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2016

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UNIVERSITY OF CALIFORNIA, SAN DIEGO

SAN DIEGO STATE UNIVERSITY

Acculturation, the Built Environment, and Health-related Quality of Life:  
A Multi-level Study in Hispanic Americans

A dissertation submitted in partial satisfaction of the requirements for the degree Doctor  
of Philosophy

in

Clinical Psychology

by

Sarah Denton Mills

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2017

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Co-Chair

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University of California, San Diego

San Diego State University

2017

## DEDICATION

To my parents, Donna and David Mills, thank you.

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## ACKNOWLEDGEMENTS

I would first like to acknowledge Vanessa L. Malcarne, Ph.D., Elizabeth A. Klonoff, Ph.D, and Georgia Robins Sadler, B.S.N., M.B.A. I am incredibly lucky to have such caring and supportive mentors. Their support and guidance has allowed me to reach my goals in graduate school. My writing and critical thinking have greatly improved. I have learned how to develop research projects, write manuscripts and grants, present at conferences, and work with others, and I enjoy all of it, because of their mentorship. I am repeatedly in awe of their abilities as researchers and educators. It is a privilege to be your mentee.

I would also like to acknowledge Scott C. Roesch, Ph.D. and James F. Sallis, Ph.D., the other members of my dissertation committee. Your guidance and expertise has enhanced my training and allowed this project to come to fruition. In addition, this project would not have occurred without the support provided by the National Cancer Institute (1F31CA189625-01A1; 1R25CA130869). Importantly, I also thank the participants of this study who set aside their time to contribute to research.

Findings from this dissertation are being prepared for publication. Publications based on this dissertation, chapters one through five, will be co-authored by Vanessa L. Malcarne, Elizabeth A. Klonoff, Scott C. Roesch, Rina S. Fox, and Georgia Robins Sadler. The dissertation author was the primary investigator and author of this material.

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## GRANTS

- Mills, S. D. (2015 - 2017). Predictors of Cancer-risk Behaviors among Hispanic Americans. National Cancer Institute: Ruth L. Kirschstein National Research Service Awards for Individual Predoctoral Fellowships to Promote Diversity in Health-Related Research (F31-Diversity), \$50,198.
- Mills, S. D. (2015 - 2016; terminated early to accept National Cancer Institute grant). Predictors of Tobacco Use in Hispanic Americans. Tobacco-related Disease Research Program: Dissertation Research Award, \$32,374.
- Mills, S. D. (2014). Trajectories of Disability in Patients with Systemic Sclerosis. Rheumatology Research Foundation: Health Professional Research Preceptorship, \$5,500.

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ABSTRACT OF THE DISSERTATION

Acculturation, the Built Environment, and Health-related Quality of Life:  
A Multi-level Study in Hispanic Americans

by

Sarah Denton Mills

Doctor of Philosophy in Clinical Psychology

University of California, San Diego, 2017  
San Diego State University, 2017

Professor Vanessa L. Malcarne, Chair  
Professor Elizabeth A. Klonoff, Co-Chair

**Rationale.** Studies demonstrate that acculturation is critical to the understanding of health and well-being among Hispanic Americans. Dependent on how acculturation is measured, however, the relationship between acculturation and health-related quality of life is inconsistent. In addition, studies often use proxy measures of acculturation that preclude an understanding of the complex process of acculturation and its relationship to health. Research using latent variables of acculturation based on several cultural indicators has been suggested as a way to advance the study of acculturation in the field.

Furthermore, research is needed that goes beyond studying individual characteristics and their impact on health. Studies have shown that aspects of the neighborhood environment (e.g., park density, access to public transit) impact health-related quality of life, but few of these studies have been conducted in Hispanic Americans, or have considered neighborhood environment in combination with individual cultural variables. Studies that consider both individual cultural and environmental characteristics simultaneously allow for the assessment of interactions. Examination of cross-level interactions may provide information on whether cultural variables are more or less important to health-related quality of life in different contexts.

In an effort to advance the study of acculturation and health-related quality of life, the present study had four aims: 1) derive person-level latent acculturation variables from multiple individual indicators of acculturation using exploratory factor analysis; 2) identify person-level latent acculturation variables that are associated with health-related quality of life; 3) identify neighborhood-related variables (e.g., proximity to open spaces, food environment) that are associated with health-related quality of life; and 4) determine how person-level acculturation variables interact with neighborhood variables to predict health-related quality of life among Hispanic Americans.

**Design.** Exploratory factor analysis and multi-level modeling were used to explore correlates of mental and physical health-related quality of life in a sample of 383 Hispanic American men and women living in a metropolitan border city. Participants completed health-related questionnaires as part of a larger study developing a clinical trials education program for Hispanic Americans. For this study, person-level acculturation variables were included at the lowest level of the model, and were

hierarchically nested within participants' residential neighborhood data. Neighborhoods were defined using census tracts, considered to be relatively homogeneous units based on population characteristics. Individual acculturation and health-related quality of life data were gathered from participant responses on measures included in the survey packet from the parent study. Participants' neighborhood-level data were obtained from the United States Census database, the Healthy Communities Data and Indicators Project, and the California State Board of Equalization.

**Results.** Exploratory factor analysis showed support for three acculturation latent variables named: Religiosity, Subjective Social Status, and Traditional Acculturation. The Subjective Social Status latent variable was significantly, positively associated with mental and physical health-related quality of life. The Religiosity and Traditional Acculturation latent variables were not significantly associated with mental or physical health-related quality of life. Neighborhoods with a greater percentage of the population within close proximity to an alcohol outlet were associated with better physical health-related quality of life. In addition, the relationship between the Subjective Social Status latent variable and physical health-related quality of life was stronger in neighborhoods with a higher density of tobacco retailers as compared to neighborhoods with a lower density of tobacco retailers.

**Conclusions.** This study suggests that subjective social status and neighborhood characteristics may play an important role in the health-related quality of life of Hispanic Americans. Subjective social status, or an individual's belief about where he or she stands in a social hierarchy, was associated with mental and physical health-related quality of life. Findings from the present study suggest that this relationship was stronger

in more disadvantaged neighborhoods. Although the study was cross-sectional, the findings identify potentially modifiable individual and neighborhood variables that may play important roles in determining overall quality of life.

## CHAPTER 1: INTRODUCTION

The goal of this project was to better understand relationships among acculturation, the neighborhood environment, and mental and physical health-related quality of life in Hispanic Americans. To accomplish this, the project examined how: 1) acculturation relates to mental and physical health-related quality of life, 2) the neighborhood environment relates to mental and physical health-related quality of life, and 3) the relationship between acculturation and mental and physical health-related quality of life may be dependent on the neighborhood environment.

The study used multi-level modeling to explore individual and environmental correlates of health-related quality of life among 383 Hispanic American adults living in a metropolitan border city. Acculturation and health-related quality of life data for this project came from a separate study that developed and evaluated an education program promoting participation in clinical trials among Hispanic Americans. Neighborhood environment data for this study were gathered from a database developed by the California Department of Public Health and the University of California, San Francisco, data from the California State Board of Equalization, and data from the United States Census Bureau. The census tract in which a participant lived was used as a proxy for the participant's neighborhood.

Using an ecological framework, this project intended to identify which Hispanic Americans are at risk for poor health-related quality of life, and under which environmental conditions this occurred. Findings from this study can be used to develop targeted interventions and policies that may lead to improvement in the health and well-being of the Hispanic American community.

Findings from this dissertation are being prepared for publication. Publications based on this dissertation, chapters one through five, will be co-authored by Vanessa L. Malcarne, Elizabeth A. Klonoff, Scott C. Roesch, Rina S. Fox, and Georgia Robins Sadler. The dissertation author was the primary investigator and author of this material.

## CHAPTER 2: BACKGROUND & SIGNIFICANCE

### 2.1 The Hispanic American Population in the United States

**Demographic Structure.** According to the United States Census Bureau, there are approximately 54 million Hispanic Americans living in the United States (Centers for Disease Control & Prevention, 2014). Hispanic Americans are the largest ethnic minority in the United States, representing 17% of the total United States population. By 2060, the Hispanic American population is expected to constitute approximately 31% of the United States population. Mexican Americans (64%) are the largest Hispanic American subgroup living in the United States, followed by Puerto Ricans (9.4%), Salvadorans (3.8%), Cubans (3.7%), Dominicans (3.1%), and Guatemalans (2.3%; Ennis, Rios-Vargas, & Albert, 2011). The remaining 13.7% identified as Other Hispanic or Latino Origins. Population growth between 2000 and 2010 varied by Hispanic American subgroup, but was the largest for the Mexican origin population, which increased by 54%, growing from 20.6 million in 2000 to 31.8 million in 2010.

The majority of Hispanic Americans living in the United States are of immigrant background and are relatively young (Pew Research Center, 2015). Approximately 35% of the Hispanic American population is foreign born. The median age of the Hispanic American population in the United States is relatively low at 28 years, as compared to the median age of the general United States population of 37 years. Hispanic Americans of Mexican descent have the lowest median age, at 26, whereas Cubans have the highest median age of 40 (Pew Research Center, 2015).

**Geographic Distribution.** In 2010, 41% of the Hispanic American population lived in the Western region of the United States and 36% percent lived in the Southern

region of the United States<sup>1</sup> (Ennis et al., 2011). These rates were lower in the Northeast and Midwest regions, accounting for 14% and 9% of the Hispanic American population, respectively. Hispanic Americans exceed the national level of 17% of the total population only in the Western region of the United States, where they account for 29% of the total population. More than half of the Hispanic American population resides in only three states: California, Texas, and Florida. Approximately one quarter (27.8%) of all Hispanic Americans living in the United States reside in California, followed by Texas and Florida, with 18.7% and 8.4% of the total Hispanic American population, respectively (Ennis et al., 2011).

**Income.** Poverty disproportionately affects Hispanic Americans in the United States with one quarter living below the poverty line as compared with 16% among the general United States population (Pew Research Center, 2015). According to the 2010 United States Census, median household income was lower among the Hispanic American population (\$37,759) in comparison to the non-Hispanic White population (\$51,846; DeNavas-Walt, Proctor, & Smith, 2011). Household income varies among the Hispanic American population with Argentinians and Venezuelans having higher household incomes in comparison to Mexican Americans, for example (Pew Research Center, 2015). Guatemalans, Dominicans, and Hondurans have the highest percentage of

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<sup>1</sup> The West census region includes Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. The Northeast census region includes Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. The South census region includes Alabama, Arkansas, Delaware, the District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. The Midwest census region includes Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.

persons living below the poverty line at 28% in each ethnic group (Pew Research Center, 2015).

**Education.** Hispanic Americans have less formal education in comparison to the general United States population (Santiago, Galdeano, & Taylor, 2015). Of Hispanic Americans adults, only 22% have earned an associate's degree or higher, as compared to 60% of Asian Americans, 46% of non-Hispanic Whites, and 31% of African Americans. The majority (64%) of Hispanic Americans are high school graduates (United States Department of Health and Human Services, 2015a). Educational attainment among Hispanic Americans is associated with place of birth, with only 44% of foreign-born Hispanic adults 25 years or older reporting to be high school graduates in comparison to 70% of Hispanics Americans born in the United States. The dropout rate for foreign-born Hispanics ages 16 to 24 is twice that of United States-born Hispanic Americans of the same age range.

## **2.2 Health Disparities among Hispanic Americans**

Hispanic Americans experience higher rates of disease, disability, and death for certain health conditions in comparison to non-Hispanic Whites. Physical health-related issues that disproportionately affect Hispanic Americans include, but are not limited to, cancer, diabetes mellitus, liver disease, human immunodeficiency virus (HIV), homicide, and work-related injury (Centers for Disease Control & Prevention, 2013; Vega et al., 2009). Mental health-related issues that have been shown to disproportionately affect Hispanic Americans include, but are not limited to, depression, acculturative stress, domestic violence, and access to mental health care.

**Cancer.** Overall, the lifetime probability of developing cancer is lower among Hispanic American men (40.6%) and women (35.0%) in comparison to non-Hispanic White men (45.5%) and women (39.6%; Siegal, Naishadham, & Jemal, 2012). In addition, incidence rates for the four most common cancers (prostate, breast, lung and bronchus, and colorectal) in the general United States population are lower among Hispanic Americans in comparison to non-Hispanic Whites. However, incidence rates are higher for certain cancers among Hispanic Americans, including gallbladder cancer, acute lymphocytic leukemia, and cancers associated with infectious organisms including cancer of the cervix, stomach, and intrahepatic bile duct. From 2000 to 2009, cancer incidence rates declined by 1.7% per year for Hispanic American men and .3% per year for Hispanic American women. Cancer incidence rates declined by 1.0% and .2% for non-Hispanic White men and women, respectively, over the same period (Siegal et al., 2012).

Hispanic Americans are more likely to be diagnosed at a later stage of disease for certain cancers in comparison to non-Hispanic Whites. Differences in disease stage are greatest for melanoma and female breast cancer. Studies show that this disparity between Hispanic Americans and non-Hispanic Whites remains when socioeconomic status and access to health care are similar across ethnic groups (Halpern et al., 2008; Lantz et al., 2006; Watlington, Byers, Mouchawar, Sauaia, & Ellis, 2007). Although Hispanic Americans are more likely to be diagnosed at a later stage of disease for several cancers, and are disproportionately represented among the poor, overall five-year cancer survival rates are similar for Hispanic Americans (65.1%) and non-Hispanic Whites (66.5%; Siegal et al., 2012).

Cancer is the leading cause of death for Hispanic Americans. In 2012, approximately 33,200 Hispanic Americans were expected to die from cancer (Siegal et al., 2012). The leading cause of cancer among Hispanic American men was cancer of the lung (18%), followed by colorectal (11%) and liver cancers (10%). Among Hispanic American women, the leading causes of cancer death were breast cancer (15%), lung cancer (13%), and colorectal cancer (10%). For all cancers combined, cancer mortality rates were lower among Hispanic Americans in comparison to non-Hispanic Whites. However, certain cancer mortality rates were higher among Hispanic Americans. For example, mortality rates for cancers of the stomach, gallbladder, liver and intrahepatic bile duct may be twice as high as rates among non-Hispanic Whites. Overall cancer mortality rates declined from 2000 to 2009 by 2.3% and 1.4% for Hispanic American men and women, respectively. These rates were lower among non-Hispanic White men (1.5%) and women (1.3%). Of note, mortality rates for liver and intrahepatic bile duct cancers increased among Hispanic-American men (1.5%) and women (1.0%; Siegal et al., 2012).

**Diabetes Mellitus.** Hispanic Americans have a greater risk for diabetes in comparison to non-Hispanic Whites (Schneiderman et al., 2014). Recent findings from the Hispanic Community Health Study/Study of Latinos (HCHS/SOL), a prospective, multi-center, population-based study, found that the prevalence of total diabetes (diagnosed and undiagnosed) was higher among all Hispanic groups living in the United States (16.9%) in comparison to prevalence rates among non-Hispanic Whites (10.2%; Schneiderman et al., 2014). However, when analyzing Hispanic American subgroups individually, risk for diabetes varied. Prevalence rates were high among Mexican

Americans (18.3%), Dominicans (18.1%), and Puerto Ricans (18.1%), but lower for South Americans (10.2%). In addition, prevalence of diabetes significantly varied by length of residence in the United States, after adjusting for age, sex, body mass index, Hispanic background, and field center. Diabetes prevalence was significantly higher for those living in the United States for ten or more years in comparison to those living in the United States for less than ten years ( $p = .02$ ; Schneiderman et al., 2014).

**Liver Disease.** Hispanic Americans have higher mortality due to liver disease and cirrhosis in comparison to the general United States population despite data that show no differences in alcohol-related disorders (United States Department of Health and Human Services, 2015b; Vega et al., 2009). In 2013, chronic liver disease was the sixth leading cause of death among Hispanics Americans. Hispanic American's chronic liver disease rate is twice as high as that among non-Hispanic Whites (United States Department of Health and Human Services, 2015b). Several hypotheses have been made to explain this disparity. For example, researchers have suggested that health disparities for other conditions that disproportionately affect Hispanic Americans may contribute to the disparities seen for liver disease. Hispanic Americans have higher rates of hepatitis C virus infection, which acts a cofactor in liver disease, as well as higher rates of nonalcoholic fatty liver disease (Vega et al., 2009).

**HIV.** Hispanic Americans accounted for 23% of new diagnoses of HIV infection in 2013, and of those cases, the majority (85%) were men. The rate of HIV infection among Hispanic Americans is 347.8 per 100,000 people as compared to 149.2 per 100,000 people among non-Hispanic Whites. HIV is the eighth leading cause of death among Hispanic Americans ages 25 to 34 years old and is among the top ten causes of

death for Hispanic Americans ages 35 to 54 years old (Centers for Disease Control & Prevention, 2015). Language, education level, and lower income have all been found to be associated with knowledge about HIV and testing rates. Perceived discrimination, as well as beliefs about prevention and treatment, have been posited as reasons for the higher mortality rates seen among Hispanic Americans (Vega et al., 2009).

**Homicide.** Homicide rates among Hispanic Americans are higher in comparison to non-Hispanic Whites (Centers for Disease Control & Prevention, 2015). In 2009, Hispanic Americans experienced homicide rates of 6.6 per 100,000 population in comparison to 2.6 per 100,000 for non-Hispanic Whites and 5.5 per 100,000 for the general United States population. Disparities in homicide rates are greatest among young Hispanic American men. In 2009, Hispanic American men 15 to 29 years old had homicide rates of 22.7 deaths per 100,000 in comparison to 4.3 deaths per 100,000 among non-Hispanic White men 15 to 29 years old (Centers for Disease Control & Prevention, 2015). In addition, according to the Bureau of Justice Statistics, from 2004 to 2011, Hispanic Americans were more likely to be shot than non-Hispanic Whites in the United States (Californians for Safety and Justice, 2014). Immigration status is a correlate of homicide among Hispanic Americans. Hispanic American immigrants are less likely to be victims or perpetrators of homicide in comparison to Hispanic Americans born in the United States (Vega et al., 2009).

**Work-related Injury.** Hispanic Americans are more likely to be employed in high-risk occupations and experience higher rates of work-related injury in comparison to non-Hispanic Whites (Centers for Disease Control & Prevention, 2015; Vega et al., 2009). In 2010, 24.4% of Hispanic Americans worked in high-risk occupations, higher

than any other ethnic group in the United States (Centers for Disease Control & Prevention, 2015). In 2008, the work-related injury death rate was 4.2 per 100,000 among Hispanic Americans and 3.7 per 100,000 for all workers (Centers for Disease Control and Prevention, 2015). This disparity may be even greater as a result of underreporting of work-related injuries by informal labor contractors and smaller employers. Among Hispanic Americans, foreign-born workers had a 59% higher work-related injury death rate in comparison to those born in the United States. Federal government regulatory safety-inspection monitoring may be ineffective and allow for unsafe workplaces, in particular in industries where Hispanic American labor is concentrated (construction, agricultural work, manufacturing). Between 1992 and 2006, more than one-third of all occupational deaths were among individuals working in construction (Vega et al., 2009). Hispanic Americans immigrants working as temporary or occasional workers may be at increased risk for work-related injury because of failure to receive appropriate instruction and training (Vega et al., 2009).

**Depression.** Hispanic Americans are at high risk for depressive episodes in their lifetimes (Wassertheil-Smoller et al., 2014). Among a large national sample of Hispanic Americans, 27% reported depression. Prevalence of depression was lower among Mexican Americans (22.3%) as compared to persons of Puerto Rican background (38%) in the study. In addition, Hispanic Americans born in the United States reported higher rates of depression in comparison to those who were foreign-born (Wassertheil-Smoller et al., 2014). Among persons with a depressive disorder in the past year, Hispanic Americans were less likely to have accessed mental health treatment as compared to non-Hispanic Whites (Alegría et al., 2015).

**Acculturative Stress.** The process of adapting to United States culture and norms can be stressful, especially for immigrant populations who are no longer with their social support systems. Several studies have shown that as Hispanic Americans acculturate to the United States they also experience a decline in mental health (Rios-Ellis, 2005). Exceptions have been found for Cuban Americans, but this may be a result of their higher socioeconomic status. Berry (1990) suggested that elevated levels of acculturative stress may result in increased levels of depression and anxiety. Difficulty balancing perceived demands with limited resources can be distressing, in particular for those with limited English language proficiency or little previous contact with United States culture. Acculturative stress has also been associated with fatalistic thinking, which may lead to decreased self-efficacy and depression. Furthermore, changes in cultural identity may result in feelings of alienation and isolation (Rios-Ellis, 2005).

**Domestic Violence.** Domestic violence is considered to be a social problem experienced by Hispanic American women (Rios-Ellis, 2005). Several risk factors have been identified for Hispanic American women, including lower socioeconomic status, limited personal resources, and lower levels of education. Cultural factors such as religious practices, fatalistic beliefs, and norms that enforce a patriarchal structure may also influence the receipt of domestic violence among Hispanic American women. Data from the National Couples Study indicate that Hispanic Americans are more likely to have engaged in male-to-female partner violence in comparison to non-Hispanic Whites and that more than one quarter of all violence episodes are preceded by drinking. Female-to-male partner violence is also more common among Hispanic Americans in comparison to non-Hispanic Whites (Rios-Ellis, 2005).

**Access to Health Care.** Hispanic Americans are less likely to seek health care in comparison to the general United States population (Rios-Ellis, 2005). Lower access to health care has been associated with language, immigration status, and lack of health insurance. Latinos with limited English-language proficiency may be particularly vulnerable and have difficulty identifying and communicating with health care providers. Across all age groups, Hispanics Americans are less likely to have health insurance and are thus at risk for lacking basic access to medical care. In 2010, 41% of Hispanic Americans did not have health insurance in comparison to 16.1% of non-Hispanic Whites (Centers for Disease Control & Prevention, 2015). Changes in health care coverage among Hispanic Americans may occur with the recent implementation of the Patient Protection and Affordable Care Act.

**Summary.** Hispanic Americans are the largest ethnic minority group in the United States and are expected to represent 31% of the total United States population by 2050 (Ennis et al., 2011). Hispanic Americans experience several physical and mental health-related disparities. These disparities have been associated with several factors including cultural factors, health-related lifestyle choices, and the environment in which one lives. It is critical to address these health issues to improve the health-related quality of life among Hispanic Americans. Thus, researchers have called for culturally tailored community-based intervention programs that focus on improving the health and well-being of Hispanic Americans. With limited resources, it is critical to tailor these intervention programs for those with greatest need.

### **2.3 Acculturation in Hispanic Americans**

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). More recent definitions do not view this as a linear process, but rather view acculturation as a multifaceted reciprocal process consisting of several domains such as language, social affiliation, food and music preferences, and ethnic identity. The term acculturation originated from the field of anthropology. It was originally used in discussions of European colonial expansion. The earliest use of the term is believed to date back to 1880 when describing changes experienced by Native Americans as a result of English speakers coming to the United States (Herskovitz, 1958; Hunt, Schneider, & Comer, 2004). In the early 20<sup>th</sup> century, there was worry and fear about the impact of immigrant populations and native populations in the United States, and thus also growing interest in the concept of acculturation (Hunt et al., 2004).

Since the introduction of the construct, two major models of acculturation have been posited in the literature: 1) the unidimensional model, and 2) the bidimensional model (Lara, Gamboa, Kahramanian, Morales, & Bautista, 2005). Acculturation was originally conceptualized as a unidimensional process. Retention of one's native culture was at one end of the continuum and receipt of a new culture was at the opposite end (Cabassa, 2003; Lara et al., 2005). The acquisition of values, beliefs, and customs from a new culture was believed to parallel the loss of one's native or heritage culture. In addition, the unidimensional model presumes that the acculturation process only affects the acculturating group; the dominant culture is not influenced or impacted by the acculturating group (Marin & Gamba, 1996).

The bidimensional model proposes that the acquisition of values and beliefs from a new culture does not require the loss of one's native culture. The bidimensional model suggests that immersion into the dominant culture and participation in one's culture of origin are best characterized as two independent dimensions (Cabassa, 2003). Berry's bidimensional model uses these two independent dimensions to create four acculturation categories: assimilation, separation, integration and marginalization. Assimilation refers to complete acquisition of a new culture without maintenance of one's heritage culture. Separation refers to the maintenance of one's native culture and rejection of the new culture. Integration (or biculturalism) refers to retention of one's native culture along with acceptance of a new culture. Marginalization refers to rejection of both one's native culture and the new mainstream culture (Berry, 1997, 1998; Berry & Sam, 1996).

Both the unidimensional and bidimensional models have been criticized (Cabassa, 2003). The unidimensional model has been critiqued for its focus on adaptation to the dominant culture, precluding understanding of how individuals retain their culture of origin, or how the dominant culture is impacted. The bidimensional model has been criticized for presuming that individuals are able to freely choose their acculturation category. Acculturation may be forced in some societies or not allowed in others. Both unidimensional and bidimensional models have also been criticized for not considering the dynamic nature of acculturation. Acculturation is a developmental process, yet these models do not consider that level of accultuation may change over time (Cabassa, 2003).

A multidimensional model of acculturation has been presented as an alternative to the unidimensional and bidimensional models (Abraído-Lanza et al., 2006). Like the bidimensional model, the multidimensional model considers the extent to which one

participates in native culture and adopts the practices of the new culture as independent processes. The multidimensional model also takes into account other aspects of acculturation such as one's cultural values and identifications, viewing these all as independent components as well (Cabassa, 2003). Cultural practices include language use, media preference, and social affiliations. Cultural values include beliefs systems associated with a specific cultural group (e.g., individualistic vs. collectivistic belief system). Cultural identification includes attachment to one's group and self-esteem associated with this attachment. Proponents of the multidimensional model state that much of the literature studying acculturation has focused on the behavioral component of the construct. For example, many measures of acculturation, in particular among Hispanics, focus on language use and preference. According to the multidimensional model, language use is just one component of the greater acculturation domain. A broader assessment of the construct would also include conceptually related, but potentially distinct components such as values and identification (Lara et al., 2005).

**Measuring Acculturation in Hispanic Americans.** Several measures of acculturation have been developed, some specifically for Hispanics. Early measures of acculturation typically followed the unidimensional model. Measures of acculturation for Hispanics following the unidimensional model include the Acculturation Rating Scale for Mexican Americans (ARMSA; Cueller, Harris, & Jaso, 1980), the Short Acculturation Scale for Hispanics (SASH; Marin, Sabogal, Marin, Otero-Sabogal, & Perez-Stable, 1987), the Short Acculturation Scale for Hispanic Youth (SASH-Y; Barona & Miller, 1994), the Brief Acculturation Scale for Hispanics (BASH, Norris, Ford, & Bova, 1996), the Acculturation Index for Mexican Americans (Mainous, 1989), the Los Angeles

Epidemiologic Catchment Area Acculturation Scale (Burnman, Hough, Telles, & Escobar, 1987), the Acculturation Scale for Mexican Americans (Deyo, Diehl, Hazuda, & Stern, 1985), and the Children's Acculturation Scale (Franco, 1983). These measures typically ask respondents to rate the extent to which they participate in a particular cultural domain (e.g., language, identity) along a single continuum ranging from predominantly Hispanic/Spanish to predominantly Anglo/English. Respondents are forced to select from two cultures. Forcing respondents to select along a single continuum results in a zero-sum assumption. The process of acculturation is presumed to correspond with the loss of one's native culture. In studies using a unidimensional model, common proxy variables include generational status, language preference, place of birth, and years lived in the United States. Single-continuum measures and proxy variables often place respondents into dichotomous levels of acculturation (e.g., low vs. high).

Bidimensional measures of acculturation allowing independent assessment of maintenance of one's heritage culture and acquisition of the mainstream culture were developed in response to these unidimensional measures. Bidimensional measures of acculturation for Hispanics include the Bidimensional Acculturation Scale for Hispanics (Marin & Gamba, 1996), the American and Puerto Rican Cultural Involvement Scales (Cortes, Rogler, & Malgady, 1994), the Abbreviated Multidimensional Acculturation Scale (Zea, Asner-Self, Birman, & Buki, 2003), the Acculturation Rating Scale (Montgomery, 1992), the Cultural Life Styles Inventory (Mendoza, 1989), the Psychological Acculturation Scale (Tropp, Erkut, Coll, Alarcon, & Vazquez-Garcia, 1999), and the Bicultural Involvement Questionnaire (Szapocznik, Kurtines, & Fernandez, 1980). Bidimensional scales allow respondents to rate their involvement in

both the native and dominant cultures independently, allowing for a more thorough understanding of an individual's level of acculturation. Although bidimensional scales typically provide more acculturation-related information than unidimensional measures, some bidimensional measures (e.g., Bidimensional Acculturation Scale for Hispanics) continue to rely on language to assess acculturation. Researchers have stated that measures that use language to assess level of acculturation are indirectly, as opposed to directly, evaluating the construct (Cabassa, 2003). Bidimensional (and unidimensional) scales have also been criticized for their limited response options. Measures such as the Bidimensional Acculturation Scale for Hispanics use four-point rating scales that force respondents to select responses in either a positive or negative direction. The absence of middle points on response scales may lead to skewed distributions of scores (Cabassa, 2003).

Researchers in the field have provided many suggestions in effort to improve the measurement of acculturation in Hispanics. Several researchers have called for *multidimensional* measures to expand the scope of acculturation domains that are studied (Abraído-Lanza et al., 2006; Alegría, 2009; Cabassa, 2003; Hunt et al., 2004; Wallace, Pomery, Latimer, Martinez, & Salovey, 2010). Multidimensional measures of acculturation for Hispanics include the Acculturation Rating Scale for Mexican Americans-II (Cuellar, Arnold, & Maldonado, 1995) and the Hazuda Scale (Hazuda et al., 1988). Researchers have stated that we need to move beyond the use of proxy measures of acculturation because they provide an incomplete depiction of the acculturation process (Abraído-Lanza et al., 2006; Cabassa 2003, Thomson & Goetz, 2009; Wallace et al., 2010). Furthermore, the use of single proxy measures in studies

relating acculturation to health precludes understanding of what particular aspects of the construct are most impactful to one's health. Cabassa (2003) also called for the incorporation of contextual factors into the study of acculturation. Contextual factors such as the environment in which one was raised may provide a more in-depth understanding into an individual's particular process of acculturation. Proponents of the multidimensional model have recommended the use of latent methodologies using several indicators of acculturation to bolster construct validity (Abraído-Lanza, Chao, & Florez, 2005; Corral & Landrine, 2008).

A multidimensional model of acculturation proposes that contact with a distinct culture can have an impact on many different areas in one's life such as on one's beliefs, values, norms, and behaviors (Cabassa, 2003). According to this model, an assessment of one's level of acculturation is best conducted by examining several indicators of the construct (Cabassa, 2003). The present study used a multidimensional model of acculturation and examined several variables that were expected to change among Hispanic Americans during the process of acculturation. These indicators included language preference, the number of years a participant lived in the United States, religiosity, subjective social status, and discrimination.

Language preference and the number of years an individual has lived in the United States are commonly used indicators of the construct (Abraído-Lanza et al., 2006). Language preference among Hispanic Americans is expected to change during the process of acculturation. Greater integration into the dominant culture in the United States is expected to generally result in a greater preference for the English language as opposed to the Spanish language (Thomson & Goetz, 2009). In addition, it is

hypothesized that an individual who has lived in the United States for a longer period of time will be more acculturated, adopting more aspects of the dominant culture as length of residence in the United States increases. The present study not only examined these commonly used proxy measures of the construct, but following a multidimensional model of acculturation, other variables that were believed to change as Hispanic Americans become more immersed in the dominant culture in the United States were assessed. Engagement with religion was examined. Hispanic Americans generally report high levels of religious practice and involvement in the United States (Pew Research Center, 2014). Of note, these rates are significantly higher than those seen among non-Hispanic Whites (Pew Research Center, 2014). Thus, religiosity was expected to decrease as Hispanic Americans become more immersed in the dominant culture of the United States. Subjective social status, or a person's belief about where he or she stands relative to others, was expected to decrease as Hispanic Americans become more acculturated (Adler, Epel, Castellazzo, & Ickovics, 2000). Hispanic Americans who are less immersed in the dominant culture may be more likely to make social comparisons to others who are similar to themselves, potentially resulting in a moderate to high rating of subjective social status (Padilla & Perez, 2003). On the other hand, more acculturated Hispanic Americans who have greater exposure to the dominant culture may compare themselves to the larger society, which is majority (62%) non-Hispanic White (United States Census Bureau, 2015). In the United States, overall, Hispanic Americans have less education, wealth, and income in comparison to non-Hispanic Whites (Krogstad, 2016; Taylor, Lopez, Velasco, & Motel, 2012). Thus, more acculturated Hispanic Americans may be more likely to make social comparisons with more educated and affluent groups in the

United States, resulting in lower ratings of subjective social status. Furthermore, anti-immigrant legislation and sentiment has become pervasive in the United States, also potentially fueling lower ratings of subjective social status among more acculturated Hispanic Americans (Ortiz & Telles, 2012). Experiences with discrimination were also expected to change as Hispanic Americans become more immersed in the dominant culture in the United States. Discrimination was expected to increase as Hispanic Americans become more immersed in the dominant culture. Previous studies show that Hispanic Americans who have more contact with non-Hispanic Whites experience more discrimination and stereotyping (Ortiz & Telles, 2012; Viruell-Fuentes, 2007). Less acculturated Hispanic Americans may be protected from discrimination by having more limited involvement with the dominant culture in the United States.

The present study examined several indicators of acculturation in effort to better understand the construct and its relationship to health. Previous studies have been limited by the use of single proxy measures and dichotomous acculturation variables. The use of multiple indicators of the construct potentially allows for a more detailed understanding of what particular aspects of the acculturation process impact health-related quality of life among Hispanic Americans living in the United States.

#### **2.4 Health-related Quality of Life**

Quality of life is a complex concept without a clear consensual definition (Haas, 1999). Farquhar (1995) stated that there is a lack of consensus regarding the definition of the construct because it is so widely used across disciplines. Even within the domain of health care, several definitions and interpretations of the construct have been used. Day and Jankey (1996) have discussed the study of quality of life over time. In the 1960's,

despite increases in overall societal wealth, there were also increases in crime and violence (Haas, 1999). This prompted researchers to consider that quality of life cannot be explained by economic growth alone. Other indicators beyond measures of economic growth were needed to assess the welfare of the nation. Thus, data were collected on several social indicators such as education and crime rates to better assess the quality of life of individuals living in the United States. By the 1970's, the social indicators that were assessed such as education, type of housing, and crime rates were found to account for only 15% of the variance in individuals' quality of life. Thus, researchers began to measure quality of life using subjective indicators such as self-reported happiness and satisfaction. In the 1980's, researchers proposed gap theories of quality of life. These gap theories suggested that the most accurate way to measure of quality of life was to assess the difference between one's present life and a standard to which one holds. A major difficulty with the gap theory approach was identifying an appropriate referent (Haas, 1999).

The study of quality of life became a major issue in health care as technological advances allowed for increased life span (Haas, 1999). Health-related quality of life was evaluated as a way to help guide treatment decisions and determine allocation of resources. In the medical field, health is often viewed as a dichotomous construct where those with disease have poor health-related quality of life and those without disease have good health-related quality of life (Haas, 1999). However, researchers have found that this is incongruent with how individuals measure their health. In addition, subjective measures of health status have been shown to be more accurate predictors of mortality and morbidity in comparison to objective measures of health. Rather than viewing health

as a dichotomous construct, there is the potential for “health within illness” (Haas, 1999, p. 730). In response, the term health-related quality of life is now more often considered a *multidimensional* construct that includes subjective evaluations of perceived physical and mental health functioning. The Centers for Disease Control and Prevention defines health-related quality of life as “an individual’s or group’s perceived physical and mental health over time” (Centers for Disease Control and Prevention, 2011).

The study of health-related quality of life has become a focus of public policy, and is used as a national health standard in effort to connect different research disciplines (Centers for Disease Control and Prevention, 2011). Improvement in quality of life is a major public health goal in *Healthy People 2000, 2010, and 2020*. The measurement of health-related quality of life has been identified as an important measure of progress in the nation’s health objectives (Centers for Disease Control and Prevention, 2011).

**Measuring Health-related Quality of Life.** Several measures of health-related quality of life have been developed including the Medical Outcomes Study Short-Form Health Survey (SF-36; Ware & Sherbourne, 1992), the Sickness Impact Profile (Bergner, Bobbitt, Carter, & Gilson, 1981), and the Quality of Well-Being Scale (Kaplan, Atkins, & Timms, 1984), among others. This study uses the short form of the SF-36, the 12-Item Short Form Health Survey (SF-12; Ware, Kosinski, & Keller, 1996), and the current discussion will focus on that measure. The SF-36 and its short form are widely used in health research. In addition, these measures are used at the federal level by the Health Care Financing Administration, which oversees the United States Medicare program and the federal portion of the Medicaid program, and the National Committee for Quality Assurance’s Health Plan Employer Data and Information Set, a national committee that

evaluates quality of care in health care plans (Centers for Disease Control and Prevention, 2011).

The Medical Outcomes Study Short-Form Health Survey (SF-36; McHorney, Ware, & Raczek, 1993; Ware & Sherbourne, 1992) was originally validated in a large sample ( $N = 1,014$ ) of English-speaking adults (18 years of age and older) who had an office visit with a clinician enrolled in the Medical Outcomes Study, a study aimed at advancing the measurement of routine monitoring in medical research and practice. The Medical Outcomes Study was conducted in three cities (Boston, MA; Chicago, IL; Los Angeles, CA) and clinicians were recruited from health maintenance organizations, multispecialty groups, and solo practices in each city. As expected, using principal components analysis, two broader dimensions (Physical health, Mental health) were found to underlie the structure of the eight-domain measure (Physical Health: Physical functioning, Role limitations because of physical health problems, Bodily pain, General health perceptions; Mental Health: Mental health, Role limitations because of emotional health problems, Social functioning, Vitality). The two dimensions were labeled the Physical Component Summary (PCS) and the Mental Component Summary (MCS) subscales. To minimize confusion, the PCS and MCS subscales for the SF-36 will be referred to as the SF-36 PCS and SF-36 MCS, respectively. Demonstrating construct validity, the measure was able to distinguish 1) patients with a serious medical condition from patients with a minor medical condition, 2) patients with a psychiatric condition from patients with a minor medical condition, and 3) patients with a serious medical and psychiatric condition from patients with a minor medical condition. Internal consistency reliability estimates for all SF-36 subscales were high ( $\alpha$ 's  $\geq .78$ ). Reviews examining the

psychometric properties of the SF-36 have shown that the measure has good internal consistency reliability, structural validity, and construct validity in several studies using diverse clinical and non-clinical samples, and in samples including English and Spanish speakers (Coons, Rao, Keininger, & Hays, 2000; McPherson & Martin, 2012).

The SF-12 (Ware, Kosinski, & Keller, 1996) is a short-form of the SF-36. The SF-12 was developed in effort to provide a brief version of the SF-36 that correlated well with the longer measure, could be printed on one-to-two pages, and requires less than two minutes to complete. The SF-12 was developed and psychometrically validated in samples from the National Survey of Functional Health Status, a cross-sectional survey used to collect data on the SF-36 Health Survey, and the Medical Outcomes Study, an observational study of patients with chronic conditions. The sample sizes used for the validation analyses were not provided in the study. The two SF-12 summary measures, the Physical Component Summary (PCS) and Mental Component Summary (MCS) subscales, were constructed independently to replicate the two subscales of the SF-36, the SF-36 PCS and SF-36 MCS. To minimize confusion, the PCS and MCS subscales for the SF-12 will be referred to as the SF-12 PCS and SF-12 MCS, respectively. The authors (1996) reported that forward-step regression analysis was used to identify the 12 items for the brief measure, but do not provide a more detailed description of how and why the items from the longer measure were selected. As expected, the SF-12 PCS and SF-12 MCS were weakly correlated with each other ( $r = .06$ ), but highly correlated with the SF-36 PCS and SF-36 MCS, respectively ( $r = .95$  and  $.97$ , respectively). The SF-12 also evidenced good test-retest reliability; however, internal consistency reliability was not examined. Demonstrating construct validity, the measure was able to distinguish between

1) patients with a mental condition and patients with a minor medical condition, and 2) patients with a serious mental and physical condition and patients with a serious physical condition only (Ware et al., 1996). The measure has been widely used and has shown good psychometric properties in diverse clinical and non-clinical samples, as well as diverse ethnic groups including English- and Spanish-speaking Hispanic Americans (Burdine, Felix, Abel, Wiltraut, & Musselman, 2000; Gandek et al., 1998; Ware, 1999).

### **2.5 Acculturation and Health-related Quality of Life in Hispanic Americans**

Overall, general trends exist between acculturation and health, whereby acculturation has been shown to have a negative impact on the health and health behaviors of Hispanic Americans. However, dependent on the measure used and health outcome examined, findings are sometimes mixed (Lara et al., 2005). Studies have examined the relationship between acculturation and health-related quality of life in Hispanic Americans. However, the majority of these studies have been performed in clinical samples, limiting generalizability of findings to healthy community samples of Hispanic Americans (Luckett et al., 2011; Servellen, Chang, Lombardi, 2002; Stephens, Stein, & Landrine, 2010; Thoman & Suris, 2004). In addition, studies are often limited in their measurement of acculturation, using proxy indicators as opposed to multidimensional measures of the construct. Among studies using non-clinical Hispanic American samples, Franzini and Fernandez-Esquer (2004) used a modified version of the Acculturation Rating Scale for Mexican-Americans (ARSMA; Cuellar, Harris, & Jasso, 1980) to assess acculturation in a sample of 1,745 Mexican origin participants (median age: 36 years) living in low-income neighborhoods in Texas. The sample was predominantly (74%) female and the majority of participants (85%) completed the survey

in Spanish as opposed to English. The median income for participants was between \$15,000 and \$20,000. The original ARSMA is a multidimensional measure of acculturation that assesses the construct via nativity, language, and ethnic identification and pride. The measure was modified to only assess nativity and language use for the study. Four acculturation categories were created: 1) foreign-born who mainly speak Spanish (Spanish-speaking immigrants); 2) United States-born who mainly speak Spanish (Spanish-speaking native-born); 3) foreign-born who mainly speak English (English-speaking immigrants); and 4) United States-born who mainly speak English (English-speaking native born). The two summary measures of the SF-12 (SF-12 PCS-12, SF-12 MCS), as well as a single global health assessment item from the measure (“In general, would you say your health is...?”), were used to assess health-related quality of life. Spanish-speaking immigrants reported better physical health-related quality of life in comparison to those born in the United States, whether English speaking or Spanish-speaking. However, Spanish-speaking immigrants reported worse overall health in comparison to English-speakers, whether foreign-born or United States-born. No differences were found across acculturation categories for mental health-related quality of life (Franzini & Fernandez-Esquer, 2004).

A study of 70 day laborers of Mexican origin residing in the San Diego area assessed the relationship between acculturative stress and health-related quality of life, as measured by the SF-12 (Salgado, Castaneda, Talavera, & Lindsay, 2012). Acculturative stress was measured using the Hispanic Stress Inventory Scale for Immigrants (Cavazos-Rehg, Zayas, Walker, & Fisher, 2006), a measure of family/cultural conflict, occupational/economic stress, and parental and immigration stress. Participants were all

male and had a mean age of 27.7 years ( $SD = 9.07$ ). The sample had lower SF-12 PCS ( $M = 48.268$ ,  $SD = 8.08$ ) and SF-12 MCS ( $M = 44.75$ ,  $SD = 9.07$ ) scores in comparison to the general United States population in 1998 (SF-12 PCS:  $M = 49.63$ ,  $SD = 9.91$ ; SF-12 MCS:  $M = 50.2$ ,  $SD = 9.75$ ). In bivariate correlations, acculturative stress was negatively correlated with the SF-12 PCS ( $r = -.31$ ;  $p \leq .05$ ), but not the SF-12 MCS. More acculturative stress was associated with lower levels of physical health-related quality of life. In multivariate linear regression analysis, more acculturative stress was associated with worse physical health-related quality of life, after controlling for social support. In a second multivariate linear regression model examining interactions, social support moderated the relationship between acculturative stress and physical health-related quality of life (Salgado et al., 2012).

A study using data from the 2001 California Health Interview Survey examined the relationships between self-reported overall health, language, and nativity in a large multi-ethnic sample ( $N = 47,967$ ; Kandula, Lauderdale, & Baker, 2007). Self-reported health was assessed via one item in the SF-12 measure used to assess overall health-related quality of life (“In general, would you say your health is...?”). Self-reported overall health was lower among all ethnic groups (Latinos, Chinese, Filipinos, Korean, Vietnamese, and other Asians) in comparison to non-Hispanic Whites, independent of demographics, chronic disease, and current smoking status. The largest differences in overall health were seen when non-Hispanic Whites were compared to Latinos and Vietnamese participants. In addition, Latinos reporting limited English proficiency reported worse overall health in comparison to English-proficient Latinos (Kandula et al., 2007).

## **2.6 Built Environment and Health-related Quality of Life in Hispanic Americans**

There is a growing literature on the impact of the built environment on health behaviors and health outcomes. The built environment has been defined as the “totality of places built or defined by humans including buildings, grounds and buildings, layout of communities, transportation infrastructure, and parks and trails” (Sallis, Floyd, Rodriguez, & Saelens, 2012, p. 729). Mortality and morbidity have been related to aspects of the built environment such as the retail food environment, crime, proximity of alcohol and tobacco retailers, and walkability, among other neighborhood attributes such as social capital and cohesion (Fields, Kaczynski, Bopp, & Fallon, 2013; Frank, Kavage, Devlin, & Urban Design 4 Health, 2012; Srinivasan, O’Fallon, & Dearry, 2003). Research in this area has been enhanced by the use of spatial modeling programs, which permit mapping of variables within small geographic regions (Dulin et al., 2012).

Several studies have examined the relationship between self-reported health and the built environment, and greater neighborhood deprivation has been associated with worse self-rated health (Bécares et al., 2012; Poortinga et al., 2008; Stafford et al., 2004; van Jaarsveld et al., 2007; Verhaeghe & Tampubolon, 2012). Specific features of the built environment such as green space, safety, social connections, and access to public facilities and services have all been associated with self-rated health measures (Bond et al., 2012; Cummins, Stafford, Macintyre, Marmot, & Ellaway, 2005; Collins, Hayes, & Oliver, 2009; De Vries, Verheij, Groenewegen, & Spreeuwenberg, 2003; Gidlow, Cochrane, Davey, Smith, & Fairburn, 2010; Maas, Verheij, Groenewegen, De Vries, & Spreeuwenberg, 2006; Weden, Carpiano, & Robert, 2008). For example, in a study of a large ( $N = 5,959$ ) multi-ethnic sample (40% non-Hispanic White, 26.9% African

American, 21.5% Hispanic), neighborhood sociability (i.e., aesthetic quality, safety, social cohesion) and walkability were significantly related to participants self-reported health-related quality of life, as measured by the SF-12 (Tomey, Diez Roux, Clarke, & Seeman, 2013). Neighborhood sociability and walkability were associated with physical health-related quality of life, but not mental health-related quality of life, after adjusting for sex, age, education, income, race, and study site. Furthermore, associations of neighborhood sociability and walkability were more strongly associated with physical health-related quality of life than neighborhood poverty (Tomey et al., 2013).

Another study of 32 neighborhoods in Seattle, WA and Baltimore, MD examined the relationship between the built environment and health-related quality of life in a large ( $N = 2,199$ ) multi-ethnic sample including Hispanic Americans (Sallis et al., 2009). When controlling for potential self-selection bias in neighborhood, worse mental health-related quality of life was associated with high-walkability neighborhoods as opposed to low-walkability neighborhoods. The authors (2009) noted that their results were consistent with studies that demonstrate a relationship with high residential densities and psychological distress. However, the literature in this area is inconsistent. The authors (2009) noted that additional research is needed to explore the relationships between the built environment and mental health.

A study of 386 Mexican Americans living in colonias, incorporated, impoverished settlements at the Texas-Mexico border, examined the relationship between the built environment and health-related quality of life (Mier et al., 2008). Participants provided self-report information on the neighborhood in which they lived including health care access problems (e.g., access to dental, medical, and pharmacy services), housing

problems (e.g., affordable housing), recreation problems (e.g., limited recreational and cultural activities), social problems (e.g., poor quality schools, unemployment, crime), and physical environment problems (e.g., water quality, pollution). The Medical Outcomes Short Form (SF-8; Ware, Kosinski, Dewey, & Gandek, 2001) was used to assess health-related quality of life. Participants residing in colonias for longer periods (four years or more) reported lower mental and physical health-related quality of life. In addition, limited access to healthcare, housing problems, and physical environment problems were significantly correlated with worse physical health-related quality of life. Limited access to healthcare and physical environment problems were significantly correlated with worse mental health-related quality of life (Mier et al., 2008).

A study of 47,614 adults who completed the California Health Interview Survey examined the relationship between neighborhood safety concerns and health-related quality of life as measured by a single item from the SF-12 (Meyer, Castro-Schilo, & Aguilar-Gaxiola, 2014). Participants' greater neighborhood safety concerns were significantly associated ( $r = -.15, p < .001$ ) with worse health-related quality of life among the multi-ethnic sample, of whom 12.8% were Latino.

A separate study of 250 Spanish-speaking Latinos adults with diabetes living in the San Joaquin Valley examined the relationship between perceived neighborhood problems and health-related quality of life (Moreno et al., 2014). Participants were asked to consider how much of a problem the following issues were in their neighborhood: 1) crime in area, 2) access to exercise facilities, 3) trash and litter, 4) lighting at night, 5) access to public transportation, and 6) access to supermarkets. Response options for each item were the following: "very serious," "somewhat serious," "minor," or "not a

problem.” Based on responses, participants were classified into two groups (no problems v. one or more problems). Only participants who selected “not a problem” for each of the six items were included in the no problems category. There was no significant difference in health-related quality of life between participants in the no problem category and participants in the one or more problems category ( $p = .18$ ; Moreno et al., 2014).

To date, few studies have examined the relationship between specific features of the built environment and self-rated health-related quality of life among Hispanic Americans specifically (Tomey et al., 2013). Furthermore, few studies of the built environment examine its relationship to physical and mental health-related aspects of health separately (Gidlow et al., 2010). In addition, some studies ask respondents about perceptions of their neighborhood, as opposed to obtaining objective measures of the built environment. Studies are needed that examine how specific features of the built environment, objectively measured, impact mental and physical health-related quality of life among Hispanic Americans.

**Summary.** Studies demonstrate that acculturation is critical to the understanding of health among Hispanic Americans. However, the study of acculturation has not kept up with more recent statistical advances and theoretical models (Abraído-Lanza et al., 2006). The majority of studies of acculturation and health have used proxy indicators of acculturation that limit understanding of the impact of culture on health in this ethnic group. Researchers have called for the study of acculturation to move beyond unidimensional and bidimensional models, and for acculturation to be conceptualized as a multidimensional process consisting of several domains such as language, food, and music preferences as well as cultural values and practices. Research using latent variables

of acculturation based on several indicators has been suggested as a way to advance the study of acculturation and health in the field.

Furthermore, research is needed that goes beyond assessing the impact of individual behavior on health and well-being. Studies have shown that the built environment is associated with health-related quality of life. However, few studies are available that assess this relationship in Hispanic Americans specifically (Mier et al., 2008). Studies are needed that assess what particular features of the built environment are associated with health-related quality of life in Hispanic Americans. Thus, the present study examined acculturation and the environment jointly to better understand predictors of health-related quality of life among Hispanic Americans.

## **2.7 The Ecological Model**

The ecological model was used to inform the selection of variables and data analysis for the present study. This model proposes that individual behavior reciprocally shapes, and is affected by, the environment. Furthermore, there are multiple levels of influence for health including individual factors and community factors, among others (Sallis, Owen, & Fisher, 2008). The ecological model is different from behavioral models of health behavior that focused on the individual and his or her characteristics and close social relationships. Behavioral models of health behavior typically fail to incorporate the impact of one's larger community and the environment in which one lives (Sallis et al., 2008).

There are four main principles of ecological models of health behavior: 1) health behaviors are influenced by multiple factors at the intrapersonal, interpersonal, organizational, community, and policy levels; 2) these levels interact to influence health

behavior; 3) ecological models should be specific to particular health behaviors; and 4) the most effective way to change health behavior is through multi-level interventions (Sallis et al., 2008). Ecological models have been used to promote behavior change in several domains including physical activity, diet, and smoking. A strength of the ecological model is that it increases the levels at which intervention is possible. In addition, interventions targeted at policy and the environment have the potential to impact large communities. Interventions aimed at the individual are less likely to have as broad an impact because they are restricted to those who agree to participate. Furthermore, interventions aimed at policy and the environment may be more sustainable, as opposed to interventions focused on the individual (Sallis et al., 2008).

Studies have tested the ecological model by examining multi-level influences on health behaviors and interactions across levels. For example, multi-level logistic regression was used to identify individual and environmental predictors of smoking among sixth and seventh-grade elementary school students ( $N = 6,341$ ; Leatherdale, McDonald, Cameron, Jolin, & Brown, 2006). Significant predictors of smoking were found at both individual and environmental levels. At the individual level, non-smoking sixth and seventh-grade students were more likely to smoke if they had friends who smoked or a mother who smokes. Whether a father smoked did not influence whether youths smoked. At the environmental level, high school smoking rates among older students was found to significantly predict smoking rates among sixth and seventh-grade students.

An international study examined factors that modified casual attribution of an injury event to alcohol consumption among emergency room patients who reported

drinking prior to injury (Cherpitel et al., 2006). The likelihood to attribute injury to alcohol consumption was moderated by the type of drinking society in which one lived. In societies with high rates of detrimental drinking, individuals were less likely to make a casual attribution between injury and alcohol as compared to societies with low rates of detrimental drinking patterns. These studies demonstrate how application of the ecological model to the study of health results in a more comprehensive understanding of our health-related decisions and behaviors. A more in-depth understanding potentially allows for more targeted and effective interventions.

## **2.8 Limitations of Previous Research**

Research examining the relationship between acculturation and health has been limited by the use of proxy measures of acculturation or use of dichotomous acculturation variables, placing individuals in either high or low levels of acculturation groups. Researchers have recommended the use of latent methodologies and multidimensional measures of acculturation to bolster construct validity (Abraído-Lanza et al., 2005; Corral & Landrine, 2008). This project intends to expand our understanding by using multiple acculturation-related measures as opposed to a proxy indicator, to create latent variables of acculturation. Single proxy indicators of acculturation often reflect a linear model of acculturation. Research using latent variables of acculturation based on several indicators has been suggested as a way to advance the study of acculturation and health in the field (Abraído-Lanza et al., 2006).

A critical aspect missing from research relating acculturation to health is an understanding of environmental or contextual factors (Abraído-Lanza, Echeverría, & Flórez, 2016). The impact of the environment on health has previously been documented

among minority populations (Adler & Stewart, 2010). Although the ability to engage in healthy behaviors is often attributed to an individual's choices, it also is affected by the availability of resources in the environment. An environment with an abundance of tobacco and liquor stores, limited access to open park space, and unhealthy food options, may make it more difficult to live a healthy lifestyle. Studies have examined the independent effects of acculturation and the environment on health-related quality of life. A few studies have examined the joint impact of acculturation and the environment on health behaviors and outcomes in Hispanic Americans (Abraído-Lanza et al., 2016; Adler & Stewart, 2010). To date, no studies have examined the joint impact of acculturation and the neighborhood environment on mental and physical health-related quality of life in Hispanic Americans (Adler & Stewart, 2010).

A study of 225 Latino adolescents living at the San Diego-Tijuana border assessed the relationship between individual cultural characteristics and the built environment on alcohol and tobacco use (West et al., 2010). As expected, shorter distance from adolescents' homes to the nearest alcohol and tobacco retailer was associated with increased risk of alcohol and tobacco use. In addition, there was a significant interaction between the distance to the nearest retailer and parenting behavior in predicting alcohol and tobacco use. This interaction suggests that the relationship between the alcohol and tobacco retail environment and alcohol and tobacco use among Latino adolescents is dependent on parents' culture (e.g., parenting practices; West et al., 2010). Another study used multilevel modeling to examine the relationships of individual and environmental predictors of tobacco use among 5,234 adolescents from 11 towns in the Midwestern United States (Pokorny, Kason, & Schoeny, 2003). The majority of the

sample was non-Hispanic White and 8.5% identified as Latino. There was a significant interaction among retail tobacco availability, presence of an adult tobacco user in the household, and smoking initiation of youth. Higher levels of tobacco availability were related to smoking initiation among youth when there was no adult tobacco user in the household. This relationship was not significant when there was an adult tobacco user in the household. This is another example of a study demonstrating that culture (e. g., parent health behavior practices) can impact the relationship between the tobacco retail environment and tobacco use among youth (Pokorny et al., 2003). A study of 919 African American, non-Hispanic White, and Latino adults living in Detroit, Michigan examined the relationship between the neighborhood food environment and fruit and vegetable intake (Zenk et al., 2009). Presence of a large grocery store in one's neighborhood was associated with an average .69 increase in daily fruit and vegetable servings for the full sample. However, there was also a moderating effect of individual race/ethnicity. In comparison to African Americans, Latinos who had a large grocery store in their neighborhood ate 2.20 more daily servings of fruits and vegetables. The relationship between the food environment and intake did not differ for African Americans and non-Hispanic Whites. This study demonstrates the importance of the neighborhood food environment for healthy eating. In addition, a moderating effect was found for race/ethnicity, suggesting that other factors, such as culture, may play a role in the relationship between the neighborhood food environment and food intake (Zenk et al., 2009). Similarly, another large multi-ethnic study ( $N = 13,102$ ) examined the relationship between the neighborhood built environment (e.g., transit access, mixed land use) and body mass index among individuals living in New York City (Lovasi,

Neckerman, Quinn, Weiss, & Rundle, 2009). This relationship was moderated by race/ethnicity and socioeconomic status. Relationships between the built environment and body mass index were strongest for non-Hispanic Whites and study participants with more education and income (Lovasi et al., 2009).

More studies are needed that go beyond examining independent effects, and instead evaluate the interplay between the individual and environment and its impact on health. Adler and Stewart (2010) discussed the growth and progression of health disparities research, and stated that a burgeoning area in the field is the study of moderators in multilevel analyses. This study jointly examines the relationships of acculturation and the environment to health-related quality of life, and examines whether the neighborhood in which one lives moderates the relationship between an individual's level of acculturation and their health-related quality of life. Sallis et al. (2008) noted that research using ecological models is more challenging than research conducted at the individual level. Only multi-level studies, however, can provide insight into how to best develop effective multi-level interventions.

## **2.9 Specific Aims and Hypotheses of the Present Study**

Mental and physical health-related quality of life among Hispanic Americans may be related to differences that exist at the individual (e.g., perceived discrimination) and neighborhood (e.g., proximity to open space) levels. In an effort to understand how individual cultural differences and the neighborhood environment relate to health-related quality of life among Hispanic Americans, this study examined the relationships among acculturation variables, neighborhood variables, and health-related quality of life. Using multi-level modeling, this project hoped to identify which Hispanic Americans are at risk

for poor mental and physical health-related quality of life, and importantly, under what environmental conditions this occurs. In pursuit of this goal, this project had the following specific aims:

**Aim I.** Derive person-level latent acculturation variables from multiple individual indicators of acculturation.

**Hypothesis I.** Latent variables of acculturation can be derived from multiple individual indicators of acculturation.

**Aim II.** Identify person-level latent acculturation variables that are associated with mental and physical health-related quality of life among Hispanic Americans. Acculturation has been previously shown to relate to health-related quality of life. Previous studies have been limited, however, by their use of proxy indicators of acculturation or use of dichotomous acculturation variables, placing individuals in either high or low levels of acculturation groups. Researchers in this area have recommended the use of latent methodologies and multidimensional measures of acculturation to bolster construct validity.

**Hypothesis II.** Person-level acculturation latent variables will be associated with mental and physical health-related quality of life. We expected certain relationships between acculturation, as measured in this study, and health-related quality of life in Hispanic Americans. Based on the literature, among Hispanic American men and women, higher levels of acculturation to the United States were expected to be associated with worse mental and physical health-related quality of life.

**Aim III.** Identify neighborhood-related variables (e.g., proximity to alcohol outlets, food environment) that are associated with quality of life among Hispanic Americans, after controlling for person-level acculturation variables.

**Hypothesis III.** Neighborhood variables will be associated with mental and physical health-related quality of life, after controlling for person-level acculturation latent variables. Among Hispanic American men and women, it was hypothesized that:

3a. Greater access to open spaces will be associated with better mental and physical health-related quality of life;

3b. Greater public transit access will be associated with better mental and physical health-related quality of life;

3c. Fewer road traffic injuries will be associated with better mental and physical health-related quality of life;

3d. A more healthy retail food environment will be associated with better mental and physical health-related quality of life;

3e. Greater distance from alcohol outlets will be associated with better mental and physical health-related quality of life;

3f. Lower density of active tobacco retailers will be associated with better mental and physical health-related quality of life;

3g. Greater percentage of the population who vote among those who have registered will be associated with better mental and physical health-related quality of life;

**Aim IV.** Determine how person-level acculturation variables interact with neighborhood variables to predict health-related quality of life among Hispanic Americans.

**Hypothesis IV.** Neighborhood variables will moderate the relationship between person-level acculturation variables and mental and physical health-related quality of life. Among Hispanic American men and women, we expected significant interactions between person-level acculturation variables and neighborhood variables in predicting mental and physical health-related quality of life. Due to limited research examining these interactions, and the use of latent variables of acculturation that were derived as part of this study, there were no specific a priori predictions about how the acculturation variables and neighborhood variables interact to predict quality of life.

Findings from this dissertation are being prepared for publication. Publications based on this dissertation, chapters one through five, will be co-authored by Vanessa L. Malcarne, Elizabeth A. Klonoff, Scott C. Roesch, Rina S. Fox, and Georgia Robins Sadler. The dissertation author was the primary investigator and author of this material.

## CHAPTER 3: METHODS

### **3.1 Participants**

A sample of 383 English- and Spanish-speaking Hispanic American men and women from the San Diego community completed health-related questionnaires. To be eligible, individuals must have self-identified as Hispanic American, been at least 21 years of age, and been residents of the United States. Individuals needed to be literate in English and/or Spanish. Eligible participants gave written consent, and completed the survey packet in their preferred language (English or Spanish).

### **3.2 Procedure**

The Hispanic American sample came from a National Cancer Institute-funded cross-sectional, community-based study in San Diego County (NCI 1R25CA130869). The goal of the parent study was to develop and evaluate a cancer clinical trials education program for the Hispanic American community aimed at increasing clinical trial participation among Hispanic Americans. The parent study consisted of three parts: 1) a measurement validation phase, 2) two rounds of community-based focus groups to support intervention development, and 3) a randomized controlled trial to evaluate the impact of the intervention on knowledge of and attitudes toward clinical trials participation. This dissertation project uses survey data collected at baseline during the randomized controlled trial phase of the study. Recruitment strategies included flyer distribution, word-of-mouth, and meetings at community sites, churches, and health fairs. Individuals interested in participating were screened for potential inclusion. Survey completion took approximately two hours. 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.

### 3.3 Measures

**Acculturation Measures.** Person-level acculturation data were gathered from responses on measures included in the survey packet from the larger National Cancer Institute study discussed above.

***MacArthur Scale of Subjective Social Status (SSS; Adler, Epel, Castellazo, & Ickovics, 2000).*** This is a self-anchoring visual scale in the form of a 10-rung ladder. Participants are 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 in the United States. On the other, they compared themselves to other individuals within their community. The measure has shown good psychometric properties (i.e., test-retest reliability, convergent validity) among a multi-ethnic sample including Hispanic Americans in the United States (Operario, Adler, & Williams, 2004).

***Duke University Religion Index (DUREL; Koenig & Bussing, 2010).*** This is a brief, five-item measure of religious involvement in three separate dimensions: organizational religious activity, non-organizational religious activity, and intrinsic religiosity. All three subscales were used in the present study. Used in over 100 published studies, the measure has high test-retest reliability (intra-class correlation = 0.91) and internal consistency reliability ( $\alpha = 0.78-0.91$ ). It has demonstrated convergent validity with other measures of religiosity. In the present study, internal consistency reliability for the intrinsic religiosity subscale was good ( $\alpha = .84$ ).

***Brief Acculturation Scale for Hispanics (BASH; Norris, Ford, & Bova, 1996).***

The BASH is a four-item measure that uses language as a proxy for acculturation.

Respondents select the language in which they think, speak at home, speak with friends, and read. Response choices are the following: Only Spanish, more Spanish than English, both equally, more English than Spanish, and only English. In the original validation study, internal consistency reliability was good for Mexican respondents ( $\alpha = 0.92$ ). The measure also demonstrated good reliability, structural validity, and convergent validity when examined in a sample of English- and Spanish-speaking Hispanic Americans (Mills, Malcarne, Fox, & Sadler, 2014). In the present study, internal consistency reliability was excellent ( $\alpha = .95$ ).

***Experiences of Discrimination (EOD; Kreiger, Smith, Naishadham, Hartman, & Barbeau, 2005).*** The EOD is a nine-item self-report measure of racial/ethnic discrimination. Respondents select the frequency with which they have ever experienced discrimination in nine different contexts (e.g., at school, getting hired or getting a job, at work). Respondents select from the following response options: Once, Two or three times, Four or more times, and Never. The measure was validated in a large working-class sample including Hispanic Americans, and has adequate internal consistency and good structural and convergent validity (Kreiger et al., 2005). In the present study, internal consistency reliability was good ( $\alpha = .87$ ).

***Demographic acculturation-related data.*** Number of years lived in the United States was collected as part of the demographic information included in the survey packet from all participants.

**Neighborhood-level Environment Measures.** Each participant's neighborhood-level data was obtained at the census tract level using data from the Health Communities Data and Indicators Project (HCI) collected by the California Department of Public Health and the University of California, San Francisco and data from the California State Board of Equalization (California Department of Public Health, 2015).

***Access to Open Spaces.***

*Access to Open Spaces.* Access to open spaces was defined as the percent of residents within .5 miles of a park greater than 1 acre, or a beach, open space, or coastline. The California Protected Areas Database was obtained as a shape file by the HCI. Open space lands including parks, as well as open lands with other uses such as recreation, forestry, habitat conservation, historical/cultural, water supply, scenic areas, flood control, general open space, and agricultural/ranching greater than one acre with "open access" designation were selected for analysis and half mile buffers were created around each park. Census blocks with centroids inside the parks buffer area were selected, and block data were then aggregated by census tract.

***Transit.***

*Public Transit Access.* Public transit access was defined as the percent of the population residing within .5 miles of a major transit stop with a waiting time of less than 15 minutes during peak commute hours (6:00-9:00AM, 3:00-6:00PM). HCI collected data on transit stops from the San Diego Association of Governments, the Southern California Association of Governments, and the Metropolitan Transportation commission. Geospatial software (ArcMAP 10.1) was used to identify census blocks with

centroids inside a .5 mile buffer of a transit stop. Block data were then aggregated by census tract.

*Road Traffic Injuries.* Road traffic injuries were defined as the annual number of severe road traffic injuries per 100,000 population. Collision data for severe injuries were downloaded by HCI from the Transportation Injury Mapping System and geocoded to census tracts. Victim mode of transport included all of the following: bicyclist, bus, car/pickup, motorcycle, pedestrian, truck, and vehicles. Severe injuries were defined as other than fatal injuries that include the following: broken or fractured bones, dislocated or distorted limbs, severe lacerations, skull, spinal, chest or abdominal injuries that go beyond other visible injuries, unconsciousness at or when taken from collision scene, and severe burns.

### ***Food.***

*Healthy Food Retailers.* The retail food environment was assessed using the modified retail food environment index (mRFEI), an indicator developed by the Centers for Disease Control and Prevention, which provides the percentage of healthy food retailers for each census tract (Centers for Disease Control & Prevention). Healthy food retailers include supermarkets, larger 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. Lower mRFEI scores indicate that the census tract contains more convenience stores and fast food restaurants in comparison to healthy food retailers. A score of 0 indicates there are no healthy food retailers (food desert). The mRFEI was calculated for each census tract by the Centers for Disease Control and Prevention using the formula:

$mRFEI = \# \text{ of Healthy Food Retailers} / \# \text{ of Healthy Food Retailers} + \# \text{ of Less Healthy Food Retailers}$

***Drugs.***

*Proximity to Alcohol Outlets.* Proximity to alcohol outlets was defined as the percent of the population 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 a .25 mile were created around all alcohol establishments, and block data were then aggregated by census tract.

*Density of Tobacco Outlets.* Number of active tobacco outlets divided by area in square miles was calculated for each census tract. Tobacco outlet data came from the California State Board of Equalization, which is responsible for collecting the state tax imposed on all tobacco products.

***Social Capital.***

*Voting.* Voting was defined as the percent of adults who voted in the 2010 general elections among those who registered. Estimates of the number of people who were eligible to vote were obtained by HCI from the Secretary of State's Reports of Registration. The total eligible population was calculated by subtracting the total population counts, as collected by the Department of Finance, from the population that is 17 years or younger, non-citizens, felons in prison, and supervised felon parolees. Data on the number of people 18 years or older who registered to vote and then voted in the

general elections were obtained from the Statewide Database. Data were aggregated at the census tract level.

**Health-related Quality of Life.** Quality of life data were gathered from participant responses on measures included in the survey packet from the larger National Cancer Institute study discussed above.

***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), measures health-related quality of life. Physical component summary (SF-12 PCS) and mental component summary (SF-12 MCS) scores were calculated using software provided by the measure developers. SF-12 PCS and SF-12 MCS scores range from 0 to 100, with higher scores indicating better quality of life. The two subscales are designed to have a mean of 50 and standard deviation of 10. The measure has shown good psychometric properties in diverse clinical and non-clinical samples, as well as diverse ethnic groups including English- and Spanish-speaking Hispanic Americans (Burdine, Felix, Abel, Wiltraut, & Musselman, 2000; Gandek et al., 1998; Ware, 1999). Internal consistency reliability was good for the SF-12 MCS ( $\alpha = .82$ ) and the SF-12 PCS ( $\alpha = .79$ ) in the present study.

**Covariates.** Covariate data were gathered from participant responses on measures included in the survey packet from the larger National Cancer Institute study discussed above. Neighborhood covariate data were obtained using the United States Census database.

***Person-level.*** Age and income data were assessed via self-report from study participants.

*Neighborhood-level.* Median age and median family income data came from the United States Census database and were extracted for each census tract in which an individual lived.

### **3.4 Data Analytic Plan**

**Analysis for Aim I.** Exploratory factor analysis (EFA) using principal axis factoring with direct oblimin rotation was conducted in SPSS version 23 (IBM Corp, 2015) to identify latent acculturation variables at the person-level. EFA is a statistical method used to identify the underlying relationships between measured variables when a researcher has no a priori hypotheses about how the measured variables are related. EFA was selected for the present analysis because it was not clear how the individual indicators of acculturation would relate to form latent variables. The goal of EFA is to identify the smallest number of theoretically and practically salient factors needed to explain the correlations among observed variables (Ullman, 2006). The following acculturation-related measures were used in the EFA: DUREL (Koenig & Bussing, 2010), BASH (Norris, Ford, & Bova, 1996), SSS (Adler, et al., 2000), EOD (Kreiger, Smith, Naishadham, Hartman, & Barbeau, 2005), and participants self-report of the number of years lived in the US.

The variance accounted for by the solution, the variance accounted for by each individual factor, and the interpretability of the factors were considered when making a determination about the appropriate number of factors. To maximize practical significance and minimize multi-vocality (items loading on more than one factor), items with a primary loading  $\geq .40$  and secondary loadings  $\leq .25$  were retained. Factor loadings

were examined using oblique (direct oblimin) rotation to allow for possible correlations among factors.

**Analysis for Aims II - IV.** Multi-level modeling using Mplus version 7.2 (Muthén & Muthén, 2006) tested the relationships of person-level latent acculturation variables and neighborhood variables to mental and physical health-related quality of life. Separate models were examined for mental health-related quality of life and physical health-related quality of life.

A multi-level data structure contains observations at one level of analysis that are nested within observations of another level of analysis. A key component of multi-level modeling is that the data at different levels of analysis are interdependent (Nezlek, 2012). For this study, person-level acculturation latent variables were included at the lowest level of each model (level 1), and were hierarchically nested within participants' residential neighborhood data (level 2). Neighborhoods were defined using United States census tracts, considered to be relatively homogeneous units based on population characteristics (Fry & Taylor, 2012). Using hierarchical linear modeling methods proposed by Enders and Tofighi (2007), person-level latent acculturation variables and each neighborhood variable were entered in a joint model to examine the impact of acculturation and neighborhood on mental and physical health-related quality of life. Additionally, we specifically tested whether neighborhood variables moderate the relationship between person-level acculturation variables and mental and physical health-related quality of life. Covariates (i.e., age and income) were controlled for in all analyses.

Multi-level 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. The intercept-only model provides the variance in quality of life (mental, physical) that exists at the individual and neighborhood levels. If variance exists at both levels of the data structure, the random-regression coefficients model is examined. In this model, the person-level latent acculturation variables are included as the only predictors in the model to examine the relationship between these level 1 variables and the outcome [Aim II]. Next, the means-as-outcome model is examined. The means-as-outcome model includes neighborhood predictor variables to examine the relationship between these level 2 variables and the outcome, after controlling for person-level latent acculturation variables [Aim III]. Last, the intercepts- and slopes-as-outcomes model is examined. This last model includes both person-level and neighborhood-level variables in the model simultaneously, as well as a cross-level interaction term. A cross-level interaction term was also included in this final model to assess whether neighborhood variables moderate the relationship between person-level latent acculturation variables and quality of life. 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 IV].

Missing data was handled in Mplus using the full-information maximum likelihood approach. This estimation approach allows even those cases with missing data on one or more study variables to be included in analyses. Model parameters and standard errors are estimated using all observed data, and therefore data from both complete cases and partial cases are used to estimate target model parameters. Prior

research has demonstrated that this estimation technique produces unbiased parameter estimates and standard errors under various missing data conditions (Enders, 2010).

Findings from this dissertation are being prepared for publication. Publications based on this dissertation, chapters one through five, will be co-authored by Vanessa L. Malcarne, Elizabeth A. Klonoff, Scott C. Roesch, Rina S. Fox, and Georgia Robins Sadler. The dissertation author was the primary investigator and author of this material.

## CHAPTER 4: RESULTS

### 4.1 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 approximately equally split among men and women. Thirty-six percent of the sample had less than a high school education. Approximately half of participants were employed and had an annual household income of less than \$20,000. Forty-two percent of the sample was born in Mexico. Participants had a mean SF-12 MCS score of 47.26 ( $SD = 9.83$ ) and a mean SF-12 PCS score of 49.97 ( $SD = 8.97$ ). Characteristics of the census tracts examined in the study can be found in Table 2. Averaged across census tract, the median age was 33.61 years ( $SD = 4.83$ ) and the median income was \$51,570.01 ( $SD = \$19,919.38$ ).

### 4.2 Exploratory Factor Analysis (Aim I)

Principal axis factoring with direct oblimin rotation suggested that the three-factor solution best explained the data (see Table 3). The variance explained by the solution was 50.93%, and the three factors individually accounted for 22.76%, 15.83%, and 12.34% of the variance, respectively. Using the pattern matrix for interpretation, three items loaded onto the first factor (values ranged from .70 to .85), two items loaded onto the second factor (values were both .77), and two items loaded onto the third factor (values were .67 and .77). The EOD measure did not load onto any factor. In addition, the parallel analysis indicated that a three-factor solution best represented the data when eigenvalues from the target data were compared to eigenvalues from randomly generated data: 1) 2.24 v. 2.20, 2) 1.67 v. 1.12, and 3) 1.37 v. 1.05. Factor names were created based on item loadings.

Factor 1 was labeled Religiosity. Factor 2 was labeled Subjective Social Status. Factor 3 was labeled Traditional Acculturation.

### **4.3 Multi-level Modeling (Aims II - IV)**

Multi-level modeling was used to statistically analyze a data structure where participants (level-1) were nested within neighborhoods (level-2). Of specific interest was the relation between participants' SF-12 MCS and SF-12 PCS scores (level-1 outcome variables) and acculturation factors (level-1 predictor variables) and neighborhood environment indicators (level-2 predictor variables). Separate models were examined for the SF-12 MCS and SF-12 PCS outcome variables.

#### **SF-12 MCS.**

For the SF-12 MCS, the intercept-only model revealed an intraclass correlation coefficient of .05. Thus, 5% of the variance in SF-12 MCS scores is between-neighborhoods and 95% of the variance in SF-12 MCS is at the individual-level. Because variance existed at both levels of the data structure, predictors were individually added at each level. Next, the random-regression coefficients model was tested using the three acculturation factors identified in the exploratory factor analysis as the predictor variables, controlling for age and income (see Table 4). Separate models were run for each acculturation factor. The regression coefficient relating the Subjective Social Status factor to the SF-12 MCS was positive and statistically significant ( $b = 1.829, p < .01$ ). Higher scores on the Subjective Social Status factor were associated with higher SF-12 MCS scores, controlling for age and income. The regression coefficients relating the Religiosity and Traditional Acculturation factors to the SF-12 MCS were not statistically significant (Religiosity:  $b = -.464, p = .30$ ; Traditional Acculturation:  $b = .864, p = .14$ ).

The means-as-outcomes models were then examined to assess the relationship between each neighborhood environment variable and the SF-12 MCS outcome, controlling for age and income, at both the individual and neighborhood levels, as well as acculturation (see Table 5a). Separate models were run for each acculturation factor. No neighborhood variables were statistically significantly ( $p > .05$ ) associated with the SF-12 MCS.

Finally, the intercepts- and slopes-as-outcomes model was tested which also included a cross-level interaction between each neighborhood environment variable and acculturation factor (see Table 6a). Separate models were run for each acculturation factor. There were no significant ( $p > .10$ ) cross-level interactions.

#### **SF-12 PCS.**

For the SF-12 PCS, the intercept-only model revealed an intraclass correlation coefficient of .05. Thus, 5% of the variance in SF-12 PCS scores is between neighborhoods and 95% of the variance in SF-12 PCS is at the individual-level. Because variance existed at both levels of the data structure, predictors were individually added at each level. Next, the random-regression coefficients model was tested using the three acculturation factors identified in the exploratory factor analysis as the predictor variables, controlling for age and income (see Table 4). Separate models were run for each acculturation factor. The regression coefficient relating the Subjective Social Status factor to the SF-12 PCS was positive and statistically significant ( $b = .788, p = .03$ ), controlling for age and income. Higher scores on the Subjective Social Status factor were associated with higher SF-12 PCS scores. The regression coefficients relating the

Religiosity and Traditional Acculturation factors to the SF-12 PCS were not statistically significant (Religiosity:  $b = -.218, p = .57$ ; Traditional Acculturation:  $b = -.549, p = .33$ ).

The means-as-outcomes models were then examined to assess the relationship between each neighborhood environment variable and the SF-12 PCS outcome, controlling for age and income, at both the individual and neighborhood levels, as well as acculturation (see Table 5b). Separate models were run for each acculturation factor. For the Subjective Social Status and Traditional Acculturation factors, the regression coefficient relating the proximity to alcohol outlets variable to the SF-12 PCS was positive and statistically significant (Subjective Social Status:  $b = .048, p = .05$ ; Traditional Acculturation:  $b = .048, p = .05$ ). No other neighborhood variables were statistically significantly ( $p > .05$ ) associated with the SF-12 PCS.

Finally, the intercepts- and slopes-as-outcomes model was tested which also included a cross-level interaction between each neighborhood variable and acculturation factor (see Table 6b). Separate models were run for each acculturation factor. For the Subjective Social Status factor, there was a significant cross-level interaction with the tobacco density neighborhood variable ( $b = .034, p = .01$ ). The relationship between the Subjective Social Status latent variable 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.

Findings from this dissertation are being prepared for publication. Publications based on this dissertation, chapters one through five, will be co-authored by Vanessa L.

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Sadler. The dissertation author was the primary investigator and author of this material.

## CHAPTER 5: DISCUSSION

The present study used an ecological approach to examine factors associated with mental and physical health-related quality of life among a community sample of Hispanic Americans living in a metropolitan border city. The ecological model considers how both the individual and the environment are associated with health, and is in line with the predominant mission of epidemiology: “to discover the agent, host, and environmental factors which affect health, in order to provide the scientific basis for prevention of disease and injury and the promotion of health” (Terris, 1992, p. 142).

### **5.1 Health-related Quality of Life in Hispanic Americans**

Health-related quality of life is an important health outcome to examine in Hispanic Americans. Self-reported health-related quality of life is the perception of one’s physical and mental health, and compliments traditional public health measures of morbidity and mortality. Furthermore, self-reported health status has been shown to independently predict objective measures of morbidity and mortality (Jerant, Arellanes, & Franks, 2008). According to the Centers for Disease Control and Prevention, fair or poor health-related quality of life has been consistently reported by higher percentages of Hispanic Americans in comparison to non-Hispanic Whites (Zack, 2013; Zahran et al., 2005). The age-adjusted percentage of Hispanic American adults reporting fair or poor health-related quality of life is more than double that of non-Hispanic Whites (28.1% v. 13.3%; Zack, 2013). The only racial/ethnic group with a greater percentage of the population reporting fair or poor health-related quality of life is American Indian/Alaska Natives (28.1% v. 30.8%). In the present study, the mean SF-12 MCS and SF-12 PCS scores were 47.26 ( $SD = 9.83$ ) and 49.97 ( $SD = 8.97$ ), respectively. The SF-12 MCS and

SF-12 PCS scores were developed to have a mean score of 50 and a standard deviation of 10 in a sample representative of the United States population (Jerant et al., 2008). The minimal clinically important difference (MCID) is not known for the SF-12; however, a MCID of three to five points has been recommended for the SF-36, and both measures were designed to have the same score means, standard deviations, and range (Hays & Morales, 2001). Hays and Morales (2001) recommended caution when interpreting the MCID, as previous studies have found clinically important changes in the SF-36 measure with changes in total scores as small as .86 points ( $SD = .09$ ). Thus, Hispanic American participants in the present study may have clinically significantly lower mental health-related quality of life as compared to the general United States population. On the other hand, participants' mean physical health-related quality of life scores did not appear clinically different from the general United States population.

## **5.2 Exploratory Factor Analysis of Acculturation-related Measures**

The individual-level variables included in this study were acculturation focused. There is a large literature base that shows a significant relationship between acculturation and health behaviors (e.g., diet, substance abuse, cancer screening) and health outcomes (e.g., low birthweight, depression, hypertension) in Hispanic Americans (Abraído-Lanza et al., 2016; Lara et al., 2005). However, few studies have examined the relationship between acculturation and health-related quality of life, specifically, in community samples of Hispanic Americans. Furthermore, among these studies, findings have been mixed. Researchers have called for the use of multidimensional measures of acculturation and latent statistical methodologies to better understand the relationship between acculturation and health.

Thus, the first aim of the present study was to use EFA to identify latent variables of acculturation from several acculturation-related measures. EFA showed support for a three-factor solution consisting of the following factors named: 1) Subjective Social Status, 2) Religiosity, and 3) Traditional Acculturation. The Subjective Social Status factor was made up of the two measures of the MacArthur Scale of Subjective Social Status (Adler et al., 2000). One measure asks the respondent to indicate where he or she stands relative to others in the United States. The other measure asks the respondent to indicate where he or she stands relative to others in their community. Thus, this latent factor considers both the United States and community referents simultaneously, providing an overall evaluation of social status. The Religiosity factor was made up of the three subscales of the Duke University Religion Index (Koenig & Bussing, 2010): Organizational Religious Activity, Non-organizational Religious Activity, and Intrinsic Religiosity. This latent factor provides a combined evaluation of these three types of religious activity. The Traditional Acculturation factor was named based on the two measures which constitute it: the Brief Acculturation Scale for Hispanics (Norris et al., 1996), a language-based measure of acculturation, and the participant's report of the number of years he or she has lived in the United States. Language preference and the number of years lived in the United States are commonly used proxy measures of acculturation.

The only acculturation-related measure included in the EFA that did not significantly load onto any factor was the Experiences of Discrimination measure (Kreiger et al., 2005). This is not surprising as EFA is a data reduction technique with the purpose of making fewer variables (i.e., factors) from more observed variables to

discover the underlying relationships between the observed variables. Reviewing the measures used in the EFA, it was not clear how discrimination would relate to the other measure constructs. A previous study examining correlates of perceived discrimination among Hispanics found that English language proficiency and age of arrival to the United States were significantly associated with perceived discrimination (Pérez, Fortuna, & Alegria, 2008). Of note, English language proficiency and younger age of arrival to the United States or being born in the United States were associated with more perceived discrimination as compared to those not reporting English language proficiency and older age of arrival to the United States, respectively. In the present study, the Experiences of Discrimination measure and the BASH, a measure of language preference, had a significant, but small, positive correlation ( $r = .11, p = .04$ ). More acculturation to the United States, as demonstrated by a greater preference for the English language as opposed to the Spanish language, was associated with more perceived discrimination, albeit this correlation was small. The Experiences of Discrimination measure and the number of years lived in the United States variable were not significantly correlated ( $r = .09, p = .08$ ). The Experiences of Discrimination measure may not have loaded onto any factor because of the low levels of discrimination participants reported in the present study. The mean score for the Experience of Discrimination measure was 6.85 ( $SD = 9.09$ ), and the potential range in scores for the measure is 0 to 45, with higher scores indicating greater perceived discrimination. On the other hand, as suggested by the EFA, discrimination may actually represent a construct that is distinct from the other acculturation-related measures included in the analysis.

Results from the EFA suggest that acculturation is a multidimensional construct consisting of several distinct components. In the present study, an exploratory approach was used to examine how the acculturation measures were related. Previous theoretical models of acculturation, such as the unidimensional model, would suggest that these acculturation measures have a unidimensional factor structure representing an overall Hispanic orientation. However, the present study's findings indicate that the acculturation dimensions assessed are better conceptualized as separate components of acculturation. For example, an individual may be more traditional in one acculturation-related domain (e.g., religiosity), but more acculturated in another (e.g., language preference). These findings underscore the importance of examining unique aspects and experiences related to culture independently to better understand the construct of acculturation and how it relates to health outcomes.

### **5.3 Acculturation and Health-related Quality of Life**

The second aim of the study was to examine how the acculturation latent variables identified in the EFA relate to mental and physical health-related quality of life. The Subjective Social Status latent variable was significantly, positively associated with mental and physical health-related quality of life, controlling for individual-level age and income. A higher subjective social status was associated with better mental and physical health-related quality of life. This finding is consistent with other studies that have shown 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 Hispanic Americans. Franzini and Fernandez-Esquer (2004) found

that subjective social status was significantly, positively associated with mental and physical health-related quality of life in a sample of 1,754 Mexican-origin men and women living in Texas. Another study found that subjective social status was significantly, positively associated with self-rated health among pregnant Latina women (Ostrove, Adler, Kupperman, & Washington, 2000). However, this relationship was no longer significant when controlling for education and household income. The present study suggests that subjective social status has an independent association with mental and physical health-related quality of life, beyond measures of socioeconomic status such as income.

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 (Sing-Manoux, Adler, & Marmot, 2003).

Social status has been related to health through a mobilization of the stress-response (Sapolsky, 2004). Among animals (e.g., mice, rats, olive baboons, tree shrews, lemurs, rabbits, guinea pigs, hamsters), studies show that subordinate animals, or those with a low social status, tend to have a slow stress-response and poor recovery after being stressed. When the body experiences stress, the amygdala, an area of the brain responsible for emotional processing, sends a signal to the hypothalamus (Harvard Mental Health Letter, 2011). The hypothalamus acts like a command center to

communicate this distress signal to the rest of the body through the sympathetic nervous system. In a stress-response, the hypothalamus activates the sympathetic nervous system by sending signals to the adrenal glands. The adrenal glands then pump the hormone epinephrine into the bloodstream. The release of epinephrine results in several physiological changes (e.g., faster heartbeat, increased blood pressure, widening of airways in the lungs), as well as the release of glucocorticoids and fats from temporary storage providing energy to the body. The hypothalamus also activates the hypothalamic-pituitary-adrenal (HPA) axis, which consists of the hypothalamus, the pituitary gland, and the adrenal glands. The HPA axis maintains the sympathetic nervous system response through hormonal signals (i.e., corticotropin-releasing hormone, adrenocorticotropic hormone), promoting the release of cortisol. Cortisol and epinephrine levels may fall when the threat or stress is no longer perceived (Harvard Mental Health Letter, 2011).

Sapolsky (2004) proposed that subordinate animals, or those of low status, have a delayed stress-response and recovery because of delayed termination of the secretion of glucocorticoids. When glucocorticoids levels are chronically high, the brain sensitivity to the hormone is attenuated. The brain then becomes less responsive to a glucocorticoid negative feedback signal and slow to terminate glucocorticoid secretion after a stressor (Sapolsky, 2004). The delayed stress-response and recovery seen in subordinate animals also impacts other hormones involved in the stress response such as epinephrine and cortisol. Persistent epinephrine surges may damage blood vessels and increase blood pressure and the risk of heart attack and stroke. Chronic elevated cortisol levels can result in increased fat tissue and weight gain (Harvard Mental Health Letter, 2011). Subordinate position has been associated with several adverse health outcomes including increased

risk of cardiovascular disease, hypertension, and, among females, reproductive dysfunction (Sapolsky, 2004).

The stress-response may be activated not only in response to physical stressors, but also to in response to psychological stressors and in anticipation of stressors. Sapolsky (2004) discussed several psychological stressors that are common among those in subordinate positions and result in a stress-response. These psychological stressors include lack of predictability, lack of control, lack of outlets for frustration, and lack of social support (Sapolsky, 2004). These psychological stressors may be exacerbated in the Hispanic American population, which has and continues to be socially marginalized in the United States, despite being the largest ethnic minority (Vázquez, 2011).

In addition to physiological mechanisms, subjective social status has also been associated with health through psychosocial mediators. Psychosocial factors such as self-esteem, sense of control, negative affectivity, neuroticism, and optimism have been found to mediate the relationship between subjective social status and self-rated health (Bosma et al., 2005; Bosma, Schrijvers, & Mackenbach, 1993; Cundiff, Smith, Uchino, & Berg, 2013; Gallo, de los Monteros, Ferent, Urbina, & Talavera, 2007; Matthews, Raikonen, Gallo, & Kuller, 2008; Schnittker, 2004). Future studies should examine psychosocial mediators of the relationship between subjective social status and health specifically among Hispanic Americans. The impact of these psychosocial mediators on health may vary cross-culturally dependent on the meaning of these constructs for particular cultural groups (Kan et al., 2014).

The Religiosity and Traditional Acculturation factors were not significantly associated with mental or physical health-related quality of life. Previous studies have

found significant relationships between religion and mental and physical health (George, Larson, Koenig, & McCullough, 2000). For example, religious involvement has been associated with a reduced likelihood of anxiety (e.g., Koenig, Ford, George, Blazer, & Meador, 1993; Koenig, George, Blazer, Pritchett, & Meador, 1993) and depression (e.g., Koenig, Hays, George, & Blazer, 1997; Meador et al., 1992). Religiosity has also been associated with the onset of several physical conditions including coronary heart disease, heart attack, and hypertension, as well as mortality (George, Larson, Koenig, & McCullough, 2000). Of note, public religious participation such as attendance at religious services has been shown to be the strongest religious predictor of mental and physical health (George et al., 2000). One of the mechanisms by which public religious participation is proposed to promote health is through social support. Attendance at religious activities may facilitate social support, which, in turn, has been shown to promote and protect health. The Religiosity latent variable may not have been significantly associated with mental and physical health-related quality of life in the present study because it included an assessment of organizational religion participation (e.g., attending church), non-organizational religious activity (e.g., prayer at home), and intrinsic religiosity (i.e., degree of personal commitment to religion). This finding suggests that the latter measures of religious involvement, which do not involve public religious participation, may not be strongly associated with mental and physical health-related quality of life, driving the insignificant findings in the present study.

Interestingly, the Traditional Acculturation latent variable, consisting of a measure of language preference and the number of years lived in the United States, was not significantly associated with mental and physical health-related quality of life. While

acculturation has been shown to be significantly associated with health among Hispanic Americans, a review of this topic among Hispanic Americans also identified several studies that have found no significant relationship between acculturation and mental health (e.g., Burnam, Hough, Karno, Escobar, & Telles, 1987; Cuellar & Roberts, 1997) and acculturation and physical health (e.g., Harris, 1991; Lara et al., 2005; Markides, Lee, & Ray, 1993). Language preference and country of birth were used, among other measures, to evaluate acculturation in these studies with non-significant results. The authors of the review wrote, “Thus, depending on the subject area, the measure of acculturation used, and factors such as age, gender, or unmeasured constructs, acculturation may have a negative, positive, or no effect on the health of Latinos” (Lara et al., 2005, p. 374).

Lara et al. (2005) proposed that the findings of their review relating acculturation to health were inconsistent, in part, because of the different ways in which acculturation was measured across studies. For example, a study examining the relationship between acculturation and health outcomes found that country of birth was significantly associated with better birth outcomes; however, language preference was not (English, Kharrazi, & Guendelman, 1997; Lara et al., 2005). Proxy measures of acculturation such as language preference, country of birth, and years lived in the United States attempt to represent a complex process. Psychometric analyses have shown that language preference accounts for a large proportion of the variance in acculturation scales (Mills, Malcarne, Fox, & Sadler, 2014). Those who critique the use of language-based proxy measures of acculturation, however, highlight the complex nature of language use, in particular among bicultural individuals. In addition, the proxy measures of country of birth and the

number of years lived in the United States assume that level of acculturation can be approximated via the length of exposure to the dominant culture in the United States (Lara et al., 2005). This may not always be the case, in particular for individuals who live in ethnic enclaves. Although proxy measures of acculturation may be useful in that they can provide a quick assessment of a construct, they may also produce invalid findings, especially with a complex construct like acculturation. These findings highlight the importance of carefully selecting measures when examining acculturation and provide insight into the inconsistent findings seen in the literature relating acculturation to health in Hispanic Americans.

#### **5.4 Neighborhood and Health-related Quality of Life**

The third aim of the study was to examine the relationship between the neighborhood environment in which one lives and mental and physical health-related quality of life. Better physical health-related quality of life was reported among individuals who lived in neighborhoods with a greater percentage of the population living within .25 miles of an alcohol outlet. These findings are inconsistent with the literature that shows a significant relationship between alcohol use and physical health problems such as increased risk of several cancers (e.g., liver, oral cavity, colon; Nelson et al., 2013). A greater percentage of the population within close proximity to an alcohol outlet has been associated with a greater likelihood to consume alcohol, which, in turn, has been associated with worse physical health (Campbell et al., 2009; Nelson et al., 2013). Thus, it was expected that a greater percentage of the population within close proximity to an alcohol outlet would be associated with worse physical health-related quality of life in the present study.

The significant positive finding between alcohol outlet proximity and physical health-related quality of life may be a result of the way in which the alcohol outlet neighborhood variable was operationalized. In the present study, the variable examining alcohol outlet proximity included an assessment of all alcohol outlets with *off-sale* licenses in a census tract. Stores with an off-sale alcohol license not only include liquor and convenience stores, but also include grocery stores and supermarkets. The availability of local area food stores such as supermarkets and grocery stores has been significantly associated with several healthy behaviors and outcomes such as more fruit and vegetable consumption, healthy diet, and lower obesity rates (Laraia, Siega-Riz, Kaufman, & Janes, 2004; Morland, Diex-Roux, & Wing, 2006; Morland, Wing, Diex Roux, & Poole, 2002; Powell, Slater, Mirtcheva, Bao, & Chaloupka, 2007). Thus, the physical health benefit of living in close proximity to retailers with off-sale alcohol licenses may be related to the availability of grocery stores and supermarkets in one's neighborhood. In addition, this variable assessing alcohol outlet proximity may be serving as a proxy for neighborhood walkability. A neighborhood that has alcohol outlets in close proximity (within .25 miles) to one's home may also be likely to include other retailers close by, and be walking friendly, resulting in improved physical health-related quality of life. Neighborhood walkability has been associated with several positive health outcomes and behaviors including increased physical activity, fewer individuals who are overweight, and lower reports of depression (Renalds, Smith, & Hale, 2010).

There was also a significant cross-level interaction in the present study. The relationship between acculturation, as measured by subjective social status, and physical health-related quality of life was dependent on the tobacco density neighborhood

variable. The relationship between acculturation and physical health-related quality of life 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. Neighborhoods with a high density of tobacco retailers are typically areas with lower median household incomes and areas with a higher prevalence of ethnic minorities, in particular Hispanic Americans and African Americans (Rodriguez, Carlos, Adachi-Mejia, Berke, & Sargent, 2014). This study suggests that acculturation, specifically subjective social status, has a greater impact on physical health-related quality of life in more disadvantaged neighborhoods as compared to more affluent neighborhoods. Previous studies have shown that acculturation and socioeconomic status are interconnected in their relationships to health (Fitzgerald, 2010). Holding a negative view about oneself in comparison to others may be particularly detrimental in disadvantaged neighborhoods where there may be more opportunity to engage in health-risk behaviors. This finding is of particular importance for Hispanic Americans living in the United States given the marginalization and discrimination they may experience, potentially resulting in reports of lower subjective social status (Vázquez, 2011).

The majority of the neighborhood environment variables evaluated in this study were not significantly associated with mental or physical health-related quality of life. Although a power analysis was not conducted in the present study because of the complexity of such analyses in multi-level modeling, the non-significant findings may accurately reflect the relationship between the neighborhood environment and mental and physical health-related quality of life. Previous studies that have examined the

relationship between the neighborhood environment and health outcomes (e.g., body mass index) have found this relationship to be absent or inconsistent, specifically in disadvantaged groups (Lovasi, Neckerman, Quinn, Weiss, & Rundle, 2009). The present study sample can be considered a disadvantaged group based on the low average income and education status of participants. Individuals from disadvantaged groups may encounter other barriers, besides those that exist in the built environment, that have a greater impact on health-related quality of life. For example, although a neighborhood may have several parks, few individuals may use this space for exercise or recreation because they do not have time outside of their work. Also, Lovasi et al. (2009) suggested that health outcomes among disadvantaged groups 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. Several barriers may need to be addressed before the relationship between one particular aspect of the neighborhood environment and health can be observed (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.

In addition, because of high rates of daily mobility, individuals often spend a limited proportion of time in their residential neighborhood (Chaix et al., 2013). The appropriate contextual units for examining the effects of environment variables on health outcomes remains unclear. This problem has been referred to as the *uncertain geographic context problem* (Kwan, 2012). Although residential neighborhoods, often defined according to census tract areas, are commonly used in studies examining the relationship between the environment and health, other contextual units may also be important to

examine to better understand the relationship between the built environment and health-related quality of life. For example, among working adults, the availability of healthy food retailers in close proximity to the workplace may relate to health-related quality of life (Kwan, 2012). Furthermore, the appropriate contextual unit for examining environmental influences on health likely varies for different population groups. For example, Kwan (2012) suggested that smaller geographic contextual units may be appropriate for the elderly because of their lower rates of out-of-home mobility. Studies are needed that identify appropriate contextual units for environmental studies among Hispanic Americans.

### **5.5 Implications for Public Health**

The present study has research implications that may benefit the public health. Interventions aimed at improving mental and physical health-related quality of life among Hispanic Americans may benefit from focusing on an individual's perception of his or her social status. Subjective social status, or one's belief about his or her position in a social hierarchy, is potentially modifiable. Although subjective social status is often attributed to socioeconomic standing, which is difficult to modify, it may also be affected by non-economic factors (Demakakos, Nazroo, Breeze, & Marmot, 2008). Interventions are needed that identify effective ways to modify subjective social status. Further exploration of mediators of the relationship between subjective social status and health may provide useful information for intervention development. The study of social networks and their impact on subjective social status may offer promising information for the development of such interventions.

In addition, this study highlights the utility of an ecological framework for understanding health. Historically, the psychology field has focused on the role an individual has in impacting one's health. The psychology field has largely neglected to study the impact of the environment in which an individual lives. The ecological model allows for the study of individual and environmental factors simultaneously, permitting the assessment of potential interactions across individual and environmental variables. For example, findings from the present study suggest that the relationship between subjective social status and physical health-related quality of life is strongest in disadvantaged neighborhoods. Interventions aimed at improving health by focusing on subjective social status may be of particular use in disadvantaged neighborhoods. The study of the individual and environment provides a more detailed and comprehensive understanding of factors related to health for specific populations.

This study also has clinical implications. Findings from this study suggest that social comparison, or how one compares oneself to others, can impact health-related quality of life. Padilla and Perez (2003) suggest that individuals from stigmatized groups, such as Hispanic Americans in the United States, may protect their well-being by restricting social comparisons to others who also share a similar stigmatized status. This may be difficult, however, in present society where technology (e.g., social media, internet) allows for constant comparison with others outside of one's community. Also, although restricting social comparison to "in-group" members may be helpful for protecting well-being in the short-term, this may also result in long-term maladaptive outcomes (e.g., complacency). Nevertheless, clinicians may benefit from heightened awareness of repeated comparisons to advantaged "out group" members, and alert a

patient to this if appropriate, as constant upward comparisons may adversely impact mental and physical health-related quality of life (Padilla & Perez, 2003). It is recommended that healthcare professionals assess and openly communicate about patients' perceived social status. Subjective social status can be efficiently measured using the MacArthur Subjective Social Status scales. Healthcare professionals may benefit from using these scales to assess a patient's view of his or her standing in relation to others as part of an initial psychosocial or medical assessment.

According to the "shift and persist" hypothesis, cognitive reappraisal strategies may be better suited for individuals who report low social status in effort to find acceptance and meaning in the adversity they experience (Chen & Miller, 2012). Mental health professionals may aid patients who report low social status and face social disadvantage through the use of acceptance and commitment therapy (ACT) methods, an evidence-based psychotherapy approach. ACT emphasizes acceptance, or allowing oneself to experience a range of human emotions with an open perspective. ACT does not attempt to change unwanted feelings or thoughts; but rather, ACT encourages acceptance of unchangeable experiences. ACT also emphasizes identification of values and related goals. Values clarification can help patients identify and prioritize areas that are important in their lives, and help patients engage in actions congruent with these values. In ACT, acceptance and the identification of values and related goals are interconnected. Often, not accepting one's present situation or unchangeable past can be distracting and prevent someone from acting in ways that are congruent with their values.

Traditional cognitive behavioral therapy (CBT) methods may be less appropriate for individuals with low subjective social status as a cognitive-behavioral approach

focuses on challenging irrational and distorted thoughts. Individuals who report low social status may have thoughts that are not appropriate to challenge. For example, an individual who reports low social status may have the thought, “Some people think I am not educated because I do not know English well.” This may not be a distorted thought, but rather may represent a real experience. ACT methods such as acceptance and values clarification may help a patient with low subjective social status identify and engage in goal-related actions (e.g., pursue a valued career) despite living in an unsupportive environment (e.g., others think the patient is not educated).

This study suggests that clinicians that utilize a biomedical model that includes only biological factors to explain illness are not obtaining a comprehensive understanding of factors that impact the health of Hispanic Americans. In strictly following a biomedical model, clinicians may be doing harm by not gathering important social, psychological, and environment-related information that has been shown to influence health among Hispanic Americans. For example, obtaining information on a patient’s social network (e.g., close family friend) may be useful for a clinician and inform treatment recommendations (e.g., walk with close friend for exercise). A biopsychosocial model that incorporates biological, psychological, and social factors to explain health may be better suited for both the theoretical conceptualization and practical understanding and promotion of health, in particular among Hispanic Americans.

## **5.6 Study Limitations**

Study results should be interpreted while considering study limitations. The percent of variance in SF-12 MCS and SF-12 PCS scores that was accounted for at the neighborhood level was small (5%). This may be a result of the limited variability in

neighborhood level variables in the present study. The parent study from which data for this project came did not explicitly seek geographic variation among study participants, potentially limiting variability in the neighborhood level variables. Multi-level studies examining the relationship between the built environment and health should consider geographic variation as part of the study methodology in attempt to maximize variation in neighborhood-level scores.

In addition, the majority of the neighborhood environment variables included in the present study were originally operationalized for a separate project called the Healthy Communities Data and Indicators Project conducted by the California Department of Public Health and the University of California, San Francisco. The goal of the Healthy Communities Data and Indicators Project was to provide data and tools that can be used to plan healthy communities and evaluate the impact of community projects and environmental changes on health in California. Although the Healthy Communities Data and Indicators Project provided an array of environmental indicators, the way in which these variables were operationalized could be improved. For example, the variable assessing proximity to alcohol outlets included all alcohol retailers with off-sale alcohol licenses. Retailers with off-sale alcohol licenses can range from liquor stores to grocery stores focused on promoting healthy lifestyles. Environmental variables are often measured using methods out of convenience that result in noisy data and preclude understanding of relationships between particular aspects of the environment and health (McCune, 1997). Furthermore, built environment measures often focus on availability, and do not examine the quality of aspects of the built environment (Saelens & Handy, 2008). A park in close proximity to one's home may not be used if it is littered with trash.

Publically available datasets that include variables examining more specific aspects of the neighborhood environment are needed to promote research examining the relationship between the environment and health.

In addition, the present study used the census tract in which a participant lived as a proxy for the participant's neighborhood. Despite being widely used in literature examining the relationship between neighborhood factors and health, census tracts may not accurately represent real neighborhoods (Coulton, Korbin, Chan, & Su, 2001). Census tracts are often used because they represent small geographically stable units consisting of around 4,000 people, on average (United States Census Database, 2012). In addition, demographic information is available for census tracts from the United States census database. An alternative way to operationalize neighborhood that may be more valid is to use residents' opinions to define neighborhood boundaries (Coulton et al., 2001).

Also, the study population was predominantly of Mexican descent, and resided in a metropolitan border city in southern California, limiting the generalizability of study results. The Hispanic American population living in the United States is a heterogeneous group. Results from this study may not apply to all Hispanic American subgroups. However, they can be used to inform studies among other Hispanic American subgroups, and are of particular use for interventions to be developed among Mexican Americans. Also, the present study examined the relationships among acculturation, the neighborhood environment, and health-related quality of life in a combined sample of Hispanic American men and women. Acculturation has been shown to relate to certain health behaviors and outcomes differently across gender (Lara et al., 2005). In addition,

the neighborhood environment variables assessed in the study may also relate to health-related quality of life differently across gender. Future studies should examine the relationships among acculturation, the neighborhood environment, and health-related quality of life among men and women separately. Finally, the study was cross-sectional, precluding discussion of causality.

### **5.7 Conclusion**

In summary, the present study used an ecological framework to examine how acculturation and the neighborhood environment are associated with mental and physical health-related quality of life among Hispanic Americans. Subjective social status, or a belief about where one stands in a social hierarchy relative to others, was associated with mental and physical health-related quality of life. Higher subjective social status was associated with better mental and physical health-related quality of life. Religiosity and widely-used proxy variables of acculturation, language use and number of years lived in the United States, were not significantly associated with mental or physical health-related quality of life.

Several neighborhood environment variables were examined to assess their relationship with mental and physical health-related quality of life among Hispanic Americans. Neighborhoods in which a greater percentage of the population lived within close proximity to an alcohol retailer were significantly associated with better physical health-related quality of life. This relationship was not expected and may be a result of the way in which the alcohol neighborhood environment variable was operationalized, including grocery stores and supermarkets as alcohol retailers. In addition, the present study found that the relationship between subjective social status and physical health-

related quality of life varied dependent on the tobacco retail environment in one's neighborhood. The relationship between subjective social status and physical health-related quality of life was stronger in neighborhoods with a high density of tobacco retailers as compared to neighborhoods with a low density of tobacco retailers.

This study suggests that subjective social status may play an important role in the health-related quality of life of Hispanic Americans, in particular in disadvantaged neighborhoods. Interventions focused on improving subjective social status may be an effective way to improve health in this population. Future studies should identify mediators of the relationship between subjective social status and health-related quality of life among Hispanic Americans to inform intervention development.

Findings from this dissertation are being prepared for publication. Publications based on this dissertation, chapters one through five, will be co-authored by Vanessa L. Malcarne, Elizabeth A. Klonoff, Scott C. Roesch, Rina S. Fox, and Georgia Robins Sadler. The dissertation author was the primary investigator and author of this material.

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TABLES

Table 1

*Sample Characteristics (N = 383)*

Age <sup>a</sup>	43.61 (14.69)
Gender <sup>b</sup>	
Female	195 (50.9%)
Male	188 (49.1%)
Education <sup>b</sup>	
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%)
Employment status <sup>b</sup>	
Employed	183 (47.7%)
Unemployed	72 (18.83%)
Homemaker	40 (10.4%)
Student	17 (4.4%)
Retired/disabled	37 (9.7%)
Social Security/ SSI	20 (5.2%)
Missing	14 (3.7%)
Marital status <sup>b</sup>	

*Note.* <sup>a</sup> *M (SD)*; <sup>b</sup> *n (%)*.

*Table 1, continued*  
*Sample Characteristics (N = 383)*

Married	152 (39.7%)
Single	103 (26.9%)
Living with partner	27 (7.0%)
Divorced/Separated	80 (20.9%)
Widowed	18 (4.7%)
Missing	3 (0.8%)
Annual Household Income <sup>b</sup>	
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 <sup>b</sup>	
United States	166 (43.3%)
Mexico	159 (41.5%)
Other	17 (4.6%)
Missing	41 (10.7%)
Years lived in the United States <sup>a</sup>	30.01 years (15.80); range: .75 – 84
Short Form Health Survey (SF-12) <sup>a</sup>	
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 – United States <sup>a</sup>	4.95 (1.97); range: 1 - 10

*Note.* <sup>a</sup> *M (SD)*; <sup>b</sup> *n (%)*.

*Table 1, continued*  
*Sample Characteristics (N = 383)*

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MacArthur Scale of Subjective Social Status – Community <sup>a</sup>	6.11 (2.25); range: 1 - 10
Duke University Religion Index – Organizational <sup>a</sup>	3.68 (1.65); range: 1 - 6
Duke University Religion Index – Non-organizational <sup>a</sup>	3.16 (1.87); range: 1 - 6
Duke University Religion Index – Intrinsic Religiosity <sup>a</sup>	11.61 (3.42); range: 3 - 15
Brief Acculturation Scale for Hispanics <sup>a</sup>	11.42 (5.23); range: 4 - 20
Experiences of Discrimination <sup>a</sup>	6.85 (9.09); range: 0 - 45

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*Note.* <sup>a</sup> *M (SD)*; <sup>b</sup> *n (%)*.

Table 2

*Means and Standard Deviations for Neighborhood Environment Variables across  
Census Tracts*

Median Age	33.61 years (4.83)
Median Income	\$51,570.01 (19,919.38)
Access to Open Spaces	86.98% (23.11)
Public Transit Access	69.57% (41.69)
Road Traffic Injuries	26.38 (35.61)
Healthy Food Retailers	14.81% (7.92)
Proximity to Alcohol Outlets	60.33% (31.30)
Density of Tobacco Retailers	11.10 (10.92)
Voting	53.34% (8.19)

*Note. M (SD).*

1. Access to Open Spaces = Percentage of the population within .5 miles of a park greater than one acre, or a beach, open space, or coastline.
2. Public Transit Access = Percentage of the population residing within .5 miles of a major transit stop with a waiting time of less than 15 minutes during peak commute hours (6:00 - 9:00AM, 3:00 - 6:00PM).
3. Road Traffic Injuries = Annual number of severe road traffic injuries per 100,000 population.
4. Healthy Food Retailers = Percentage of healthy food retailers (e.g., supermarkets, larger grocery stores, supercenters).
5. Proximity to Alcohol Outlets = Percentage of the population with .25 miles of an alcohol outlet.
6. Density of Tobacco Retailers = Number of active tobacco outlets divided by area in square miles.
7. Voting = Percentage of adults who voted in the 2010 general elections among those who registered.

Table 3

*Factor Loadings for the Acculturation Factors identified in the Exploratory Factor*

*Analysis*

	Factor 1 Religiosity	Factor 2 Subjective Social Status	Factor 3 Traditional Acculturation
Duke University Religion Index - Organizational Religiosity	<b>.854</b>	-.088	.025
Duke University Religion Index - Non-organizational Religious Activity	<b>.707</b>	.054	.023
Duke University Religion Index - Intrinsic Religiosity	<b>.701</b>	.029	-.062
Subjective Social Status - Community	.073	<b>.770</b>	-.011
Subjective Social Status - United States	-.039	<b>.766</b>	.067
Years lived in the United States	.097	.233	<b>.767</b>
Brief Acculturation Scale for Hispanics	-.204	-.024	<b>.668</b>
Experiences of Discrimination	.024	-.092	.139

*Note.* Bold font indicates the item loads on to that factor.

Table 4

*Multi-level Analyses: Random-Regression Coefficients Models (Aim II)*

Variable	SF-12 MCS		SF-12 PCS	
	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>
Age	-.041	.18	-.142	< .01
Income	1.776	< .01	2.101	< .01
Subjective Social Status	1.829	< .01	.788	.03
Age	.009	.79	-.114	< .01
Income	2.427	< .01	2.352	< .01
Religiosity	-.464	.30	-.218	.57
Age	-.004	.91	-.104	< .01
Income	2.330	< .01	2.445	< .01
Traditional Acculturation	.864	.14	-.549	.33

*Note.* *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.

Table 5a

*Multi-level Analyses: Means-as-Outcomes Models for the SF-12 MCS Outcome (Aim III)*

Variable	Subjective Social Status		Religiosity		Traditional Acculturation	
	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>
Age	-.036	.24	.003	.92	-.006	.84
Income	1.570	< .01	2.153	< .01	2.065	< .01
Median Age	.046	.67	.022	.85	.020	.87
Median Income	.006	.03	.007	.01	.063	.02
Acculturation	1.572	< .01	-.330	.44	.802	.20
Open Space	.036	.14	.033	.21	.034	.18
Age	-.036	.24	.004	.91	-.007	.82
Income	1.602	< .01	2.168	< .01	2.137	< .01
Median Age	.026	.81	< .001	.99	< .001	.99
Median Income	.006	.05	.007	.03	.067	.04
Acculturation	1.566	< .01	-.348	.41	.761	.18
Public Transit Access	.003	.83	< .001	.99	.004	.81
Age	-.044	.17	-.007	.84	-.018	.57
Income	1.597	.01	2.073	< .01	2.058	< .01
Median Age	.026	.83	.008	.95	.006	.97
Median Income	.008	< .01	.008	< .01	.080	< .01
Acculturation	1.432	< .01	-.398	.334	.673	.32

*Note.* *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.

*Table 5a, continued*  
*Multi-level Analyses: Means-as-Outcomes Models for the SF-12 MCS Outcome*  
*(Aim III)*

Variable	Subjective Social Status		Religiosity		Traditional Acculturation	
	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>
Road Traffic	-.014	.42	-.010	.54	-.009	.60
Injuries						
Age	-.028	.41	.006	.87	-.001	.99
Income	1.664	.02	2.208	< .01	2.090	< .01
Median Age	-.027	.81	-.033	.78	-.039	.75
Median Income	.007	.03	.007	.02	.069	.02
Acculturation	1.426	< .01	-.153	.73	.862	.21
Healthy Food	-.088	.25	-.094	.22	-.076	.32
Retailers						
Age	-.039	.21	.004	.89	-.008	.82
Income	1.692	< .01	2.211	< .01	2.171	< .01
Median Age	.014	.89	-.005	.96	-.010	.93
Median Income	.005	.29	.006	.22	.006	.22
Acculturation	1.590	< .01	-.378	.35	.803	.22
Proximity to Off-	-.001	.98	-.001	.96	< .001	.99
Sale Alcohol						
Outlets						
Age	-.036	.26	.002	.95	-.009	.79
Income	1.586	.01	2.149	< .01	2.107	< .01

*Note.* *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.

*Table 5a, continued*  
*Multi-level Analyses: Means-as-Outcomes Models for the SF-12 MCS Outcome*  
*(Aim III)*

Variable	Subjective Social Status		Religiosity		Traditional Acculturation	
	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>
Median Age	.022	.83	.002	.99	-.002	.99
Median Income	.007	.03	.008	.01	.081	< .01
Acculturation	1.555	< .01	-.345	.42	.744	.24
Density of Tobacco Outlets	.020	.78	.036	.61	.045	.52
Age	-.036	.26	.004	.91	-.006	.84
Income	1.596	.01	2.160	< .01	2.132	< .01
Median Age	.028	.85	-.010	.95	.001	.99
Median Income	.006	.03	.007	.01	.065	.01
Acculturation	1.565	< .01	-.346	.41	.743	.19
Voting	-.007	.94	.010	.93	-.007	.94

*Note.* *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.

Table 5b

*Multi-level Analyses: Means-as-Outcomes Models for the SF-12 PCS Outcome**(Aim III)*

Variable	Subjective Social Status		Religiosity		Traditional Acculturation	
	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>
Age	-.143	< .01	-.110	< .01	-.114	< .01
Income	2.026	< .01	2.296	< .01	2.364	< .01
Median Age	.099	.33	.087	.38	.109	.29
Median Income	< .001	.94	< .001	.88	.003	.92
Acculturation	.759	.02	-.338	.39	-.582	.31
Open Space	.017	.45	.015	.49	.016	.48
Age	-.145	< .01	-.111	< .01	-.116	< .01
Income	2.079	< .01	2.337	< .01	2.392	< .01
Median Age	.100	.33	.087	.38	.105	.31
Median Income	.001	.68	.001	.69	.010	.75
Acculturation	.762	.02	-.275	.47	-.529	.37
Public Transit	.011	.36	.009	.47	.007	.57
Access						
Age	-.124	< .01	-.091	< .01	-.099	< .01
Income	1.718	< .01	2.002	< .01	2.113	< .01
Median Age	.116	.32	.107	.37	.125	.30
Median Income	.001	.79	.001	.79	.007	.81
Acculturation	.826	.03	-.215	.56	-.626	.28

*Note.* *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.

*Table 5b, continued*  
*Multi-level Analyses: Means-as-Outcomes Models for the SF-12 PCS*  
*Outcome (Aim III)*

Variable	Subjective Social Status		Religiosity		Traditional Acculturation	
	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>
Road Traffic	-.019	.09	-.016	.13	-.018	.08
Injuries						
Age	-.152	< .01	-.116	< .01	-.120	< .01
Income	2.055	< .01	2.311	< .01	2.400	< .01
Median Age	.081	.47	.077	.48	.102	.37
Median Income	-.001	.65	-.001	.67	-.015	.61
Acculturation	.778	.02	-.338	.39	-.679	.27
Healthy Food	-.058	.31	-.055	.34	-.066	.28
Retailers						
Age	-.130	< .01	-.106	< .01	-.110	< .01
Income	2.063	< .01	2.316	< .01	2.413	< .01
Median Age	.086	.40	.077	.43	.090	.38
Median Income	.006	.17	.006	.15	.006	.14
Acculturation	.700	.04	-.281	.437	-.472	.42
Proximity to Off-	.048	.05	.047	.06	.048	.05
Sale Alcohol						
Outlets						
Age	-.144	< .01	-.111	< .01	-.122	< .01

*Note.* *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.

*Table 5b, continued*  
*Multi-level Analyses: Means-as-Outcomes Models for the SF-12 PCS*  
*Outcome (Aim III)*

Variable	Subjective Social Status		Religiosity		Traditional Acculturation	
	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>
Income	2.020	< .01	2.268	< .01	2.356	< .01
Median Age	.086	.41	.077	.45	.088	.40
Median Income	.002	.45	.003	.38	.025	.41
Acculturation	.725	.03	-.283	.45	-.380	.51
Density of Tobacco Outlets	.060	.24	.066	.20	.061	.23
Age	-.141	< .01	-.109	< .01	-.112	< .01
Income	1.958	< .01	2.217	< .01	2.290	< .01
Median Age	-.032	.80	-.044	.71	-.040	.74
Median Income	-.001	.65	-.001	.68	-.015	.61
Acculturation	.728	.03	-.262	.48	-.722	.23
Voting	.118	.16	.120	.15	.139	.12

*Note.* *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.

Table 6a

*Multi-level Analyses: Intercepts- and Slopes-as-Outcomes Models for the SF-12 MCS**(Aim IV)*

Variable	Subjective Social Status		Religiosity		Traditional Acculturation	
	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>
Age	-.044	.14	.005	.88	-.008	.82
Income	1.537	.01	2.198	< .01	2.086	< .01
Median Age	.047	.66	.012	.91	.042	.71
Median Income	.006	.04	.007	< .01	.068	.04
Acculturation	1.676	< .01	-.321	.58	.775	.22
Open Space	.034	.17	.034	.19	.040	.14
Open Space X Acculturation	.012	.30	.018	.36	-.053	.38
Age	-.044	.13	.004	.90	-.009	.79
Income	1.599	< .01	2.199	< .01	2.151	< .01
Median Age	.017	.88	.003	.98	.002	.99
Median Income	.006	.06	.007	.02	.070	.03
Acculturation	1.689	< .01	-.362	.39	.697	.31
Public Transit Access	.003	.86	.002	.90	.004	.82
Public Transit Access X Acculturation	.006	.47	-.005	.60	-.002	.88

*Note.* *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.

*Table 6a, continued*  
*Multi-level Analyses: Intercepts- and Slopes-as-Outcomes Models for the SF-12*  
*MCS (Aim IV)*

Variable	Subjective Social Status		Religiosity		Traditional Acculturation	
	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>
Age	-.056	.06	-.008	.81	-.020	.58
Income	1.588	< .01	2.043	< .01	2.085	< .01
Median Age	.011	.93	.013	.92	.006	.96
Median Income	.008	< .01	.008	< .01	.080	< .01
Acculturation	1.676	< .01	-.376	.52	.676	.33
Road Traffic Injuries	-.019	.40	-.009	.73	-.009	.60
Road Traffic Injuries X Acculturation	.009	.57	.004	.87	.012	.53
Age	-.036	.24	.008	.82	-.002	.96
Income	1.658	< .01	2.276	< .01	2.145	< .01
Median Age	-.035	.76	-.021	.87	-.039	.77
Median Income	.006	.05	.007	.04	.072	.02
Acculturation	1.587	< .01	-.194	.69	.740	.36
Healthy Food Retailers	-.098	.21	-.100	.22	-.083	.29

*Note.* *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.

*Table 6a, continued*  
*Multi-level Analyses: Intercepts- and Slopes-as-Outcomes Models for the SF-12 MCS (Aim IV)*

Variable	Subjective Social Status		Religiosity		Traditional Acculturation	
	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>
Healthy Food Retailers X Acculturation	-.045	.38	-.086	.18	< .001	.99
Age	-.042	.17	.004	.90	-.006	.84
Income	1.637	< .01	2.235	< .01	2.200	< .01
Median Age	.013	.90	-.006	.96	-.006	.96
Median Income	.005	.31	.006	.20	.060	.21
Acculturation	1.721	< .01	-.353	.38	.617	.35
Proximity to Off-sale Alcohol Outlets X Acculturation	< .001	.99	-.001	.98	< .001	.99
Proximity to Off-sale Alcohol Outlets	-.002	.90	.008	.52	.002	.91
Age	-.044	.17	.002	.95	-.010	.78
Income	1.581	< .01	2.169	< .01	2.121	< .01
Median Age	.017	.87	.002	.99	-.002	.98
Median Income	.007	.03	.008	.01	.080	< .01
Acculturation	1.705	< .01	-.313	.48	.712	.32

*Note.* *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.

*Table 6a, continued*  
*Multi-level Analyses: Intercepts- and Slopes-as-Outcomes Models for the SF-12 MCS (Aim IV)*

Variable	Subjective Social Status		Religiosity		Traditional Acculturation	
	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>
Density of Tobacco Outlets	.027	.68	.032	.64	.039	.59
Density of Tobacco Outlets X Acculturation	-.004	.90	< .001	.99	-.016	.79
Age	-.042	.17	.003	.92	-.011	.73
Income	1.581	< .01	2.152	< .01	2.020	< .01
Median Age	-.003	.99	-.020	.89	-.033	.83
Median Income	.006	.04	.007	.01	.070	.01
Acculturation	1.674	< .01	-.293	.66	.684	.32
Voting	.012	.91	.016	.87	.008	.94
Voting X Acculturation	-.050	.27	-.012	.90	.099	.23

*Note.* *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.

Table 6b

*Multi-level Analyses: Intercepts- and Slopes-as-Outcomes Models for the SF-12 PCS**(Aim IV)*

Variable	Subjective Social Status		Religiosity		Traditional Acculturation	
	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>
Age	-.144	< .01	-.112	< .01	-.121	< .01
Income	2.047	< .01	2.292	< .01	2.373	< .01
Median Age	.098	.34	.086	.41	.112	.29
Median Income	< .001	.90	< .01	.92	.004	.89
Acculturation	.693	.05	-.538	.16	-.393	.49
Open Space	.022	.34	.015	.51	.017	.48
Open Space X Acculturation	-.008	.33	.006	.75	-.025	.34
Age	-.146	< .01	-.112	< .01	-.125	< .01
Income	2.042	< .01	2.323	< .01	2.419	< .01
Median Age	.091	.36	.092	.35	.098	.34
Median Income	.001	.71	.001	.78	.011	.71
Acculturation	.816	< .01	-.521	.17	-.393	.50
Public Transit Access	.009	.47	.008	.50	.009	.46
Public Transit Access X Acculturation	.012	.12	-.012	.17	-.007	.56

*Note.* *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.

*Table 6b, continued*  
*Multi-level Analyses: Intercepts- and Slopes-as-Outcomes Models for the SF-12 PCS (Aim IV)*

Variable	Subjective Social Status		Religiosity		Traditional Acculturation	
	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>
Age	-.125	< .01	-.099	< .01	-.101	< .01
Income	1.718	< .01	2.004	< .01	2.097	< .01
Median Age	.114	.31	.116	.32	.131	.29
Median Income	.001	.77	.001	.82	.005	.86
Road Traffic	-.019	.15	-.017	.15	-.018	.09
Injuries						
Road Traffic	-.001	.89	.001	.93	-.007	.75
Injuries X						
Acculturation						
Age	-.152	< .01	-.122	< .01	-.127	< .01
Income	2.050	< .01	2.305	< .01	2.429	< .01
Median Age	.082	.50	.085	.44	-.097	.39
Median Income	-.001	.72	-.001	.68	-.017	.57
Acculturation	.810	.64	-.261	.50	-.501	.42
Healthy Food	-.061	.33	-.061	.29	-.071	.28
Retailers						

*Note.* *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

*Table 6b, continued*  
*Multi-level Analyses: Intercepts- and Slopes-as-Outcomes Models for the SF-12 PCS (Aim IV)*

Variable	Subjective Social Status		Religiosity		Traditional Acculturation	
	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>
Healthy Food Retailers X Acculturation	-.004	.99	-.023	.65	.022	.77
Age	-.147	< .01	-.119	< .01	-.116	< .01
Income	2.034	< .01	2.313	< .01	2.377	< .01
Median Age	.079	.45	.091	.76	.069	.49
Median Income	.007	.09	.006	.14	.053	.11
Acculturation	.715	.15	.589	.56	-.284	.62
Proximity to Off-sale Alcohol Outlets	.050	.03	.044	.05	.059	< .01
Proximity to Off-sale Alcohol Outlets X Acculturation	.008	.37	-.001	.95	-.004	.84
Age	-.140	< .01	-.118	< .01	-.124	< .01
Income	2.007	< .01	2.255	< .01	2.371	< .01
Median Age	.078	.44	.081	.43	.090	.39
Median Income	.038	.35	.003	.36	.020	.52
Acculturation	.669	.14	-.230	.54	-.393	.48

*Note.* *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.

*Table 6b, continued*  
*Multi-level Analyses: Intercepts- and Slopes-as-Outcomes Models for the SF-12 PCS (Aim IV)*

Variable	Subjective Social Status		Religiosity		Traditional Acculturation	
	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>
Density of Tobacco Outlets	.059	.24	-.067	.20	.043	.40
Density of Tobacco Outlets X Acculturation	.034	.01	-.014	.70	-.047	.30
Age	-.140	< .01	-.116	< .01	-.122	< .01
Income	1.902	< .01	2.246	< .01	2.196	< .01
Median Age	-.051	.67	-.031	.80	-.080	.52
Median Income	-.001	.62	-.001	.68	-.014	.64
Acculturation	.798	.04	-.222	.56	-.546	.36
Voting	.121	.15	.117	.18	.154	.09
Voting X Acculturation	-.065	.18	.025	.58	.084	.21

*Note.* *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.