among race, discrimination experience, and health care system distrust (Adegbenbo et al., 2006; Armstrong et al., 2013). That is, distrust levels were higher among the medium-high income group than the high income group. Male respondents had lower distrust than did females. In contrast to those who did not complete high school, respondents with a college degree or some post-college education had lower health care system distrust. Latinos reported significantly lower distrust levels than did Whites. More importantly, after accounting for individual socioeconomic characteristics, perceived discrimination had a positive association with health care system distrust, lending support to hypothesis 1a.

The third column demonstrated the results with neighborhood social capital as the dependent variable. Stronger neighborhood social capital was observed among those who were older and richer and had better educational attainment and a partner, whereas Blacks had lower social capital than did Whites. Beyond these associations, perceived discrimination, as expected, was negatively associated with neighborhood social capital. Explicitly, perceived discrimination undermines the development of social capital and interactions among residents, which supported our hypothesis 2a.

Equations (4) to (7) investigated the relationships between perceived discrimination and health behaviors. The results suggested that perceived discrimination hindered physical activities, the quality of sleep, and the intake of fruits and vegetables, and it increased smoking intensity, after adjusting for sociodemographic characteristics. Thus, hypothesis 3a was also supported.

The impacts of health behaviors on health conditions were examined in equations (8) to (10). Controlling for sociodemographic characteristics, physical activity and quality of sleep had significant health promoting effects across all the three health conditions, namely chronic diseases, high blood cholesterol, and depression. Somewhat unexpectedly, respondents who consumed more servings of fruits and vegetables per day were more likely to report chronic diseases and depression. Smoking intensity was positively related to the three health conditions.

The last column of Table 3 included the results that allowed us to examine other research hypotheses. First, as the literature suggested, after accounting for all other covariates in the research framework, we found that perceived discrimination was positively and significantly related to poor or fair SRH. Second, there was no significant association between health care system distrust and poor or fair SRH, so hypothesis 1b was not confirmed. Third, our hypothesis 2b stated that social capital was beneficial to SRH, which was supported by the negative association between neighborhood social capital and poor or fair SRH. Finally, all health conditions were positively related to poor or fair SRH, suggesting that more health conditions lead to poor or fair SRH as we hypothesized in 3c. Echoing previous research on SRH (Idler & Benyamini, 1997; Jylhä, 2009), we found the following covariates were significantly related to poor or fair SRH: gender, income, education, and race. In general, males were more likely to report poor or fair SRH than females. Respondents with higher income levels and educational attainment were less likely to be associated with poor or fair SRH. Biracials/Multiracials and Native Americans were more likely to report poor or fair SRH than Whites.

The direct and indirect effects of perceived discrimination on poor or fair SRH were summarized in Table 4 and depicted in Figure 2. Overall, both the direct and indirect effects of perceived discrimination were significant. As shown in Table 4, the magnitude of direct effect (0.128) was higher than indirect effect (0.106), indicating that perceived discrimination had a strong and direct impact on SRH. Decomposing the indirect effect into specific pathways showed that the indirect effect through neighborhood social capital contributed the most to total indirect effect (0.038), as compared to the indirect effect through physical activities ($0.015+0.002+0.003=0.020$), quality of sleep (0.029), or smoking intensity (0.024). These significant indirect impacts further confirmed the potential mechanisms from perceived discrimination to poor or fair SRH. Although perceived discrimination had a larger impact on health care system distrust than neighborhood social capital, the effects of distrust on poor or fair SRH were not significant (see Figure 2), which explained why the indirect effects through distrust was not significant.

The indirect effect of discrimination on poor or fair SRH via health behaviors and health conditions worked mainly through physical activity, sleep quality, and smoking intensity,

compared to the path through consumption of fruits and vegetables. Figure 2 demonstrated that while significant associations were found between discrimination and all the four types of health behaviors, the paths through intake of fruits and vegetables were lower in magnitude and less significant than the other paths.

Discussions

The literature on racial discrimination and health has mainly focused on the *direct* relationship between racial discrimination and a range of health outcomes, such as increased allostatic load, depression, and cardiovascular diseases (Mays et al., 2007; Pascoe and Richman, 2009), but the *indirect* pathways through which racial discrimination operates to affect health outcomes have not been fully investigated. While self-rated health is a powerful predictor for future diseases and mortality (Jylhä, 2009), previous research has concentrated on mental health outcomes (Williams et al., 2003). This study offered two potential pathways that are related to an individual's social behaviors and attitude toward health care system and confirmed that perceived racial discrimination is negatively related to social capital and consequently hinders self-rated health. This study provides empirical evidence to the argument that social support is a mediator between racial discrimination and health (Pascoe and Richman, 2009).

While the links between perceived discrimination and various health behaviors have been well-established (Pascoe and Richman, 2009), this study puts those health behaviors in a comprehensive framework and confirms that health behaviors (e.g., sleep) should be considered as part of the process between perceived discrimination and self-rated health. The findings of this study not only address the lack of understanding of the mechanisms between discrimination and health (Williams and Mohammed, 2009), but also provide potential interventions to buffer the adverse impact of perceived racial discrimination on health.

Using the SEM approach, we obtained evidence for two of our hypotheses. Specifically, being regarded as a stressor, perceived discrimination is directly and positively associated with poor or fair SRH. More importantly, beyond this direct impact, we found that perceived discrimination is positively associated with poor or fair SRH via two pathways: neighborhood social capital, and health behaviors and conditions. That said, perceived discrimination is negatively associated with social capital, a factor shown to be negatively related to poor or fair SRH. As for health behaviors and conditions, our finding suggested that perceived discrimination is adversely related to physical activity, sleep quality and smoking, and these three behaviors are related to poor health conditions that then lead to poor or fair SRH.

Several implications can be drawn from our findings. First, the direct and adverse impact of discrimination on SRH indicates that more effort is needed to eliminate discrimination when obtaining medical care or housing. Reducing the institutional discriminations in the health care system and facilitating the communications between tenants and landlords or between patients and health providers may help promote mutual understanding and prevent individuals from feeling discriminated. Second, the indirect impacts of discrimination

through social capital on SRH call for actions to strengthen the community-level social cohesion and civil engagement. Finally, the pathway through health behaviors and conditions underscores the importance of developing an environment that encourages physical activities and helps smokers quit.

Some limitations are worth noting. First, all measures in the study are self-reported, and thus are subject to various measurement errors. There is evidence that Black elders and people with depressive symptoms tend to have more pessimistic views regarding their health statuses (Spencer et al., 2009). Health literacy may play an important role in identifying chronic diseases as well as other health conditions (Gazmararian et al., 2003). Due to data limitation, this study is not able to address these issues. Second, though the SEM in this study is recursive in nature, the direction of causation should not be inferred from the model itself and it does not exclude any reciprocal effects embedded in the pathways. For example, a possible explanation for the positive association between daily servings of fruits and vegetables and chronic conditions found in this study is that people who have chronic diseases are advised by doctors to take more fruits and vegetables considering their health benefits. Because of this limitation, statements of causal relationships in this study are mainly based on past theoretical and empirical evidence. Future research should collect longitudinal data to clarify the causality among variables in the proposed framework. Third, the hypothesized mechanisms in this study are not exhaustive and the measures used in this study are limited by the PHMC survey. For instance, more efforts should be made to further untangle how income affects the type of health care sought and to investigate how different types of health care influence discrimination experiences. Future research may develop different measures of social capital and/or discrimination to test our framework. Fourth, the findings of this study may not be generalized to other regions/areas, because the PHMC survey is regional.

In sum, perceived discrimination is a determinant of SRH and its impact can be understood as direct and indirect. Our findings not only support recent studies that found direct association between discrimination and SRH (Borrell et al., 2006; Chae & Walters, 2009; Karlsen & Nazroo, 2002; Larson et al., 2007; Schulz et al., 2006), but also further clarify the intertwined relationships of discrimination with health care system distrust, social capital, and health behaviors and conditions. These pathways shed new light on the health research that focuses on the impacts of discrimination on health outcomes.

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- We test three pathways linking perceived discrimination to self-rated health (SRH).
- Discrimination is associated with enhanced distrust in the health care system.
- Discrimination decreases neighborhood social capital, which further hinders SRH.
- Discrimination induces risky behaviors that affect health conditions and SRH.
- Net of the two pathways above, discrimination is negatively related to SRH.

Figure 1.

Conceptual framework and hypotheses

Note: variables in rectangles represent manifest variables, and variables in ovals denote latent variables. The numbers in parentheses are used to simplify our future tables.

Figure 2.

Direct and indirect effects of perceived discrimination on poor or fair SRH

Note: numbers in the figure represent standardized path coefficients.

***p 0.001; **p 0.01; *p 0.05.

Table 1

Descriptive statistics of the manifest variables obtained from 2008 PHMC survey

	Total sample		With discrimination experience		Without discrimination experience		Two sample comparison	
	9880		928		8952			
	N ^a	Mean ^b	N	Mean	N	Mean	Mean difference	
Number of respondents (N)								
Poor or fair SRH (1=Yes, 0=No)	9851	0.213	922	0.363	8929	0.197	0.166	***
Discrimination (1=Yes, 0=No)	9880	0.094	928	1.000	8952	0.000		
Health care system distrust								
Distrust1 (1–5)	9688	2.772	917	3.297	8771	2.717	0.580	***
Distrust2 (1–5)	9144	3.559	888	3.858	8256	3.526	0.332	***
Distrust3 (1–5)	9511	2.778	906	3.354	8605	2.717	0.637	***
Distrust4 (1–5)	9200	3.069	891	3.457	8309	3.028	0.429	***
Distrust5 (1–5)	9438	3.567	910	4.025	8528	3.518	0.507	***
Distrust6 (1–5)	9596	2.774	899	3.293	8697	2.720	0.572	***
Distrust7 (1–5)	9210	3.212	892	3.814	8318	3.147	0.667	***
Distrust8 (1–5)	9040	3.066	857	3.645	8183	3.005	0.640	***
Distrust9 (1–5)	8730	2.689	837	3.374	7893	2.616	0.758	***
Neighborhood social capital								
Willingness to help (1–5)	9444	3.605	887	3.148	8557	3.653	–0.505	***
Neighborhood improvement (1=Yes, 0=No)	9397	0.609	882	0.624	8515	0.607	0.016	
Sense of belonging (1–4)	9685	3.175	906	2.955	8779	3.198	–0.243	***
Trust (1–4)	9199	3.041	843	2.623	8356	3.083	–0.460	***
Health conditions								
Chronic diseases (1=Yes, 0=No)	9838	0.267	920	0.370	8918	0.256	0.113	***
High blood cholesterol (1=Yes, 0=No)	9813	0.298	925	0.290	8888	0.299	–0.010	
Depression (1=Yes, 0=No)	9847	0.137	923	0.228	8924	0.128	0.099	***
Health behaviors								
Physically active (1=Yes, 0=No)	9848	0.812	925	0.775	8923	0.815	–0.040	***

Number of respondents (N)	Total sample		With discrimination experience		Without discrimination experience		Two sample comparison	
	9880		928		8952			
	N ^a	Mean ^b	N	Mean	N	Mean	Mean difference	
Quality of sleep (1–5)	9794	3.608	923	3.206	8871	3.649	–0.444 ^{***}	
# Servings of fruits and vegetables	9610	2.774	895	2.499	8715	2.802	–0.302 ^{***}	
Smoking intensity (1–4)	9842	1.829	925	2.096	8917	1.801	0.295 ^{***}	
Sociodemographic Characteristics								
Age	9880	52.327	928	46.966	8952	52.882	–5.916 ^{***}	
Gender (1=Male, 0=Female)	9791	0.323	918	0.293	8873	0.326	–0.033 [*]	
Married or living with a partner (1=Yes, 0=No)	9844	0.548	922	0.423	8922	0.561	–0.138 ^{***}	
Low income (1=Yes, 0=No)	7919	0.242	770	0.401	7149	0.225	0.177 ^{***}	
Medium-low income (1=Yes, 0=No)	7919	0.253	770	0.290	7149	0.249	0.041 [*]	
Medium-high income (1=Yes, 0=No)	7919	0.195	770	0.157	7149	0.199	–0.042 ^{***}	
High income (Reference) (1=Yes, 0=No)	7919	0.310	770	0.152	7149	0.327	–0.175 ^{***}	
Educational attainment (Less than high school graduate=Reference) (1=Yes, 0=No)	9861	0.074	923	0.092	8938	0.072	0.020 [*]	
High school (1=Yes, 0=No)	9861	0.322	923	0.345	8938	0.320	0.025	
Some college (1=Yes, 0=No)	9861	0.201	923	0.262	8938	0.195	0.068 ^{***}	
College graduate (1=Yes, 0=No)	9861	0.243	923	0.193	8938	0.248	–0.056 ^{***}	
Post-college (1=Yes, 0=No)	9861	0.160	923	0.108	8938	0.165	–0.057 ^{***}	
Race (White=Reference) (1=Yes, 0=No)	9783	0.674	912	0.294	8871	0.713	–0.419 ^{***}	
Black (1=Yes, 0=No)	9783	0.240	912	0.522	8871	0.211	0.311 ^{***}	
Latino (1=Yes, 0=No)	9783	0.051	912	0.114	8871	0.045	0.070 ^{***}	
Asian (1=Yes, 0=No)	9783	0.014	912	0.011	8871	0.015	–0.004	
Biracial/Multiracial (1=Yes, 0=No)	9783	0.013	912	0.038	8871	0.010	0.028 ^{***}	
Native (1=Yes, 0=No)	9783	0.004	912	0.009	8871	0.004	0.005 [*]	

^aThe difference between the number of respondents in the second row and that for each variable indicates the number of missing values.

^bFor binary variables, mean values denote the proportions of observations coded 1 and multiplying the number of observations yields the number of observations coded 1.

c, Significance levels were obtained by conducting two-sample t-tests for continuous variables, tests of proportions for binary variables and Mann-Whitney U-tests for ordinal variables.

*** p 0.001;
** p 0.01;
* p 0.05.

Table 2

Determination of internal consistency and confirmatory factor analysis (CFA) results

Latent construct	Manifest variable	Question in the survey	Internal consistency		CFA	
			Cronbach's Alpha	Alpha if item	Factor loading	t value
Health care system distrust	Distrust1	Health care system makes patients' health better		0.818	0.582	52.428***
	Distrust2	Health care system covers up its mistakes		0.832	0.490	40.326***
	Distrust3	Patients receive high-quality care from health care system		0.812	0.624	59.301***
	Distrust4	Health care system makes too many mistakes		0.816	0.698	71.463***
	Distrust5	Health care system puts making money above patients' needs	0.834	0.810	0.712	74.093***
	Distrust6	The health care system gives excellent medical care.		0.812	0.609	54.688***
	Distrust7	Patients get same medical treatment regardless of race		0.824	0.603	56.408***
	Distrust8	Health care system lies to make money		0.809	0.704	76.889***
	Distrust9	Health care system experiments on patients without them		0.820	0.581	53.247***
Neighborhood social capital	Willingness to help	How likely people in your neighborhood are willing to help their neighbors with routine activities?		0.543	0.628	48.648***
	Neighborhood improvement	Have people in your neighborhood ever worked together to improve the neighborhood?	0.660	0.704	0.493	21.136***
	Sense of belonging	I feel that I belong and am a part of my neighborhood.		0.526	0.757	60.501***
	Trust	Most people in my neighborhood can be trusted.		0.576	0.813	58.841***

Model fit statistics for CFA: CFI=0.980, TLI=0.985, RMSEA=0.044

***p 0.001

Table 3

Standardized path coefficients from the structural portion of the SEM

Variables on the left-hand side →	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11) Poor or fair SRH
Variables on the right-hand side ↓											
(1) Discrimination		0.435***	-0.343***	-0.121**	-0.319***	-0.052*	0.302***				0.128*
(2) Distrust											-0.009
(3) Social capital											-0.112**
Health conditions											
(8) Chronic diseases											0.425***
(9) High blood cholesterol											0.088**
(10) Depression											0.115**
Health behaviors											
(4) Physically active								-0.285***	-0.211***	-0.225***	
(5) Quality of sleep								-0.151***	-0.067**	-0.184***	
(6) # Servings of fruits and vegetables								0.073***	-0.007	0.053*	
(7) Smoking intensity								0.102***	0.077**	0.254***	
Sociodemographic Characteristics											
Age	-0.017	-0.003	0.228***	-0.061*	0.108***	0.037*	0.034	0.244***	0.369***	-0.053†	0.046
Male	-0.038	-0.061**	-0.031	0.059*	0.060**	-0.164***	0.031	-0.053*	0.087***	-0.101***	0.060*
Married or living with a partner	-0.018	-0.003	0.084***	0.007	0.023	0.034†	-0.007	0.000	-0.017	-0.061*	-0.022
Low income	0.157***	0.037	-0.161***	-0.066†	-0.062*	-0.047*	0.075**	0.080**	0.006	0.152***	0.168***
Medium-low income	0.152***	0.039	-0.077**	-0.027	-0.005	-0.002	-0.009	0.012	-0.015	0.061*	0.131***
Medium-high income	0.062†	0.076**	-0.080***	0.013	0.008	0.007	0.023	0.015	0.033	0.046	0.047†
High income (Reference)											
Educational attainment (Less than high school graduate=Reference)											
High school	0.006	-0.017	0.032	0.086†	0.023	0.035	-0.058	0.010	-0.044	-0.030	-0.123***
Some college	0.075	-0.002	0.096*	0.024	0.008	0.090**	-0.120***	0.012	-0.065	-0.002	-0.120**

Variables on the left-hand side →	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11) Poor or fair SRH
College graduate	-0.002	-0.069 [†]	0.101*	0.043	0.003	0.165***	-0.251***	0.005	-0.049	-0.031	-0.192***
Post-college	0.014	-0.091*	0.087*	0.036	0.036	0.198***	-0.292***	0.059	-0.049	0.030	-0.216***
Race (White=Reference)											
Black	0.262***	0.018	-0.044*	0.026	0.120***	-0.064***	-0.161***	0.046*	-0.032	-0.124***	0.032
Latino	0.197***	-0.103***	0.021	0.069*	0.110***	-0.023	-0.171***	0.008	-0.016	-0.004	-0.020
Asian	0.026	0.000	-0.002	-0.008	0.018	-0.013	-0.085***	-0.022	0.005	-0.067*	0.028
Biracial/Multiracial	0.104***	0.007	-0.014	0.025	0.014	-0.016	-0.011	0.004	-0.005	0.000	0.033 [†]
Native American	0.041 [†]	-0.022	0.001	0.019	0.017	-0.016	0.018	0.035	-0.032	0.010	0.030*

Model fit statistics: CFI=0.957, TLI=0.951, RMSEA=0.030

*** p 0.001;

** p 0.01;

* p 0.05;

[†] p 0.1.

Table 4Summary of standardized direct and indirect effects^a of discrimination on poor or fair SRH

			Coef.	t Value
Total effect			0.234	6.197***
Direct effect			0.128	2.461*
Total indirect effect			0.106	4.033***
Indirect effect via	Heath care system distrust		-0.004	-0.274
	Neighborhood social capital		0.038	3.241***
	Physically active	Chronic disease	0.015	2.564**
	Physically active	High blood cholesterol	0.002	1.881 [†]
	Physically active	Depression	0.003	1.982*
	Quality of sleep	Chronic disease	0.020	4.761***
	Quality of sleep	High blood cholesterol	0.002	1.923 [†]
	Quality of sleep	Depression	0.007	2.812**
	# Servings of fruits & vegetables	Chronic disease	-0.002	-1.749 [†]
	# Servings of fruits & vegetables	High blood cholesterol	0.000	0.309
	# Servings of fruits & vegetables	Depression	0.000	-1.323
	Smoking intensity	Chronic disease	0.013	3.360***
	Smoking intensity	High blood cholesterol	0.002	2.033*
	Smoking intensity	Depression	0.009	2.812**

p 0.001;**
p 0.01;*
p 0.05;[†]
p 0.1.^a In SEM, the direct effect is the estimate between two variables that are directly connected with an arrow and the indirect effect will link one variable to another with at least two arrows (see Figures 1 and 2).