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Psychosocial and Neighborhood Correlates of Health-related Quality of Life: A Multi-level Study among Hispanic Adults

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Abstract

Objective: Improvement in health-related quality of life (HRQoL) is a public health goal of *Healthy People 2020.* Hispanics living in the United States are at risk for poor HRQoL, but the causes and correlates of this risk are not well understood. Thus, the present study examined individual-level psychosocial and neighborhood-level built environment correlates of physical and mental HRQoL among Hispanic adults.

Methods: A community sample of Hispanic adults ($N = 383$) completed self-report health-related questionnaires, and census tract was used to collect data on neighborhood-level built environment variables. Multi-level modeling was used to examine individual-level psychosocial (language preference, religiosity, subjective social status, discrimination, and number of years lived in the United States) and neighborhood-level built-environment (the retail food environment, proximity to alcohol retailers, and tobacco retailer density) correlates of physical and mental HRQoL.

Results: Higher subjective social status was significantly associated with better HRQoL, and more experiences with discrimination were significantly associated with lower HRQoL. For physical HRQoL, these relationships were stronger in neighborhoods with a higher density of tobacco retail outlets.

Conclusions: Findings from this study suggest that subjective social status and discrimination play important roles in HRQoL among Hispanics, in particular in neighborhoods with a higher density of tobacco retail outlets. This study highlights the importance of considering neighborhood

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context, and in particular neighborhood disadvantage, when examining the relationship between social status, discrimination and HRQoL among Hispanics.

Keywords

social ecological model; health-related quality of life; built environment; Hispanics

Improvement in health-related quality of life (HRQoL), defined as an individual's perceived mental and physical health, is a public health goal of *Healthy People 2020* (Centers for Disease Control and Prevention [CDC], 2011). In the United States (US), HRQoL varies by race/ethnicity (Zack, 2013). Twenty-eight percent of Hispanics report fair or poor HRQoL, more than double the rate of non-Hispanic Whites (Zack, 2013). Hispanics are the largest ethnic minority group in the US and are expected to reach 29% of the US population by 2060 (CDC, 2014); therefore, improvement in HRQoL among Hispanics is critical to improving the health of the nation. Hispanics are a diverse population with varied psychosocial experiences and neighborhood environments that can shape HRQoL. Given this heterogeneity, there is a need to identify whom among this ethnic group suffers from low HRQoL and under what neighborhood conditions this occurs. Thus, the present study used an ecological approach to examine individual-level psychosocial and neighborhood-level built environment correlates of HRQoL among Hispanic adults living in the US.

Social Ecological Framework

The social ecological model is a framework for understanding how individual characteristics, and the larger social systems in which individuals live, interact to influence health outcomes (Sallis, Owen, & Fisher, 2008). The social ecological model proposes that HRQoL has multiple levels of influence, including individual, community, and policy-level factors, among others, and that these determinants interact with one another to shape HRQoL (Sallis et al., 2008). According to this framework, contextualizing an individual's attitudes, beliefs, and practices is critical to understanding their relationship with HRQoL.

The social ecological model represents a shift from an individually oriented analysis of health in community health promotion research (Stokols, 1996). This model stands in contrast to traditional health behavior theories that predominantly focus on how an individual's choices affect health, and that fail to consider the role of the broader context in which health-related choices are made. This shift is, in part, a response to the failure of some health promotion programs that focused solely on individual cognitive or behavioral modification (Stokols, 1996). The negligible impacts of these interventions suggested limitations in traditional heath behavior models (Stokols, 1996). The social ecological framework recognizes that there are a myriad of factors outside of an individual's beliefs and behaviors that influence health.

Considering the role of the environment in health, the social ecological model provides a more comprehensive framework for understanding determinants of health. In addition, the social ecological model allows for more comprehensive interventions to be developed that target mechanisms to improve health at multiple levels of influence. A critical aspect of the model is that health is impacted by multiple levels of influence (e.g., individual, community,

policy) and that these levels are interactive and reinforcing and can have cumulative effects on health (Golden & Earp, 2012). For example, chronic exposure to tobacco retailers may increase the negative impacts of depression on health by facilitating access to cigarettes as a coping mechanism for depressed mood. An intervention to improve health in this case may be most effective if it targets both individual-level factors associated with mood as well as promotes an environment in which healthy choices for coping with low mood can be more easily made.

Psychosocial Influences.

At the individual level, the present study explores the relationships between several psychosocial constructs that have been associated with HRQoL among Hispanics. These include 1) acculturation, 2) religiosity, 3) subjective social status, and 4) perceived discrimination.

Acculturation.

Acculturation plays a critical role in health among Hispanics (Abraido-Lanza, Echeverria, & Florez, 2016; Lara, Gamboa, Kahramanian, Morales, & Bautista, 2005). Although several definitions of acculturation have been proposed, most view acculturation as a process of behavior and attitude change as a result of contact with another culture (Abraído-Lanza, Armbrister, Florez, & Aguirre, 2006). To date, most studies have found higher levels of acculturation to be adversely associated with health and health behaviors (e.g., diet, substance use) among Hispanics (Abraido-Lanza et al., 2016; Abraido-Lanza et al., 2006; Abraido-Lanza, Chao & Florez, 2005; Lara et al., 2005). Research examining the relationship between acculturation and HRQoL among Hispanics has largely been undertaken in clinical samples, precluding generalizability to community samples (e.g., Brzyski, Medrano, Hyatt-Santos, & Ross, 2001; Stephens, Stein, & Landrine, 2010; Thoman & Suris, 2004; Urizar & Sears, 2006; Wildes, Miller, San Miguel de Majors, & Ramirez, 2009). The few studies undertaken in non-clinical Hispanic samples have had mixed findings regarding the relationship between acculturation and HRQoL. For example, one study found higher levels of acculturation were associated with worse physical HRQoL, but there was no significant relationship with mental HRQoL (Franzini & Fernandez-Esquer, 2004). However, another study in a community sample found higher levels of acculturation to be associated with better mental and overall HRQoL (Kandula, Lauderdale, & Baker, 2007). Research is needed to clarify previous findings and to extend what is known about the relationship between acculturation and mental and physical HRQoL. The present study uses two widely-used proxy measures of acculturation, language preference and the number of years lived in the United States, to examine an individual's level of acculturation (Abraido-Lanza et al., 2006).

Religiosity.

Many studies show that greater religiosity is associated with better mental and physical health (George, Ellison, & Larson, 2002; Koenig, King, & Carson, 2012). Religiosity is a broad term that refers to the extent to which one participates in the beliefs and practices of religion (e.g., attending church, prayer; Wildes et al., 2009). Religiosity is believed to be

associated with health through several psychosocial mechanisms such as social support, health practices, and psychosocial resources (e.g., self-esteem, self-efficacy), for example. The strongest relationships between religiosity and health have been found for attendance at religious services (George et al., 2002). Attendance at religious activities may facilitate social support, which, in turn, has been shown to promote and protect health. Previous research examining the relationship between religiosity and HRQoL among Hispanics suggests that religiosity and spirituality is positively associated with several aspects of HRQoL including social and functional well-being (Ashing-Giwa et al., 2008; Wan et al., 1999; Wildes et al., 2009); however these studies have been largely limited to clinical populations. The majority of Hispanics report that religion is important to them, highlighting the importance of understanding the relationship between religion and HRQoL in community samples (Pew Research Center).

Subjective Social Status.

Subjective social status has been defined as "a person's belief about his location in a status order" (Davis, 1956). The concept of subjective social status is believed to consist of more than just socioeconomic variables like education, income, or occupation. Subjective social status is believed to also include a personal assessment of one's social standing. In addition, this construct not only incorporates an assessment of one's present and past, but also takes into account future opportunities (Singh-Manoux, Adler, & Marmot, 2003).

Previous studies have found significant, positive relationships between subjective social status and health-related quality of life (e.g., Adler et al., 2000; Hoebel, Kuntz, Müters, & Lampert, 2013; Singh-Manoux, Marmot, & Adler, 2005). Few studies, however, have examined this relationship among Hispanics. Franzini and Fernandez-Esquer (2006) found that subjective social status was significantly, positively associated with mental and physical health-related quality of life in a sample of 1,745 Mexican-origin men and women living in in Texas. Another study found that subjective social status was significantly, positively associated with self-rated health among pregnant Hispanic women (Ostrove, Adler, Kupperman, & Washington, 2000). However, this relationship was no longer significant when controlling for education and household income.

Perceived Discrimination.

Greater perceived discrimination has been significantly associated with poorer HRQoL (Howarter & Bennet, 2012; Molina, Alegria, & Mahalingam, 2013; Ontiniano & Gee, 2012). Discrimination can impact health through psychological, psychological, and behavioral mechanisms (Williams, Yan, Jackson, & Anderson, 1997). Studies indicate that discrimination is associated with several mental and physical health issues like high blood pressure, depression, and lower perceived well-being (Finch, Kolody, & Vega, 2000; Gee, 2002; Gee, Ryan, Laflamme, & Holt, 2006; Krieger & Sidney, 1996). Although the literature on discrimination and HRQoL has grown, especially among African Americans, less research is available among Hispanics (Ontiniano & Gee, 2012). Studies typically find discrimination to be significantly, positively associated with worse mental and physical HRQoL among Hispanics (Gee et al., 2006; Howarter & Bennet, 2012). A review of studies examining the relationship between discrimination and health noted, however, that a

limitation of the literature is the often narrow conceptualization of discrimination used in studies and failure to assess discrimination comprehensively (Williams & Mohmmed, 2009). The present study will extend what is known about the relationship between discrimination and HRQoL by using a comprehensive measure of discrimination that asks respondents about perceived discrimination in nine different contexts (e.g., school, work).

Neighborhood Environment

The relationship between psychosocial variables and HRQoL should be understood within an environmental context (i.e., neighborhood environment). Studies consistently show that the neighborhood environment in which one lives is associated with a range of health behaviors and outcomes such as smoking (Echeverria, Diez-Roux, Shea, Borrell, & Jackson, 2008), diet (Moore, Diez Roux, Nettleton, Jacobs, & Franco, 2009), physical activity and cardiovascular disease (Diez Roux, 2003). Nonetheless, research examining the relationship between psychosocial variables and health has rarely considered the role of the neighborhood environment. Including neighborhood context in health research allows for a more nuanced understanding of this complex relationship.

The impact of the environment on health has previously been documented among minority populations, with greater neighborhood deprivation associated with worse self-rated health (Adler & Stewart, 2010; Diez Roux & Mair, 2010). The relationship between the neighborhood retail environment and health has received particular attention. The neighborhood retail environment can be used as a proxy to assess neighborhood deprivation. Neighborhoods with few supermarkets and grocery stores that offer healthy foods such as fruits and vegetables, and with many tobacco and alcohol retailers, may reflect neighborhood disadvantage because these areas allow greater opportunity to engage in unhealthy behaviors. For example, a study among an ethnically diverse sample of smokers in Houston, Texas found that living within a short walking distance of a tobacco outlet was associated with lower likelihood of smoking abstinence (Reitzel et al., 2011). Another study among a community sample in Detroit, Michigan found that living in a neighborhood with a large grocery store was associated with consuming .69 more daily servings of fruit and vegetables, and that this relationship varied by race/ethnicity (Zenk, Schulz, Kannan, Lachance, Mentz, & Ridella, 2009). Hispanics living in a neighborhood with a large grocery store consumed 2.2 more daily servings of fruits and vegetables as compared to African Americans living in a neighborhood with a large grocery store (Zenk et al., 2009). Lovasi et al. (2009) noted the important role the retail food environment plays in obesity among Hispanics because predominantly Hispanic neighborhoods in the US tend to have fewer healthy food stores.

Despite the significance of the neighborhood environment in health, there is a paucity of research that considers the role the neighborhood environment plays in the relationship between individual-level psychosocial factors and health among Hispanics. Adler and Stewart (2010) recommended the study of moderators of the relationship between demographic characteristics and health in multi-level analyses, noting that the relationship between demographic characteristics and health is complex and may not be best explained by independent associations. For example, the relationship between acculturation and

HRQoL may be stronger in places with many alcohol retailers because greater access to alcohol retailers may facilitate the use of alcohol as a way to cope with experiences of acculturation, and in turn, adversely impact health. Exploring the potential moderating role of the neighborhood environment may help to better understand the relationship between individual-level psychosocial factors and health.

Present Study

This study examined how individual-level psychosocial factors and the neighborhood environment relate to HRQoL among Hispanic adults living in the US. There were three aims. The first aim was to examine the relationship of individual-level psychosocial variables to both physical and mental HRQoL. Several variables were examined: 1) acculturation, 2) religiosity, 3) subjective social status, and 4) perceived discrimination. The second aim was to examine the relationship between the neighborhood retail environment and HRQoL. Three aspects of the neighborhood retail environment were examined: 1) the retail food environment, 2) proximity to alcohol retailers, and 3) tobacco retailer density. The final aim was to examine if the neighborhood environment moderates the relationship between individual-level psychosocial factors and HRQoL. Age, gender, and income were included as covariates in all models because previous literature has found significant relationships between these sociodemographic characteristics and HRQoL (Cherepanov, Palta, Fryback, & Robert, 2010; Fryback et al., 2009; Kaplan, Anderson, & Wingard, 1991; Robert et al., 2009). Based on the social ecological framework, we hypothesized that the relationship between individual-level psychosocial variables and HRQoL would be moderated by the neighborhood retail environment.

Methods

Participants and Procedures

Participants were a community sample of Hispanic adults ($N = 383$) in San Diego, California. Participants were recruited to participate in a randomized controlled trial that evaluated an educational video about clinical trials tailored for Hispanics. To be eligible for inclusion, individuals must have: 1) self-identified as Hispanic, 2) been at least 21 years of age, 3) been residents of the US, and 4) been literate in English and/or Spanish. Eligible participants gave written consent and completed a survey packet of health-related questionnaires in their preferred language (English or Spanish) at baseline in 2012–2013, before randomization. Participants also provided their home address as part of the survey. Survey completion of the paper-and-pencil self-administered questionnaires took approximately one hour and participants received $75 for their time. The Institutional Review Boards of San Diego State University and University of California, San Diego approved all study procedures and materials prior to human subject enrollment.

The present study is a secondary data analysis of responses to survey questions from the parent study. Individual-level psychosocial measures were comprised of the following: Brief Acculturation Scale for Hispanics (BASH; Norris, Ford, & Bova, 1996), Duke University Religion Index (DUREL; Koenig & Bussing, 2010), MacArthur Scale of Subjective Social Status (SSS; Adler, Epel, Castellazo, & Ickovics, 2000), the Experiences of Discrimination

scale (EOD; Krieger, Smith, Naishadham, Hartman, & Barbeau, 2005), and the number of years participants lived in the US. Neighborhood-level retail environment measures included the Modified Retail Food Environment Index (mRFEI), proximity to an alcohol outlet, and tobacco outlet density.

Measures

Psychosocial Measures.—Psychosocial data were obtained at the individual level. Data were gathered from responses to self-report measures included in the survey packet.

MacArthur Scale of Subjective Social Status (SSS; Adler, Epel, Castellazo, & Ickovics, 2000).: The SSS is a self-anchoring visual scale in the form of a 10-rung ladder. Participants were asked to place themselves on a rung of the ladder where they believe they stand relative to others. Participants completed two ladders. On one, they compared themselves to other individuals within their community (SSS-Community). On the other, they compared themselves to others in the US (SSS-US). Scores for each single-item scale can range from 1 to 10, with higher scores reflecting greater perceived subjective social status.

Duke University Religion Index (DUREL; Koenig & Bussing, 2010).: The DUREL is a brief measure of religious involvement. The measure has three subscales that examine organizational religious activity, non-organizational religious activity, and intrinsic religiosity. The single-item organizational religious activity subscale was used in the present study. This subscale score ranges from 1 to 6, with higher scores indicating more frequent organizational religious activity (e.g., attendance at church).

Brief Acculturation Scale for Hispanics (BASH; Norris, Ford, & Bova, 1996).: The BASH is a four-item measure that uses language preference as a proxy for acculturation in Hispanics. Respondents select the language in which they think, speak at home, speak with friends, and read. Scores range from 4 to 20, with higher scores indicating greater levels of acculturation (i.e., use of English). Internal consistency reliability was excellent in the present study ($\alpha = .95$).

Experiences of Discrimination scale (EOD; Krieger, Smith, Naishadham, Hartman, & Barbeau, 2005).: The EOD scale is a nine-item self-report measure of racial/ethnic discrimination. Respondents select the frequency with which they have experienced discrimination in nine different contexts (e.g., at school, at work). Scores range from 0 to 45, with higher scores reflecting more experiences with discrimination. Internal consistency reliability was very good in the present study ($\alpha = .87$).

Neighborhood-level Retail Environment Measures.—Each participant's neighborhood-level data was obtained at the census tract level. The census tract in which a participant lived was determined based on the participant's reported home address. Census tracts were defined according to the US Census Bureau and are considered to be relatively homogeneous units based on population characteristics (Fry & Taylor, 2012). These data came from the Healthy Communities Data and Indicators Project (HCI) collected by the

California Department of Public Health and the University of California, San Francisco and from the California State Board of Equalization.

Healthy Food Retailers.: The retail food environment was assessed using the Modified Retail Food Environment Index (mRFEI), an indicator developed by the CDC, which provides the percentage of healthy food retailers for each census tract. Healthy food retailers include supermarkets, large grocery stores, supercenters, and produce stores as defined by the North American Industry Classification Codes. Less healthy food retailers include fast-food restaurants, small grocery stores, and convenience stores as defined by North American Industry Classification Codes. Scores range from 0 to 100, with higher scores indicating a healthier retail food environment. Data on the mRFEI analyzed in the present study were collected by the CDC and gathered from a publicly available database (CDC).

Proximity to Alcohol Outlets.: Proximity to an alcohol outlet was defined as the percent of the population in a census tract within .25 miles of an alcohol outlet. Addresses of all establishments with active off-sale licenses (e.g., liquor stores, grocery stores) were obtained from the California Department of Alcohol and Beverage Control by HCI and geocoded using Browser Based Geocoder. Geocoded addresses were then imported into ArcMap. Buffers of one-quarter (.25) mile were created around all alcohol establishments, and block data were then aggregated by census tract. Percent of the population in a census tract living within .25 miles of an alcohol outlet can range from 0% to 100% of the population. A higher percentage indicates that a greater percent of the population lives within close proximity to an alcohol outlet.

Density of Tobacco Outlets.: The density of tobacco outlets was defined as the number of active tobacco retailers per square mile for each census tract (e.g., eight tobacco retailers per square mile). This was calculated by dividing the number of active tobacco retailers by the area in square miles for each census tract. A higher value indicates a greater density of tobacco outlets. Tobacco retailer data came from the California State Board of Equalization, which is responsible for collecting the state tax imposed on all tobacco products.

Health-related Quality of Life.—HRQoL data were obtained at the individual level. HRQoL data were gathered from participant responses to the 12-item Short Form Health Survey included in the survey packet.

12-Item Short Form Health Survey (SF-12; Ware, Kosinski, & Keller, 1996).: The SF-12, a short form of the Medical Outcomes Study Short-Form Health Survey (SF-36; Ware & Sherbourne, 1992), was used to measure HRQoL. The SF-12 is a 12-item self-report measure of health-related quality of life that assesses eight health domains. The SF-12 can yield two general scores: the physical component summary (SF-12 PCS) and the mental component summary (SF-12 MCS). The SF-12 PCS measures the following health domains: General Health, Physical Functioning, Role Physical, and Bodily Pain. The SF-12 MCS measures the following domains: Vitality, Social Functioning, Role Emotional, and Mental Health.[1] SF-12 scores were calculated using software from the measure's developers. SF-12 PCS and SF-12 MCS scores range from 0 to 100, with higher scores indicating better HRQoL. The subscales were designed to have a mean of 50 and standard deviation of 10 in

a sample representative of the US population. Internal consistency reliability was good for the SF-12 MCS ($\alpha = .82$) and the SF-12 PCS ($\alpha = .79$) in the present study.

Sociodemographic characteristics.—Information on participant age, gender, median household income, and number of years lived in the US was gathered from participant responses in the survey packet.

Data Analysis Plan

First, descriptive statistics were calculated for the total sample, and Pearson correlation coefficients were used to examine relationships among the psychosocial variables. Next, multi-level modeling tested the relationships of person-level psychosocial variables and neighborhood-level environment variables to mental and physical HRQoL (aims 1–3). Separate models were examined for mental and physical HRQoL. A multi-level data structure contains observations at one level of analysis that are nested within observations at another level of analysis. A key component of multi-level modeling is that the data at different levels of analysis are interdependent (Nezlek, 2012). In the present study, multi-level modeling was used to account for clustering of individuals within neighborhoods. Age, gender, and income were controlled for in all analyses.

Multi-level linear modeling proceeded in four phases, examining the: 1) intercept-only model, 2) random-regression coefficients model, 3) means-as-outcome model, and 4) intercepts- and slopes-as-outcomes model. To explain the proportion of variability in HRQoL attributable to clustering at the census tract level, the intercept-only model was evaluated. Next, to examine the relationship between person-level psychosocial variables and mental and physical HRQoL, the random-regression coefficients model was evaluated [aim 1]. In the random-regression coefficients model, psychosocial variables were included as the only predictors in the model. Separate models were run for each psychosocial variable. Psychosocial variables that were not significantly associated with mental or physical HRQoL at this step were not included in further analyses. Next, the means-as-outcome model was examined to assess the relationship between the neighborhood-level environment variables and mental and physical HRQoL, after controlling for the psychosocial variables [aim 2]. The means-as-outcome model includes both neighborhood predictor variables and psychosocial variables. Last, the intercepts- and slopes-as-outcomes model was examined to assess whether neighborhood moderated the relationship between person-level psychosocial variables and HRQoL. This last model included both person-level and neighborhood-level variables simultaneously, as well as a cross-level interaction term. To reduce type II error, a *p*-value of .10 was used to evaluate significance for the interaction terms because of the exploratory nature of the present study [aim 3]. Multi-level models were conducted in SPSS Version 25.

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[1]The General Health domain reflects perceptions about overall personal health. The Physical Functioning domain reflects perceived ability to perform physical activities. The Role Physical domain reflects perceived limitations with work or other activities because of one's physical health. The Bodily Pain domain reflects the extent of perceived pain and one's limitations due to pain. The Vitality domain reflects perceived level of fatigue and energy. The Social Functioning domain reflects perceived limitations to social activities because of one's physical or emotional health. The Role Emotional domain reflects perceived limitations with work or other activities because of one's mental health. The Mental Health domain reflects perceived mental health. For a more detailed description of the Short Form Health Survey domains, see Ware and Sherbourne (1992).

Results

Descriptive Statistics

Sample characteristics can be found in Table 1. Participants (N = 383) had a mean age of 43.61 years (SD = 14.69) and were close to equally split among men (n = 188; 49.1%) and women (n = 195; 50.9%). Thirty-six percent of the sample had less than a high school education. Approximately half of participants had an annual household income of less than $20,000. Forty-two percent of the sample was born in Mexico and 43% of the sample was born in the US. About half of participants completed the survey in Spanish (n = 189) and the other participants completed the survey in English (n = 194). Participants had a mean SF-12 PCS score of 49.97 (SD = 8.97) and a mean SF-12 MCS score of 47.26 (SD = 9.83). Census tract characteristics for the study sample can be found in Table 1. Correlations among the psychosocial variables can be found in Table 2.

Multi-level Modeling

SF-12 PCS.—The intercept-only model revealed an intraclass correlation coefficient of .05. Thus, 5% of the variance in physical HRQoL was between census tracts and 95% of the variance was at the individual level. For aim 1, random-regression coefficients models were examined that assessed relationships between the psychosocial variables and the SF-12 PCS (see Table 3). SSS-Community scores were significantly, positively associated with the SF-12 PCS, but SSS-US scores were not significantly associated with the SF-12 PCS (SSS-Community: b = .55, p = .01; SSS-US: b = .47, p =.05). EOD scores were significantly, negatively associated with the SF-12 PCS (b = −.12, p = .02). No other psychosocial variables were significantly associated with the SF-12 PCS. For aim 2, means-as-outcomes models were examined to assess the relationship between each neighborhood retail environment variable and the SF-12 PCS (see Table 4). No neighborhood variables were significantly associated with the SF-12 PCS. For aim 3, the intercepts- and slopes-as-outcomes models were tested; these also included analysis of a cross-level interaction between each neighborhood and acculturation variable. There was a significant cross-level interaction between tobacco retail density and SSS-Community scores (b = .03, p = .07). The positive relationship between SSS-Community and SF-12 PCS scores was stronger among participants who lived in neighborhoods with a higher density of tobacco retailers as compared to participants who lived in neighborhoods with a lower density of tobacco retailers. There was also a significant cross-level interaction between tobacco retail density and EOD scores (b = −.01, p = .06). The negative relationship between EOD and SF-12 PCS scores was stronger among participants who lived in neighborhoods with a high density of tobacco retailers as compared to participants who lived in neighborhoods with a low density of tobacco retailers. There were no other significant (p > .10) cross-level interactions.

SF-12 MCS.—The intercept-only model revealed an intraclass correlation coefficient of .04. Thus, 4% of the variance in physical HRQoL was between census tracts and 96% of the variance was at the individual level. For aim 1, SSS-Community and SSS-US scores were significantly, positively associated with the SF-12 MCS (SSS-Community: b = .87, p < .01; SSS-US: b = 1.10, p < .01; see Table 3). EOD scores were significantly, negatively associated with the SF-12 MCS (b = −.24, p < .01). All other psychosocial variables were

not significantly associated with the SF-12 MCS. For aim 2, no neighborhood variables were significantly ($p > .05$) associated with the SF-12 MCS (see Table 4). For aim 3, there were no significant ($p > .10$) cross-level interactions.

Discussion

The present study used an ecological approach to examine psychosocial (individual) and neighborhood (environmental) factors associated with physical and mental HRQoL among Hispanics. The SF-12 PCS and SF-12 MCS scores were developed to have a mean score of 50 and a standard deviation of 10 in a population-based US sample (Jerant et al., 2008). A minimal clinically important difference (MCID) has not been established for the SF-12; however, a MCID of three to five points has been recommended for the long-form SF-36 and both measures were designed to have the same score means, standard deviations, and range (Hays & Morales, 2001). Hays and Morales (2001), however, noted that previous studies have found clinically important changes in the SF-36 measure with differences in total scores as small as .86 ($SD = .09$) points. Thus, participants in the present study (with a mean of 49.97) appear to have average physical HRQoL as compared to the overall US population, but their average mental HRQoL (mean of 47.26) is 2.74 points lower than the value for the overall US population, suggesting worse mental HRQoL to an extent that is clinically meaningful.

Higher subjective social status compared to other people in one's community was associated with both better physical and mental HRQoL. Higher subjective social status compared to others in the US was associated with better mental HRQoL, but not physical HRQoL. Overall, these findings are consistent with previous studies that have shown significant, positive relationships between subjective social status and HRQoL (e.g., Adler et al., 2000; Hoebel, Kuntz, Müters, & Lampert, 2013; Singh-Manoux, Marmot, & Adler, 2005). Subjective social status has been related to health through sustained activation of the body's stress-response (Sapolsky, 2004). The stress response can initiate physiological responses (e.g., elevated blood pressure, cortisol secretions) that, over time, can negatively impact health. In addition to physiological mechanisms, subjective social status has been associated with health through psychosocial mediators. Psychosocial factors such as self-esteem and sense of control have been found to mediate the relationship between subjective social status and self-rated health (Bosma et al., 2005; Bosma, Schrijvers, & Mackenbach, 1999; Matthews, Raikkonen, Gallo, & Kuller, 2008). Future studies should examine psychosocial mediators of the relationship between subjective social status and health specifically among Hispanics, as psychosocial mediators may vary cross-culturally dependent on the meaning and salience of these constructs for particular cultural groups (Kan et al., 2014).

Consistent with previous research, more experiences with discrimination were associated with worse physical and mental HRQoL in the present study. Like subjective social status, discrimination has been related to physical and mental health through a mobilization of the body's stress response (Pascoe & Richman, 2009). In addition, discrimination has been shown to put individuals at greater risk for engaging in health behaviors (e.g., tobacco use) that provide short-term stress relief, but may have long-term negative impacts on health (Pascoe & Richman, 2009). Discrimination is a common experience among Hispanics in the

US with close to half of US-born Hispanics and a quarter of the foreign-born reporting everyday discrimination (Perez, Fortuna, & Alegria, 2008). This research suggests the need for interventions that identify ways to buffer the relationship between discrimination and HRQoL among Hispanics.

Religiosity and the commonly used proxy measures of acculturation, language preference and years lived in the US, were not associated with physical or mental HRQoL. Religiosity may not have been associated with HRQoL because the measure used to assess the construct in the present study asked about how often respondents attended church and religious meetings. Religiosity has been linked to HRQoL through increased social support (George et al., 2002). Frequency of attendance at church and religious meetings may not well capture strength of relationships and support. In addition, results from this study provide insight into the inconsistent findings seen in the literature relating acculturation to health in Hispanics and highlight the importance of carefully selecting constructs to measure when examining acculturation. Proxy measures of acculturation are limited because they assume acculturation is reflected in the amount of exposure individuals have to the dominant culture (Cabassa, 2003). These measures often provide an incomplete picture of acculturation and fail to capture the intricacies of the process of cultural change (Cabassa, 2003). In addition, although not a primary focus of the study, consistent with prior research (Brazier et al., 1992), higher income was significantly associated with better mental and physical HRQoL and older age was significantly associated with worse physical HRQoL.

There were no significant main effect relationships between the neighborhood retail environment and HRQoL. This may be a result of examining the relationship between particular aspects of the retail environment and HRQoL. Health outcomes are typically the result of multiple environmental issues simultaneously affecting individuals. The relationship between one aspect of the neighborhood environment and health is likely confounded by other neighborhood issues, potentially obstructing the ability to find a significant relationship between one particular aspect of the neighborhood environment and HRQoL (Lovasi et al., 2009). Future studies should consider the use of latent variables to combine different aspects of the neighborhood environment into more robust variables.

Although there were no significant main effect relationships between the neighborhood retail environment and HRQoL in the present study, there were two significant cross-level interactions. Lower subjective social status as compared to one's community and more experiences with discrimination were both more strongly associated with worse physical HRQoL in neighborhoods with a higher density of tobacco retailers. Neighborhoods with a high density of tobacco retailers are typically areas where residents with low socioeconomic status reside (Rodriguez, Carlos, Adachi-Mejia, Berke, & Sargent, 2014). Thus, this may suggest that subjective social status and discrimination have a stronger relationship to physical HRQoL in more disadvantaged neighborhoods. Holding a negative view about oneself in comparison to others or feeling discriminated against may be particularly detrimental for HRQoL in disadvantaged neighborhoods where there may be more opportunity to engage in health-risk behaviors in an effort to cope with these challenges. For example, Hispanics living in neighborhoods with a high density of tobacco retailers may use smoking as a way to cope with discrimination and low socioeconomic status, potentially

explaining the stronger relationship to physical HRQoL. This finding is of particular importance for Hispanics living in the US given the marginalization and discrimination they may experience.

Results should be interpreted while considering study limitations. Study participants were predominantly of Mexican descent and resided in a metropolitan border city in southern California, limiting the generalizability of study results. In addition, the present study only examined the built environment in the census tract in which a participant lived. Examination of other spatial areas participants frequent (e.g., geographic area around work) may provide further insight into the role the environmental context plays in physical and mental HRQoL. Finally, the study was a secondary analysis of cross-sectional data, precluding determination of causality.

In summary, the present study examine the relationship between several psychosocial variables and HRQoL and considered the potential moderating role of the neighborhood built environment. Findings from this study suggest that subjective social status and discrimination play important roles in HRQoL among Hispanics, and this may be particularly true in disadvantaged neighborhoods. These findings help identify who among this group is in particular need of intervention to meet the *Healthy People 2020* goal of improving HRQoL in the US (Zack, 2013). Furthermore, this study highlights the importance of considering neighborhood context when examining the relationship between social status, discrimination, and HRQoL among Hispanics.

Acknowledgements:

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Table 1.

Sample Characteristics (N = 383)

Variable		*M (SD)/ n (%)*
Age[a]		43.61 (14.69)
Gender[b]		
Female		195 (50.9%)
Male		188 (49.1%)
Education[b]		
Less than High School		136 (35.6%)
High school/ Trade School		100 (26.1%)
Some college/Associates degree		80 (20.9%)
Bachelor's degree		31 (8.1%)
Postgraduate		18 (4.7%)
Missing / Don't Know		18 (4.7%)
Annual Household Income[b]		
Less than $20,000		194 (50.6%)
$20,000 to $49,999		111 (29.0%)
$50,000 to $74,999		21 (5.5%)
$75,000 or more		25 (6.5%)
Missing/ Don't Know		32 (8.4%)
Country of birth[b]		
United States		166 (43.3%)
Mexico		159 (41.5%)
Other		17 (4.6%)
Missing		41 (10.7%)
Years lived in the United States[a]		30.01 years (15. 80); range: .75 – 84
Short Form Health Survey (SF-12)[a]		
Physical Component Summary		49.97 (8.97); range: 20.02 – 68.21
Mental Component Summary		47.26 (9.83); range: 6.83 – 65.89
MacArthur Scale of Subjective Social Status – Community[a]		6.11 (2.25); range: 1 – 10
MacArthur Scale of Subjective Social Status – United States[a]		4.95 (1.97); range: 1 – 10
Duke University Religion Index – Organizational[a]		3.68 (1.65); range: 1 – 6
Brief Acculturation Scale for Hispanics[a]		11.42 (5.23); range: 4 – 20
Experiences of Discrimination[a]		6.85 (9.09); range: 0 – 45
Healthy Food Retailers[a]		14.81 (7.92)
Proximity to Alcohol Outlets[a]		60.33% (31.30)

Variable		*M (SD)/ n (%)*
Density of Tobacco Retailers[a]		11.10 (10.92)

Note.

[a]*M (SD)*

[b]*n (%).*

Table 2.

Pearson correlation coefficients among the psychosocial variables

Scale	1	2	3	4	5	6
1. Language preference [Acculturation]	-	.48*	−.19*	−.08	.01	.11*
2. Years lived in the US [Acculturation]		-	.03	.14*	.15*	.09
3. Religiosity			-	.01	−.06	.06
4. SSS - Community				−	.59*	−.05
5. SSS - US					-	−.10
6. Discrimination						-

Note. SSS= Subjective Social Status.

*
$p < .05$.

Table 3.

Multi-level Analyses: Random-Regression Coefficients Models

Variable	SF-12 MCS		SF-12 PCS	
	b	*95% CI*	*b*	*95% CI*
Age	−.03	−.10, .04	**−.14**	**−.21, −.08**
Gender	−1.03	−3.06, 1.00	−.20	−2.0, 1.6
Income	**2.05**	**1.01, 3.09**	**2.16**	**1.24, 3.09**
SSS - Community	**.87**	**.40, 1.34**	**.55**	**.13, .97**
Age	−.03	−.10, .04	**−.13**	**−.19, −.07**
Gender	−1.05	−3.05, .96	−.10	−1.89, 1.70
Income	**1.84**	**.80, 2.89**	**2.17**	**1.24, 3.11**
SSS - United States	**1.10**	**.57, 1.63**	.47	−.01, .95
Age	.01	−.06, .08	**−.12**	**−.18, −.06**
Gender	−.93	−2.97, 1.12	−.06	−1.85, 1.75
Income	**2.41**	**1.38, 3.45**	**2.39**	**1.48, 3.30**
Religion	−.34	−.98, .30	−.18	−.74, .38
Age	−.01	−.07, .06	**−.12**	**−.18, −.06**
Gender	−1.47	−3.5, .54	−.25	−2.05, 1.56
Income	**2.53**	**1.53, 3.53**	**2.40**	**1.50, 3.30**
Discrimination	**−.24**	**−.35, −.13**	**−.12**	**−.22, −.02**
Age	.01	−.06, .08	**−.12**	**−.18, −.06**
Gender	−.94	−2.99, 1.11	−.01	−1.81, 1.79
Income	**2.38**	**1.34, 3.42**	**2.40**	**1.48, 3.32**
Language Preference	.12	−.09, .33	.01	−.17, .20
Age	−.02	−.10, .05	**−.10**	**−.16, −.03**
Gender	−.88	−2.93, 1.17	−.21	−2.01, 1.59
Income	**2.37**	**1.34, 3.40**	**2.52**	**1.62, 3.43**
Years lived in the US	.05	−.03, .12	−.05	−.11, .01

Note. Bold font indicates $p < .05$. b = unstandardized regression coefficient; SF-12 MCS = 12-item Short Form Health Survey Mental Component Summary; SF-12 PCS = 12-item Short Form Health Survey

Physical Component Summary; SSS= Subjective Social Status.

Table 4.

Means-as-Outcomes Models for the SF-12 MCS and SF-12 PCS Outcomes

Variable	SF-12 MCS						SF-12 PCS					
	Retail Food Environment		Proximity to Alcohol Outlet		Tobacco Retailer Density		Retail Food Environment		Proximity to Alcohol Outlet		Tobacco Retailer Density	
	b	95 % CI	b	95 % CI	b	95 % CI	b	95 % CI	b	95 % CI	b	95 % CI
Age	−.02	−.10, .05	−.03	−.10, .04	−.03	−.10, .04	**−.15**	**−.21, −.08**	**−.14**	**−.21, −.08**	**−.14**	**−.21, −.08**
Gender	−1.28	−3.40, .85	−1.12	−3.19, .89	−1.12	−3.16, .92	−.07	−1.93, 1.80	−.05	−1.87, 1.77	−.17	−1.98, 1.64
Income	**2.08**	**1.00, 3.16**	**1.93**	**.86, 3.00**	**1.99**	**.94, 3.04**	**2.10**	**1.15, 3.04**	**2.23**	**1.28, 3.18**	**2.18**	**1.25, 3.11**
SSS – Community	**.81**	**.32, 1.30**	**.86**	**.39, 1.33**	**.88**	**.41, 1.36**	**.58**	**.15, 1.00**	**.56**	**.14, .98**	**.55**	**.13, .96**
Retail Environment	−.10	−.24, .04	−.03	−.06, .00	−.05	−.15, .04	−.07	−.19, .05	.01	−.02, .04	.02	−.07, .10
Age	−.02	−.09, .05	−.03	−.10, .04	−.03	−.10, .04	**−.14**	**−.21, −.08**	**−.14**	**−.20, −.07**	**−.13**	**−.20, −.07**
Gender	−1.26	−3.37, .85	−1.15	−3.16, .87	−1.14	−3.15, .87	.02	−1.85, 1.89	.06	−1.78, 1.87	−.04	−1.84, 1.76
Income	**1.88**	**.80, 2.97**	**1.77**	**.71, 2.84**	**1.78**	**.73, 2.83**	**2.13**	**1.16, 3.09**	**2.25**	**1.29, 3.21**	**2.20**	**1.26, 3.14**
SSS – United States	**1.01**	**.46, 1.57**	**1.07**	**.54, 1.61**	**1.10**	**.57, 1.63**	.49	−.00, .99	**.50**	**.02, .99**	.47	−.00, .95
Retail Environment	−.10	−.24, .04	−.03	−.06, .01	−.05	−.15, .05	−.06	−.18, .06	.02	−.02, .05	.03	−.05, .12
Age	.00	−.07, .07	−.00	−.07, .06	−.00	−.07, .06	**−.13**	**−.20, −.07**	**−.13**	**−.19, −.06**	**−.12**	**−.18, −.06**
Gender	−1.62	−3.73, .50	−1.61	−3.63, .41	−1.58	−3.60, .43	−.13	−2.01, 1.74	−.10	−1.93, 1.71	−.19	−2.00, 1.62
Income	**2.50**	**1.45, 3.55**	**2.45**	**1.42, 3.48**	**2.47**	**1.47, 3.48**	**2.36**	**1.43, 3.29**	**2.50**	**1.58, 3.43**	**2.42**	**1.52, 3.33**
Discrimination	**−.23**	**−.35, −.12**	**−.23**	**−.34, −.12**	**−.24**	**−.35, −.14**	**−.13**	**−.23, −.03**	**−.12**	**−.22, −.03**	**−.12**	**−.22, −.02**
Retail Environment	−.09	−.23, .04	−.03	−.06, .01	−.06	−.16, .03	−.04	−.16, .08	.02	−.01, .05	.03	−.06, .11

Note. Bold font indicates $p < .05$. b = unstandardized regression coefficient; SF-12 MCS = 12-item Short Form Health Survey Mental Component Summary; SF-12 PCS = 12-item Short Form Health Survey Physical Component Summary; SSS = Subjective Social Status.