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Natalie Bishop	April 8, 2015

The Association Between Marital Status, Spousal Ethnic Identity, Acculturation, and BMI Among Latino New Lawful Permanent Residents in the United States: An Examination of the New Immigrant Survey

By

Natalie Bishop
MPH

Behavioral Sciences and Health Education

_____

Delia Lang, PhD
Committee Chair

_____

Solveig Cunningham, PhD
Committee Member

_____

Colleen McBride, PhD
Department Chair

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By

Natalie Bishop

B.A. Psychology
University of Vermont
2012

Thesis Committee Chair: Delia Lang, PhD

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Abstract

The Association Between Marital Status, Spousal Ethnic Identity, Acculturation, and BMI Among Latino New Lawful Permanent Residents in the United States: An Examination of the New Immigrant Survey

By Natalie Bishop

Background: As the number of Latino immigrants continues to increase in the U.S., it is important to investigate health disparities between foreign- and native-born individuals. Overall, the literature supports that the longer immigrants stay in the U.S., the worse their health status.

Objective: This study examines (1) whether acculturation mediates the relationship between marital status (e.g., married/living together but not married vs. single) and BMI among new Latino lawful permanent residents, and (2) whether acculturation mediates the relationship between spousal ethnic identity (e.g., intra-ethnic relationship vs. inter-ethnic relationship) and BMI among new Latino lawful permanent residents.

Methods: The New Immigrant Survey (NIS) is a multi-cohort prospective-retrospective panel study of recent legal immigrants in the U.S. It is a public-use dataset that aims to provide a longitudinal study on new lawful permanent residents. A weighted subset of the total Adult Sample (n=2,680) was used for analyses and only respondents that self-identified as Hispanic or Latino were included in the final dataset. Two separate multiple linear regressions were run; one including marital status as a predictor and the other including spousal ethnic identity as a predictor to determine grounds for mediation models.

Results: Latino lawful permanent residents who were married or living in a married-like relationship had a BMI that was 0.566 points higher than those who were single, while controlling for age, sex, years of education, hypertension, diabetes, primary language spoken, and time spent in the U.S. ($p=0.027$). Acculturation did not mediate the relationship between marital status and BMI. Spousal ethnic identity was not statistically associated with BMI ($p=0.583$). Acculturation did not mediate the relationship between spousal ethnic identity and BMI.

Discussion: Latino lawful permanent residents who are married or in marriage-like relationship have higher BMIs than those who are single. Spousal ethnic identity was not related to BMI, yet this study adds to the literature, as few studies attempt to understand the relationship between spousal ethnic identity and health. The results of this study may have important implications as it points to what types of needs and services should be prioritized for Latino immigrants.

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Introduction

Introduction

In the past few decades, the U.S. has experienced an influx of diversification due to immigration. The immigrant population has more than doubled since 1960, and rates are still at an unprecedented high (Center for American Progress, 2014). According to the most current rates in 2012, the foreign-born population in the U.S. consisted of almost 41 million people (Martin & Midgley, 2010). Most immigrants are Asian or Hispanic, and if current trends continue, by 2050, non-Hispanic whites will decline to 50%, while Asians and Hispanics rise to approximately one-third of the population (Martin & Midgley, 2010). As many strive to come to the U.S., there are limited ways for immigrants to come legally in hopes to become a lawful permanent resident.

Obtaining green card status is one of the many challenges immigrants face as they settle into their new home country. In addition to stresses from this application process, immigrants face a new culture, customs, and even language. The process of learning about a new culture and incorporating some of its customs (language, food, etc.) in to the native culture (Ahluwalia, Ford, Link, & Bolen, 2007) is known as acculturation. Acculturation is a multi-faceted process that has received extensive attention in previous research. It is important to note that while the literature notes that acculturation is used synonymously with assimilation there is a distinction between the terms. Assimilation occurs when immigrants choose to shed their original cultural identify and assume the cultural identity of the native culture. Acculturation does not necessitate assimilation, yet assimilation requires acculturation (McDermott-Levy, 2009). For the purposes of this study, acculturation is examined more thoroughly.

There is a rich amount of research that has examined how the process of acculturation affects various health behaviors among immigrants. However, the effect of acculturation on Latino or Hispanic immigrants and health outcomes is complex and not well understood[1] (Lara, Gamboa, Kahramanian, Morales, & Bautista, 2005). There is some evidence that when Latino immigrants first arrive in the U.S., certain health outcomes are better than native-born Latinos. This phenomenon is known as the Hispanic Paradox, which states that Hispanics, mostly Mexican immigrants, have better than expected health and mortality outcomes even though they are of lower socioeconomic status (Gonzalez et al., 2009). Yet, as they spend more time in the U.S., certain health outcomes deteriorate and; thus, researchers have questioned evidence for the Hispanic Paradox phenomenon. This finding is consistent with dietary changes that have been shown to be associated with overweight and obesity among Latino immigrants. The process by which immigrants adopt the dietary practices of the host culture is known as dietary acculturation (Satia, 2010). The growing number of overweight and obese immigrants is adding to the obesity epidemic in the U.S. and is of growing concern as it is linked to certain health conditions such as coronary heart disease, type 2 diabetes, certain types of cancers, hypertension, and stroke (Centers for Disease Control and Prevention, 2013). Furthermore, there are substantial indirect and direct costs associated with obesity. Specifically, in 2008, total medical care costs related to obesity in the U.S. were $147 billion (Finkelstein, Trogdon, Cohen, & Dietz, 2009).

Despite the literature that supports acculturation and its association with an increase in body mass index (BMI) among Latino immigrants, there is little research on how social support varies by population subgroups thereby potentially mediating these outcomes. The social support

[1]The accepted term to identify people of Hispanic origin in the U.S. is mixed. The literature uses both Hispanic and Latino and thus both terms are used interchangeably.

derived from being married, has been linked to positive health outcomes ranging from being less depressed to having longer life expectancies than unmarried individuals (Umberson & Williams, 2004). Yet research shows that marriage is not a protective factor in regards to weight gain. BMI increases for both men and women during marriage and throughout their cohabitating relationship (Averett, Sikora, & Argys, 2008). In addition, those who are married have a higher prevalence of overweight and obesity than other marital status categories (Schoenborn, 2004).

In addition, due to the influx of immigrants resulting in an increasingly diverse society, there are more inter-ethnic couples in the U.S. Inter-ethnic marriage is seen as part of the acculturation process and even as the final step towards the assimilation process for immigrants. Marrying an individual of a different culture is tied with the resilience of traditional behaviors and the adoption of certain social norms of the new country (Gordon, 1964; Qian & Lichter, 2007; Sassler, 2005). Specifically, inter-ethnic marriage with whites is often viewed as a signal that the minority group members have adopted cultural patterns of the host society and that they have been adopted, both economically and politically, into the host culture (Qian & Lichter, 2007). Inter-ethnic marriage influences language abilities as well as knowledge of host cultural norms and labor market settings (Giuntella, 2014).

However, most studies have focused on the socioeconomic repercussions associated with intermarriage, and not necessarily its effect on the health of immigrants. There is only one published study on the impact of inter-ethnic marriage on health. Giuntella (2014) investigated birth outcomes of Hispanics in endogamous and inter-ethnic relationships and found that third-generation children of Hispanics who intermarried were 9% more likely to have low birth weights than endogamously married Hispanics. Yet, it is important to note that this finding may

be influenced by prevalence of risky behavior among second-generation mothers, such as smoking. The paucity of research on this topic merits more attention.

Thus, the current research objectives are (1) to examine how acculturation mediates the relationship between marital status (e.g., married/living together but not married vs. single) and BMI at time of immigration among Latino immigrants (Figure 1), and (2) to examine how acculturation mediates the relationship between spousal ethnic identity (e.g., intra-ethnic relationship vs. inter-ethnic relationship) and BMI at time of immigration among Latino immigrants[2].

Theoretical Framework

In order to understand the relationship between the aforementioned variables, a theoretical framework is utilized to identify key individual and environmental constructs based on previous research. Understanding how acculturation affects this group of immigrants based on marital status and spousal ethnic identity is useful in understanding ways to help immigrants can integrate healthily to American culture and help prevent the growing obesity epidemic in the nation.

The Social Cognitive Theory (SCT) is a theoretical framework grounded in psychological and sociological principles and is based on the notion of reciprocal determinism, which states that there is a dynamic interaction between personal, behavioral and environmental factors (Bandura, 1997). The framework proposes that individual behavior is determined by the environments in which the behaviors happen (Ayala, Rogers, et al., 2008). This theory is often

[2]Intra-ethnic relationship is operationalized as an immigrant who is married to an individual who has the same country of birth than their own; inter-ethnic relationship is operationalized as an immigrant who is married to an individual of a different country of birth than their own.

used in nutrition research and guides the development of interventions (Bandura, 1971; Baranowski, Perry, & Parcel, 2002)

Previous research has shown the importance of environmental factors in shaping food preferences and dietary decisions. The food environment as well as sociocultural factors (i.e., social support networks, family dynamics, cultural beliefs, socioeconomic position) have been identified as determinants influencing eating behaviors (Delavari, Farrelly, Renzaho, Mellor, & Swinburn, 2013; Renzaho, McCabe, & Swinburn, 2012; Tiedje et al., 2014; Wetter et al., 2001). Other research underscores how changes in lifestyle and the environment due to immigration can limit options for access to health promoting behaviors such as eating a healthy diet (Satia-Abouta, Patterson, Neuhouser, & Elder, 2002). Tiedje et al. (2014) note that "[foreign-born] groups have different immigration trajectories, but all face the struggle of dietary challenges in their new country of residence due to cultural-specific obesity risk and acculturation." Ethnic group affiliation can impact food choices since each group may have distinct ideals, identities, and roles that interact with one another to influence eating context and behaviors (Devine, Sobal, Disogni, & Connors, 1999). Other environmental influences include politico-economic contexts and migration experiences (Vallianatos & Raine, 2008).

Additionally, individual level factors shape eating behaviors among individuals. Personal factors include self-efficacy, preferences, beliefs, and self-regulation. Individual factors related to eating habits are typically viewed as implicit and subconscious rather than conscious and thoughtful (Tiedje et al., 2014). Yet, personal factors can also include people actively developing meanings and understandings of the world and using their own experiences to shape the social, cultural, and historical experiences of their lives (Tiedje et al., 2014). However, it is important to

note that Dressler and Smith (2013) found that individual level factors and behavioral factors were shown to have greater variance in BMI compared to environmental factors.

There are also acculturation models mainly used by sociologist, anthropologist, and psychologists, which can be integrated within the environmental, social, and individual levels of SCT. The dominant models of acculturation are bi-dimensional models. These models argue that there is a direct interaction with immigrants and the dominant culture. Bi-dimensional models adhere to the notion that immigrants can choose to assume practices of the host culture and decide to what degree they will keep their original cultural identity (McDermott-Levy, 2009). "Cultural learning" is a concept presented in one of the bi-dimensional acculturation models and states that there are three stages of acculturation: (1) changes in food or media use, (2) changes in behaviors around social life (i.e., language spoken with friends, neighbors, and spouses), and (3) maintenance of original cultural norms while new cultural learning of host culture occurs in a nonlinear progression (Lara et al., 2005).

The current study uses various factors to account for acculturation (i.e., changes in diet, language preferences, experience in the U.S.) based on these theoretical foundations. In addition, this analysis highlights the relationship between environmental, social, and individual factors as evidenced by SCT. Specifically, research indicates that personal factors can include self-efficacy, preferences, beliefs, and self-regulation. For this study, personal factors that are expected to influence the outcome variable, BMI, include marital status and spousal ethnic identity. One's marital status and whether he or she is in an intra-ethnic or inter-ethnic relationship can affect not only one's preferences and beliefs, but also provide positive or negative reinforcement in eating behaviors which can ultimately influence one's BMI.

Environmental factors are also found to have an effect on BMI. As SCT proposes, the food environment as well as sociocultural factors (i.e., family dynamics, cultural beliefs, socioeconomic position) have been identified as determinants in influencing eating behaviors (Delavari et al., 2013; Renzaho et al., 2012; Wetter et al., 2001). Additionally, researchers have noted that environmental influences such as migration experiences and acculturation can impact lifestyle behaviors. Pulling from the bi-dimensional model of acculturation according to Lara et al. (2005), this study incorporates various measures of acculturation in order to capture different sociocultural factors that are associated with BMI, including changes in food and changes in behavior around social life (i.e., language spoken with friends, neighbors, and spouses).

Purpose of Study

The purpose of this study is to examine (1) whether acculturation mediates the relationship between marital status (e.g., married/living together but not married vs. single) and BMI among new Latino lawful permanent residents (Figure 1), and (2) whether acculturation mediates the relationship between spousal ethnic identity (e.g., intra-ethnic relationship vs. inter-ethnic relationship) and BMI among new Latino lawful permanent residents (Figure 2).

Hypothesis 1: Latino lawful permanent residents who are married or living in a marriage-like relationship will have higher BMIs than Latino lawful permanent residents who are single.

Hypothesis 2: Among Latino lawful permanent residents who are married, those in an intra-ethnic relationship will exhibit lower BMIs than Latino lawful permanent residents in an inter-ethnic relationship.

Hypothesis 3: Acculturation mediates the relationship between marital status (e.g., married/living together but not married vs. single) and BMI among new Latino lawful permanent residents.

Hypothesis 4: Acculturation mediates the relationship between spousal ethnic identity (e.g., intra-ethnic relationship vs. inter-ethnic relationship) and BMI among new Latino lawful permanent residents.

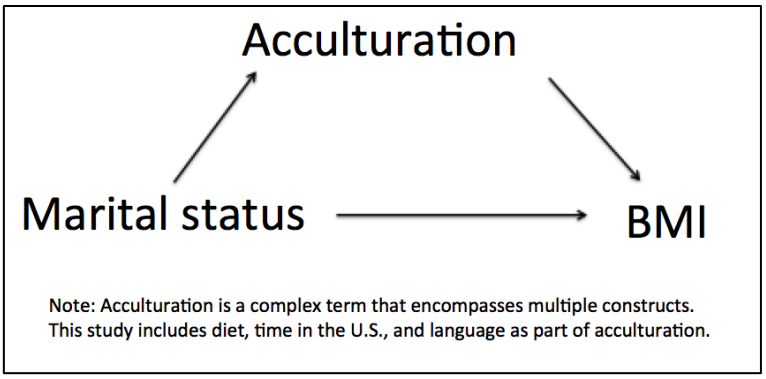


Figure 1. Relationship between marital status and BMI mediated by acculturation.

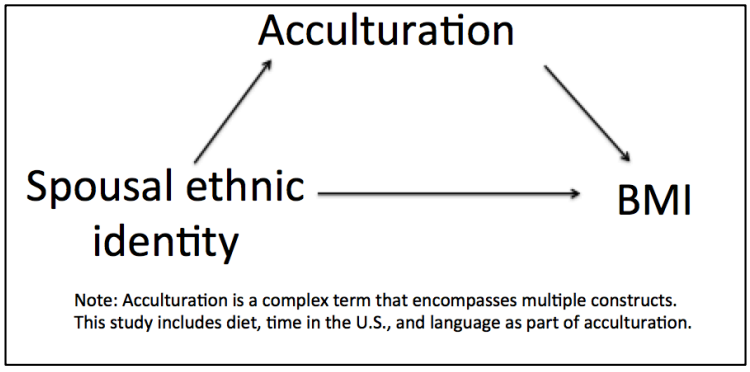


Figure 2. Relationship between spousal ethnic identity and BMI mediated by acculturation.

Significance of Study

As the number of Latino immigrants continues to increase in the U.S., it is important to understand how health differs from native-born individuals. Investigating the two proposed mediation models is vital since the age-adjusted rate of obesity among Hispanic adults is 42.5% according to the American Medical Association (Ogden, Carroll, Kit, & Flegal, 2014). While previous research has examined the association between acculturation and an increase in BMI among immigrants, there is a lack of literature on how these variables interact with social factors, such as marital status and spousal ethnic identity.

This study is unique in that it not only tests possible measures of acculturation as mediators for the relationship between marital status, spousal ethnic identity, and BMI, but also adds to the literature by examining how spousal ethnic identity impacts the health outcomes such as BMI, as there currently exists little research on this topic. Identifying how spousal ethnic identity fits into the greater picture of marital acculturation could help identify its linkage to healthy outcomes and also recognize contemporary patterns of acculturation in the U.S.

These results have important implications for governments, policymakers, the immigrants themselves and larger host community (Ramdhonee & Bhowon, 2012). Results from this study could further inform public health professionals on which Latino immigrant subgroups may be at risk for overweight and obesity. Professionals could use this information to create culturally appropriate programs and interventions that not only reduce overweight and obesity among this population, but prevent it from occurring through the acculturation process.

Literature Review

Immigrants in the United States

Immigrants comprise about 13% of the total population in the U.S. according to the Pew Research Center's Hispanic Trends Project. In 2012, there were almost 41 million immigrants in the U.S. (Nwosu, Auclair, & Batalova, 2014). Immigrants of Hispanic or Latino origin represent 46% (18.9 million) of immigrants entering the country (Goel, McCarthy, Phillips, & Wee, 2004), and represent the largest immigrant ethnic group, a dominance that will continue to grow in the years to come (Jasso, Massey, Rosenzweig, & Smith, 2004). The majority of Latinos migrate from Mexico, and according to the U.S. Census Bureau's 2012 American Community Survey (ACS), 11.6 million Mexican immigrants resided in the U.S., which represented 28.3% of all U.S. immigrants (Nwosu et al., 2014).

U.S. Legal Immigration

The demand for immigrant visas in the U.S. is high as many more people would like to immigrate than permits (Jasso, Massey, Rosenzweig, & Smith, 2005). Under the Immigration and Nationality Act (INA), the U.S. grants lawful permanent resident status to immigrants who have close family relationships with a U.S. citizen of lawful permanent resident, employment requirements, refugee or asylee status, or diversity requirements (i.e., countries with low rates of legal immigration to the U.S.) (Monger & Yankay, 2014). Lawful permanent residents may include (1) new arrivals to the county or (2) individuals already in the U.S. who had come earlier on a temporary visa or without documents and later achieving lawful permanent resident status (Jasso et al., 2005). There has been an overall upward trend since around 1945 in the number of lawful permanent residents who enter the U.S., and in 2013, a total of 990,553 individuals obtained lawful permanent resident status (Monger & Yankay, 2014). Additionally, the primary

countries of birth of new lawful permanent residents were Mexico (14%), China (7.2%), and India (6.9%).

According to the Immigration Act of 1990, there is an annual limit between 416,000 and 675,000 lawful permanent residents who may enter as either family-sponsored preference, employment-based preference, and diversity immigrants (Monger & Yankay, 2014). There is also a cap on the number of refugees who may enter, based on the declaration from the President in collaboration with Congress. In 2013, the ceiling of refugee admissions was 70,000; there is no limit on number of people granted asylum status. There is also no limit on the number of lawful permanent resident admissions for immediate relatives of U.S. citizens. Immediate relatives account for the largest category for lawful permanent residents, which include spouses, adopted orphan children, and children of U.S. citizens and parents of adult U.S. citizens over the age of 21 (Monger & Yankay, 2014). This category alone accounts for about 40% of lawful permanent resident flow annually.

The Immigrant and Hispanic Paradoxes

Despite the proportion of immigrants in the U.S., there are wide health disparities and inequalities between native-born and foreign-born persons. Even though a primary target of Healthy People 2020 is to reduce social inequalities in health, there is not a policy that explicitly aims to improve the health of immigrants in the U.S (Singh, Yu, & Kogan, 2013). The Immigrant Paradox refers to the phenomenon that occurs when racial and ethnic populations settle in the U.S. and experience better health outcomes than more acculturated or native-born people from the same race or ethnicity, or the White population (Teruya & Bazargan-Hejazi, 2013). In a systematic review of 46 articles, Teruya and Bazargan-Hejazi (2013) found evidence

that recent immigrants, especially those who are poor, have better overall health than their native-born counterparts, or those who spent more time in the country.

Additionally, there is literature supporting the Hispanic Paradox, which states that Hispanics, mostly Mexican immigrants, have better than expected health and mortality outcomes even though they are of lower socioeconomic status (Gonzalez et al., 2009). The mechanisms underlying the Hispanic paradox are debated in research without a uniform consensus. Three themes dominate the literature in attempting to account for this phenomenon. The first is the healthy migrant effect and argues the Latino immigrants are inherently healthier due to better health habits, behaviors, and social norms (Lee, O'Neill, Ihara, & Chae, 2013). This is known as the cultural-buffering hypothesis, suggesting that when immigrants first arrive, they surround themselves with social networks that have the same ethnic background as them and have the ability to reinforce positive health behaviors (Hummer et al., 1999). This may include protective effects of culture and norms that buffer Latinos from engaging in riskier health behaviors. For example, rates of cigarette smoking are lower among foreign-born Latinos than native-born peers (Jasso, Massey, Rosenzweig, & Smith, 2004). However, critics of the healthy migrant effect contend that the data do not support this theory as many countries of origin of Latino immigrants have lower mortality and morbidity rates than the U.S. (Jasso et al., 2004). The second theme present in the literature is that due to the physical and emotional toll of migration, those who initially have a lessened health status, will unlikely migrate in the first place (Akresh, 2008). Thirdly, reporting errors, data quality, methodological design, and concerns in data collection and approaches may overestimate the health of new immigrants. For instance, many studies do not include undocumented or uninsured immigrants, as this population is hard to reach. Therefore, certain diseases and conditions may be underrepresented and cannot be generalized

for all immigrants. Sociodemographic factors such as gender, ethnicity, acculturative stress, adolescence, age, age of arrival in the U.S., health behaviors and diet are not routinely examined in studies (Teruya & Bazargan-Hejazi, 2013).

Evidence is mixed for the Hispanic Paradox. A systematic review by Teruya and Bazargan-Hejazi (2013) outlines support for the paradox. For example, Latino immigrants had better oral health than U.S. born Latinos (Sanders, 2010). Another study purported that Mexican American immigrants had lower rates of mood, anxiety, and substance disorders than their U.S.-born counterparts (Vega, Sribney, Aguilar-Gaxiola, & Kolody, 2004). On the other hand, other studies have found limiting support for the Hispanic Paradox. Mortality rates, in particular, varied significantly between Latino subgroups as well as by age. Puerto Rican and U.S.-born Mexican American women who were 65 years or older, had a 25% lower death rate than non-Hispanic, White counterparts (Borrell & Lancet, 2012). Interestingly, this finding was not supported with younger Puerto Rican women and Mexican American men and women as they were found to suffer a 61% greater all-cause mortality rate than their White counterparts (Borrell & Crawford, 2009). Additionally, mental health differed by nativity status. Depressive symptoms and anxiety were found to be higher among first-generation Latino immigrants (Mikolajczyk, Bredehorst, Khelaifat, Maier, & Maxwell, 2007). This could be due to the stress of migration as Farley, Galves, Dickinson and Perez Mde (2006) suggest that Mexican immigrants had poorer mental health functioning than their native-born counterparts.

Acculturation: A History

There are numerous factors that can explain some of the differing findings supporting and undermining the Hispanic Paradox; however, the literature points to acculturation as one of the main variables that erode protective benefits of the origin culture. The term acculturation first

emerged in the literature in 1920 in a report by American anthropologists on Native Americans and their cultural interactions (McDermott-Levy, 2009). Acculturation is the process of learning about a new culture and incorporating some of its customs (language, food, etc.) in to the native culture (Ahluwalia et al., 2007). The Social Science Research Council defines acculturation as "those phenomena, which result when groups of individuals having different cultures come into continuous first-hand contact, with subsequent changes in the original cultural patterns of either or both groups (Redfield, Linton, & Herskovits, 1936). While this definition implies that acculturation affects both the host and native cultures equally, foreign-born persons tends to adapt more than native-born persons (McDermott-Levy, 2009). The process of acculturation is "interactive, development, multifactorial, and multidimensional…[since] it includes components of the language used, ethnicity characteristics, and cultural maintenance in social situations and private life" (McDermott-Levy, 2009). Understanding the consequences and effects of acculturation can underscore implications associated with migration for acculturating persons (Ramdhonee & Bhowon, 2012).

The U.S., and other countries such as Canada and Australia, have shifted away from the idea of a "melting pot" acculturation ideology, which focuses on heterogeneous cultures molding into a harmonious common culture. Instead, the ideology has shifted more toward a multicultural philosophy that accepts cultural, religious and linguistic diversity due to the consensus on the permanent nature of immigration and its cultural diversity (Ramdhonee & Bhowon, 2012). However, even though a multicultural ideology exists in the U.S., immigrants tend to adapt many aspects of self-identity to accommodate experiences within their new host society and, in turn, create new multicultural identities by combining their native culture, host culture, and even global culture (Arnett, 2002; Bhatia, 2002; Ryder, Alden, & Paulhus, 2000).

Models of Acculturation

Over time, the literature has evolved from uni-dimensional to a bi-dimensional view of acculturation. Originally, acculturation was thought of the gradual adaptation where people dissociate themselves from their native culture to that of the host culture (Navas, Sanchez, Rojas, Pumares, & Renandez, 2005). This involved people "shedding" customs from their old culture, and adapting customs from the new culture (Renzaho, 2009). Occasionally, the uni-dimensional model is referred to as the "zero-sum game" since this theory argues that acculturation moves on a continuum from not at all acculturated to fully acculturated into the new society (Lara et al., 2005). Milton Gordon, an American sociologist, also endorsed the uni-dimensional model of acculturation and thought of it to be inevitable. Gordon's conclusions were based mainly on European immigrant ethnic groups migrating to America in the late nineteenth and early twentieth centuries (Lara et al., 2005). However, Lara et al. (2005) states that the uni-dimensional model is most similar to "the experience of assimilation by which individuals become part of the new group and 'fold' in with members of the new culture."

However, research supports that acculturation does not move in a progressive linear trajectory as supported in the uni-dimensional model. In addition, the native culture and host culture are not bipolar extremes, but instead independent of one another (Der-Karabetian, 1980; Zak, 1976). Thus, theorists shifted to bi-dimensional models of acculturation, which imply that both native culture maintenance and host culture adaptation can occur orthogonally on separate continuums (Ramdhonee & Bhowon, 2012). Bi-dimensional models adhere to the notion that immigrants can choose to assume practices of the host culture and decide to what degree they will keep their original cultural identity (McDermott-Levy, 2009). John Berry, a Canadian psychologist proposed that the bi-dimensional model of acculturation has four modes of

acculturation, which include marginalization, separation, integration, and assimilation (Ramdhonee & Bhowon, 2012). Marginalization is exclusion from both cultures and can be voluntary or not voluntary. Separation occurs through maintenance of the original and rejection of the host culture. Integration involves foreign-born persons accepting and appreciating both cultures. Assimilation is when an immigrant desires to shed their culture of origin and completely embrace the new culture (Lara et al., 2005). Integration and separation are viewed as collectivist group patterns, where immigrants want to maintain their cultural traditions and customs. Assimilation is viewed as an individualistic pattern (McDermott-Levy, 2009).

Since acculturation is a process, "culture learning" is part of the acculturation progression and can occur at various levels. According to Marin (1992), the first stage of acculturation includes the most basic level of learning, which includes changes in food or media use. The second level of change involves changing behaviors fundamental to one's social life such as language spoken with friends, neighbors, and spouses (Marin, 1992). The final level of progression occurs when original cultural norms are maintained and new values follow a pattern of nonlinear adoption (Lara et al., 2005).

The interactive acculturation model presents a slightly different approach than the uni- or bi-dimensional models. Both the uni- and bi-dimensional models focus on how immigrants acculturate into dominant society (Ngo, 2008). Social scientists developed a model to incorporate the interactive nature of the immigrant and dominant culture. Bourhis et al. (1997) proposed this model and it is centered around three components: (1) acculturation orientations adapted by immigrants, (2) acculturation orientations adapted by the host culture towards immigrants, and (3) interpersonal and intergroup relational outcomes that signify combinations of immigrants' and the receiving communities' acculturation orientations (Ngo, 2008). Thus,

this model emphasizes the relational outcomes from the acculturation orientations of both the immigrants and dominant culture (Ngo, 2008).

Acculturation and the Hispanic Paradox

Acculturation is highly significant in the Immigrant and Hispanic Paradoxes, at least conceptually (Teruya & Bazargan-Hejazi, 2013). Assessing acculturation can be challenging to researchers as it lacks precise definition, can be difficult to operationalize, and involves multiple constructs which can range from social to dietary acculturation. Researchers have used various measures of acculturation which can include language, psychosocial adjustment, diet, language spoken at home, country of birth, nationality of parents, and number of years spent in the U.S. (Teruya & Bazargan-Hejazi, 2013). Despite these challenges, the literature supports that while recent immigrants may have better health outcomes than their U.S.-born counterparts, their health declines as they spend more time in the U.S. (Akresh, 2007; Teruya & Bazargan-Hejazi, 2013). That is, immigrants are healthier than the native population when they initially immigrant, but over time their health declines (McDonald & Kennedy, 2004; Newbold, 2005). For instance, Argeseanu Cunningham, Ruben, and Narayan (2008) performed a literature review of 71 articles on immigrant health and found that compared to the U.S. native born population and native-born non-Hispanic whites, foreign-born Hispanics have lower mortality rates, are less at risk to suffer from heart disease, overweight and obesity and mental disorders, are less likely to develop of die from breast, prostate, and colon cancers, and are less likely to have low birth weight babies. More specifically, it was found that Mexican women with more North American values and lifestyles were observed to have poorer perinatal outcomes, including low birth weight than their counterparts (Callister & Birkhead, 2002). Additionally, less acculturated Hispanic immigrants were less at risk of substance abuse than their native-born and highly

acculturated Hispanic peers (Campos, Podus, Anglin, & Warda, 2008). Another literature review performed by Lara, Gamboa, Kahramanian, Morales, and Buatista (2005) examined the relationship between acculturation and health and behavioral outcomes among Latinos, but found varied results. This study suggests that the effect of acculturation on Latino behaviors and health outcomes is complex and still not fully understood. The strongest evidence from this study indicated a negative effect of acculturation on health behaviors overall, specifically for substance abuse, diet, and birth outcomes (Lara et al., 2005). An explanation for varied health outcomes among acculturated individuals may be that acculturation requires psychological and sociocultural adaptation, which can be seen as either a cause of stress or opportunity (McDermott-Levy, 2009).

Dietary Acculturation

Dietary acculturation is one indicator of the level of acculturation among immigrants. As immigrants acculturate to U.S. lifestyle, dietary changes are likely to occur as they adopt many new behaviors that can result in a change in their health. Research has shown that greater acculturation to U.S. culture is correlated with less healthful dietary behaviors (Benavides-Vaella, 2005; Satia-Abouta et al., 2002). Ayala, Baquero, and Klinger (2008) performed a systematic review of the literature to examine the relationship between acculturation and diet by analyzing national, quantitative, and qualitative studies involving Latinos in the U.S. Results indicate that there was no relationship between acculturation and dietary fat intake or percent energy from fat. However, this contradicts a literature review by Lara et al. (2005) which found that less acculturated Mexican American women consume less fat. Ayala, Baquero, and Klinger (2008) also indicated that while those who are less acculturated consumed more whole milk and fat for cooking purposes, more acculturated Latinos consumed more added fats from fast food

and snacks (Ayala, Baquero, & Klinger, 2008). In addition, the review found that less acculturated individuals consume more fruit, rice and beans than more acculturated individuals (Neuhouser, Thompson, Coronado, & Solomon, 2004; Romero-Gwynn et al., 1993). Sugar consumption also varied by acculturation as Latinos who spoke English and who had lived longer in the U.S. consumed more sugar than less acculturated Latinos (Ayala, Baquero, et al., 2008).

Other studies confirm these results as Romero-Gwynn et al. (1993) purported that acculturation to the U.S. diet typically results in increases in salt, meat, dairy, and sugar, while consumption of complex carbohydrates, fiber, and numerous vitamins and minerals decreases. Lara et al. (2005) also found evidence that Latino diets tended to be more nutritious among the less acculturated and reported that less acculturated Mexican American women also consumed more fiber. Researcher found evidence that women had a higher intake of protein; vitamins A, C, E and B_6; and folate, calcium, potassium, and magnesium than more acculturated counterparts, and that more acculturated Latinos eat half the servings of fruits and vegetables less than less acculturated Latinos (Lara et al., 2005).

Overweight and Obesity

There are many factors that as associated with an increase in overweight and obesity rates in the country over the past few decades, including behavioral and environmental factors, such as lack of exercise or genetics. The most recent estimates in the U.S. report that more than one-third (78.6 million adults) is obese (Ogden et al., 2014). One's diet plays an important role in regulating and maintaining a healthy weight as well preventing chronic diseases. Overweight and obesity individual are more at risk to develop the following conditions: coronary heart disease, type 2 diabetes, certain types of cancers, hypertension, and stroke (Centers for Disease

Control and Prevention, 2013). In 2000, overweight and obesity accounted for about 17% of deaths in the county (Mokdad, Marks, Stroup, & Gerberding, 2004). Furthermore, overweight and obesity and their related health issues place a significant burden on the U.S. health care system. Direct costs such as preventive, diagnostic, and treatment services related to obesity as well as indirect costs such as morbidity and mortality costs produce a negative economic impact. In 2008, total medical care costs related to obesity in the U.S. were $147 billion (Finkelstein et al., 2009). Thus, assessing how dietary acculturation influences overweight and obesity rates among immigrants can help to determine strategies and interventions to improve health outcomes reduce the economic burden of obesity in the nation.

Several studies have examined overweight and obesity rates of immigrants over time. Regardless of country of origin, the risk of overweight and obesity increase with the amount of time spent in the U.S. (Akresh, 2007; Koya & Egede, 2007; Sanchez-Vaznaugh, Kawachi, Subramanian, Sanchez, & Acevedo-Garcia, 2008). One study found that immigrants who lived in the U.S. for 10 to 15 years and at least 15 years was correlated with BMI increase of 0.88 and 1.39, respectively (Goel et al., 2004). In a nationally representative sample of Hispanic immigrants, Kaplan, Huguet, Newsom, and McFarland (2004) found that the length of time in the U.S. is associated with increasing levels of obesity after controlling for factors such as socioeconomic status, demographic characteristics, smoking, health status, access to health services, and psychological wellbeing. Additionally, Latino immigrants who were in the country longer (≥15 years) had a nearly four-fold higher risk of obesity than Latino immigrants who recently arrived (<5 years) (Kaplan, Huguet, Newsom, & McFarland, 2004). Thus, research supports that more acculturated immigrants have higher obesity rates than those who maintain attitudes and behaviors from their native countries of origin (Goel et al., 2004; Kaushal, 2009;

Oza-Frank & Cunningham, 2010; Roshania, Narayan, & Oza-Frank, 2008). Data from the National Health Interview Survey in 2009-2011 reported that of those surveyed, 34.9% of Mexican immigrant women were overweight, 32% were obese, and 3.8% were extremely obese (Leite et al., 2013).

Social Support and Health Among Latinos

The process of acculturation can lead to alienation for immigrants and may affect their living standards and access to various opportunities (Renzaho, 2009). Migrants bring their own values and norms, which may significantly differ from those of the host culture (Renzaho, 2009). In some instances, marginalization may occur, and as a result, immigrants may have limited access to, and utilization of, services. Lopez , Ehly, and Garcia-Vasquez (2002) found that these circumstances impact immigrants' participation in employment opportunities as well as lead to poor social and health outcomes (Lopez, Ehly, & Garcia-Vasquez, 2002).

In order to avoid social isolation, there has been epidemiologic research that supports the protective nature of social networks, social support and associated health outcomes. There is literature suggesting that lack of social support is associated with poor mental health (Hamrick, Cohen, & Rodriguez, 2002; Kawachi & Berkman, 2001). There is also evidence that social support can influence health, both in regards to its relationship to mortality at the community level (Lochner, Kawachi, Brennan, & Buka, 2003) and self-perceived health at the individual level (Browning & Cagney, 2002). For example, individual level social support factors were found to mediate better health (Finch & Vega, 2003) and mental health (Galea et al., 2004). However, other researchers note that there is a lack of empirical research comparing different types of social networks and health, in particular how individual and community level supports differentially impact health (Wen, Cagney, & Christakis, 2005). Therefore, Mulvaney-Day,

Alegria, Sribney (2007) aimed to examine the relationships between social support, social cohesion, using both individual and community level measures of social support among Latino immigrants (Mulvaney-Day, Alegria, & Sribney, 2007). Results suggest that individual level support has greater influence than community social support in relation to self-rated physical and mental health. These findings suggest that individual level connections (e.g., family and friend support) may more accurately demonstrate the healthful effects of social connection among Latinos.

Latinos in particular are found to have stronger family ties and family connections, which can act as a protective factor for health. Andalo (2004) explains that "the sense of family is what saves Latinos…[and] solid family ties are essential for preserving health." Latinos are found to have more traditional family values that non-Latino whites, which also contributes to have stronger family networks (Sabogal, Marin, Otero-Sabogal, Marin, & Perez-Stable, 1987; Vega, 1990). There is evidence that familism, or a traditional family orientation, can be a protective factor and serve as a buffer for certain health behaviors. For example, Latino immigrants are less likely to smoke and abuse alcohol and drugs than their U.S-born counterparts (Abraido-Lanza, Chao, & Florez, 2005).

Marital Status and Health

Sociologists have argued that "marital status is a defining feature of the social environment" (Umberson, Liu, & Powers, 2009). More importantly, being in a married relationship has typically been considered the most important relationship for promoting health since it has the ability to enrich one's social environmental and ultimately enhance and improve health (Waite, 1995). Married individuals also report better self-perceived health, have lower rates of long-term illness, are less depressed, and have a longer life expectancy than their

unmarried counterparts (Umberson & Williams, 2004). There are various explanations that attempt to explain this phenomenon. The marital resource model explains that marital status differences in health are due to better economic resources, social support, and regulation of health behaviors (Ross, Mirowsky, & Goldsteen, 1990; Umberson, 1992). On the other hand, the crisis model suggests that the differences in health result from the strains of marital transition undermine health (Booth & Amato, 1991; Williams, Takeuchi, & Adair, 1992)

There is also research on how marital status affects weight status of couples. According to a study performed by Schoenborn (2004), married adults in the U.S. were found to be healthier than adults in other marital status categories regardless of population subgroup or health indicator. Interestingly, the only negative health outcome associated with marriage was a higher prevalence of overweight and obesity (Schoenborn, 2004). However, it is important to note that this finding was not specific to the immigrant population as the sample represented the U.S. civilian non-institutionalized household population. A similar study found that in a longitudinal study, BMI increases for both men and women during marriage and throughout their cohabitating relationship (Averett et al., 2008). This research suggests that there are additional differences in BMI and marital status among distinct racial and ethnic backgrounds. Married and divorced Hispanic women were found to have higher BMIs and a higher incidence of overweight than their single counterparts. Similarly, Hispanic men were more likely to be overweight after marriage and cohabitating was also linked to weight gain (Averett et al., 2008).

Spousal Ethnic Identity

Further research has investigated differences in marriage patterns among immigrants as this relates to acculturation. While many immigrants enter the U.S. with a partner, numerous researchers have analyzed differences between those who marry within the same ethnic group,

known as intra-ethnic marriage, and those who marry outside of the ethnic group, known as inter-ethnic marriage. Inter-ethnic marriage is viewed as the last step in the acculturation process since it is tied with the resilience of traditional behaviors and the adoption of certain social norms of the host country (Gordon, 1964; Qian & Lichter, 2007; Sassler, 2005). Intermarriage with Whites may be an indicator that the minority group members have adopted cultural patterns of the host society and that they have been adopted, both economically and politically, into the host culture (Qian & Lichter, 2007). Marrying a native has been shown to have direct effects on not only language abilities, but also knowledge of the native culture's social norms and labor market settings (Giuntella, 2014). Studies of intermarriage patterns in the U.S. suggest that Latinos have a higher rate of intermarriage with non-Hispanic Whites, which could suggest weak barriers to marriage and less social distance than Asians or Blacks (Qian & Lichter, 2007). Thus, research suggests that intermarriage accelerates the process of acculturation into American society and can be seen as an indicator into social acculturation (Giuntella, 2014).

However, most studies have focused on the socioeconomic repercussions associated with intermarriage, and not necessarily its effect on the health of immigrants. The majority of studies focus on first-generation immigrants and how intermarriage helps to successfully incorporate them into the labor market (Giuntella, 2014). Giuntella (2014) found that intermarried Hispanics have significantly higher socioeconomic status than endogamous Hispanic couples. The New Immigrant Survey Pilot provided further insight into marriage patterns among immigrants. The study revealed that among married couples formed by a U.S. citizen sponsoring the immigration of a spouse, husbands and wives had similar levels of educational attainment, with the native-born spouse having a slightly higher level of education than the foreign-born spouse (Jasso, Massey, Rosenzweig, & Smith, 2000). More specifically, U.S. citizen husbands and their

immigrant wives had on average two more years of higher schooling than U.S. citizen wives and immigrant husbands (Jasso et al., 2000). The study also found that husband-wife schooling is more similar among U.S. citizen sponsor and an immigrant spouse than among couples who are both immigrants, excluding when the wife is the principal in the employment category (Jasso et al., 2000).

There is only one published study on the association between inter-ethnic marriage and health. Giuntella (2014) investigated birth outcomes of Hispanics in endogamous and inter-ethnic relationships and found that third-generation children of Hispanics who intermarried were 9% more likely to have low birth weights than endogamously married Hispanics. Yet, it is important to note that this finding may be influenced by prevalence of risky behavior among second-generation mothers, such as smoking. The paucity of research on this topic merits more attention.

Gaps in the Literature

Despite the literature on the health benefits of marriage, there is a lack of literature on how these results may vary among immigrant groups. The majority of studies on the health benefits of marriage are focused on the native-born population and do not take into account foreign-born immigrants. Thus, while marriage seems to be a protective factor for health, fewer studies have investigated how marital status at time of immigration impacts acculturation and weight status. In addition, fewer studies have investigated how spousal ethnic identity impacts health and whether the process of acculturation and weight gain is accelerated among immigrants in inter-ethnic relationships as opposed to intra-ethnic relationships.

Methods

New Immigrant Survey Study Design

The New Immigrant Survey (NIS) is a multi-cohort prospective-retrospective panel study of recent legal immigrants in the U.S. It is a public-use dataset that aims to provide a longitudinal study on immigrants in the U.S. that can be used to inform scientific and policy questions about migration behavior. Survey topics include topics such as demographics, schooling, migration history, health, marriage and family, financial transfers, economic indicators, English language skills, and housing environment. The overall design will take representative samples of cohorts of new lawful immigrants and follow them over time. New cohorts will be selected every four or five years, or if U.S. immigrant policy or international issues authorize.

This survey is supported by the National Institutes of Health (NIH), National Institute of Child Health and Human Development (NICHD), National Institute on Aging (NIA), Office of Behavioral and Social Science Research (OBSSR) under grant HD33843, the National Science Foundation (NSF) under grants SRS-9907421 and SES-0096867, and the U.S. Immigration and Naturalization Service (now the U.S. Citizenship and Immigration Services). The Office of the Assistant Secretary for Planning and Evaluation (ASPE) and the Pew Charitable Trusts also provided additional support. This research project involved the collaboration of four institutional settings including RAND, Princeton University, New York University, and Yale University.

Sampling Design

The procedures for selecting the sample occurred in three steps. First, the Office of Immigration Statistics prepared an electronic file with the immigrant records for all new lawful immigrants whose records were entered in the specified period (for example, 1-15 May 2003)

and forwarded it to the Principal Investigators (PIs). Next, the PIs selected the Adult and Child Samples according to the abovementioned qualifications using a random-number statistical routine, where each immigrant in the sampling frame received a sampling number and then the first x cases in each stratum were chosen. Third, the PIs sent the Samples to the survey organization, the National Opinion Research Center (NORC), affiliated with the University of Chicago.

Due to geographic clustering of immigrants in the U.S., the NIS used a technique of sampling from areas with high densities of immigrants. Data from the full immigrant cohorts in the five-year period FY 1996 to 2000 showed that 89% of immigrants' initial residences, or the addresses to which the green card would be sent, were in the top 85 Metropolitan Statistical Areas (MSAs), another 4-5% in the top 38 counties, and 1% overseas. Those that were overseas were later eliminated due to difficulty in locating them. However, those who had a non-overseas address in the administrative record, but were overseas during the field period were still interviewed. A random sample of 10 MSAs and a random sample of 15 county pairs were selected.

The Adult sampling frame was 12,500 with a target response rate of 70%, which would be 8,750 participants. The baseline round of the first full cohort (NIS-2003) had 8,573 respondents or a 68.6% response rate.

Survey Procedure

A survey pilot project (NIS-P) was first conducted in 1996 to inform the fielding and design of the full study. The first full cohort (NIS-2003-1) sampled immigrants in the period May-November 2003. A baseline survey was performed from June 2003 to June 2004. The

follow-up survey (NIS-2003-2) was performed from June 2007 to December 2009. This study used the NIS-2003-1 data for analysis.

The first full cohort (NIS-2003-1) included both an Adult Sample and Child Sample. The sampling frame included new-arrival immigrants, which comprised of immigrants arriving in the U.S. with immigrant documents acquired abroad as well as adjustee immigrants who were immigrants already in the U.S. with a temporary nonimmigrant visa (or, in some cases, illegally) and adjusted to lawful permanent residence. Lawful permanent residents are foreign-born persons who have been granted permission to live in the U.S. permanently. The visa types include: spouse of U.S. citizen, spouse of permanent resident, employment of several kinds, refugee or asylee, and winners of the diversity visa lottery. The diversity visa lottery is a program that allots additional immigration visas to countries that are historically underrepresented in U.S. immigration streams.

The Adult Sample included all immigrants who were 18 years of age or older at admission to the lawful permanent resident program. Interviews were conducted as soon as possible after admission to lawful permanent residence. There was 60% of Adult Sample interviews that were performed via phone and the remaining were administered in person. For the purposes of this study, the secondary data analysis only focused on the Adult Sample.

Language Considerations

Sampled immigrants were interviewed in the language of their choice, which increased response and data quality. This resulted in numerous translations of the NIS, and thus the researchers classified languages into various tiers and designed a treatment for each tier. Language classification was determined by (1) expected origin-country distribution, (2) expected native-language distribution, and (3) expected preferred languages by country. Using

information on the immigrant cohorts of Fiscal Years 1996-2000, the set of high-admission countries identified annually by the State Department, as well as information on nonimmigrant refugee admissions, major countries of origin were identified. Following, the NIS Pilot survey data was used to identify native languages and preferred languages. The languages were then classified into tiers implying the expected number of interviews requested in each language. Tier 0 indicated English, Tier 1 was Spanish, Tier 2 contained the following six languages that were expected to be requested including Chinese, Korean, Polish, Russian, Tagalog, and Vietnamese. Tier 3 comprised of the next nine languages, and Tier 4 included all other languages. All instruments were translated verbatim in Tier 1 and Tier 2 languages. In Tier 3 certain concepts were translated. Interviews for Tier 1 and Tier 2 were conducted by bilingual interviewers. All other interviews were conducted in an interviewer-interpreter pair.

Procedure

Permission was requested from the Office of Population Research (OPR) Data Archive at Princeton University to access the publicly available datasets from the NIS-2003-1 cohort. Select datasets from the NIS-2003-1 were imported into IBM SPSS Statistics 22 for data analysis. Accompanying codebooks and questionnaires were also utilized.

The NIS-2003-1 data consist of 26 datasets. All datasets were imported, merged, and sorted by participant. Only the following datasets were used for analysis: demographics (NIS03-A), health (NIS03-D), income (NIS03-G), social variables (NIS03-J), and migration history (NIS03-K), and appendum (NIS03-N). The sample for this study was a subset of the NIS Adult Sample. Only respondents that self-identified as Hispanic or Latino were included in the final dataset. In addition, only those who noted they were married, were living together but not married, or were not married were included. Through listwise deletion, if either of these

variables were missing, they were removed from the final dataset. Further, through listwise deletion, observations with height or weight variables that were missing were deleted. The following variables of interest were cleaned and recoded, and observations that had missing data were deleted. The final dataset had a total of 2,680 weighted observations.

Demographic and Control Variables

Age

Participants were asked "In what year were you born?" The variable 'age' was created by subtracting the participants' birth year by 2003 to determine at what age each respondent became a lawful permanent resident.

Sex

A binary variable assessing sex of all participants was collected and was coded as '0' for male and '1' for female.

Country of birth

Respondents were asked "In what country were you born?" and they were able to indicate their country of origin. After simple frequencies were conducted on this variable, countries of birth with less than 5% were recoded into an "other" category.

Years of education

Years of total education was determined from the question "How many years of schooling in total have you completed?" The subset sample included a range from 0 to 30 years of education. Number of years of education was capped at 18 years based on recommendations and calculations from the Human Development Index ("Human Development Index (HDI)," 2014). Respondents who indicted more than 18 years of schooling were thus recoded as having 18 years of education.

Living with others

Respondents were asked "What is [person's name] relationship to you?" for all people living in the same household. Respondents listed all members in their household's relationship to them. Answer responses were recoded into either '1' for living with immediate family only, '2' for living with others outside of immediate family, and '3' for living with both immediate family and others. Immediate family is defined is all of the following: husband, wife, biological son, biological daughter, brother, sister, father, and mother.

Current smoker

Respondents were asked "Do you smoke cigarettes now?" This variable was included into the analysis as a binary variable of whether the respondent currently smoked. Responses were coded as '1' for yes and '0' for no.

Physical activity

Level of physical activity was assessed through the question "How often do you participate in vigorous physical exercise or sports such as aerobics, running, swimming, or bicycling?" If a respondent participated in vigorous activity more than once per week he/she was defined as 'active' and 'inactive' if they did not. Responses were dichotomously recoded as '1' for active and '0' for inactive.'

Chronic conditions

High blood pressure and diabetes were part of a list of chronic health conditions. Respondents were asked "Has a doctor ever told you that you have high blood pressure or hypertension" and "Has a doctor ever told you that you have diabetes or high blood sugar?" Responses were dichotomous and coded as '1' for yes and '2' for no.

Acculturation Variables

Changes in diet

The amount of change in the respondent's diet after arriving in the country was assessed through the question "Using a scale from one to ten where 10 indicates exactly the same and 1 means completely different, how would you compare the similarity in the diet in the food you now normally eat in the United States with the food you normally ate in your home country?"

Specific foods

Two survey items assessed the specific foods respondents ate prior to coming to the U.S. as well as foods they currently eat. Survey questions asked: (1) "Please tell me the most important thing you eat a lot now that you rarely ate before you came to the United States" and (2) "Please tell me the most important thing that you ate regularly before coming to the United States that you rarely eat now." These questions were asked to individuals who stated that there was an item that they regularly eat now that they did not used to eat or that there was something they used to eat regularly that they barely eat now. Responses were recorded verbatim and respondents were allowed to name more than one item; thus responses are not mutually exclusive. Items were then coded into the following categories: meat, vegetables, fruit, junk food, fast food, fish, starch, sweetened beverages and juice, and dairy. Items were later condensed as a dichotomous variable as '0' for healthy and '1' for unhealthy. Healthy included fruit and vegetables, and unhealthy included sweetened beverages and juice, junk food, and fast food.

Primary languages

To assess language acculturation, respondents were asked to list languages spoken at home, with friends, and with their current spouse. The primary and secondary languages were coded for each of the three variables into seven categories: '1' for English only, '2' for Spanish only, '3'

for English primary and Spanish secondary, ‘4’ for Spanish primary and English secondary, ‘5’ for English primary and other language secondary, ‘6’ for Spanish primary and other language secondary, and ‘7’ for other language. Each of these three language variables were further recoded and condensed into dichotomous variables: ‘1’ for mostly English, ‘0’ for mostly Spanish. Then, the three language variables were computed into one variable and ranged on a scale from 0 to 3 where ‘0’ signified Spanish and ‘3’ signified English. Cronbach’s alpha reliability for this scale was 0.796 suggesting adequate internal consistency of scale items.

English ability

Respondents’ ability to comprehend English was determined by two survey questions: (1) “How well would you say you understand English when someone is speaking to you?”, (2) “How well would you say you speak English?” Answer responses ranged from 1 to 4 where ‘1’ signified very well, ‘2’ signified well, ‘3’ signified not well, and ‘4’ signified not at all.

Experience in U.S.

Experience in the U.S. was calculated by asking respondents “In what month and year did you leave [country] to live in another country for at least 60 days?” and “To what country did you move at that time?” If a respondent identified that they he/she had come to the U.S. for numerous visits for more than 60 days, the years of arrival and departure were summed for each visit to acquire a cumulate number of years in the U.S. The computed variable serves as an approximation of experience in the U.S. since only years were included in the analysis. Responses entered as ‘0’ represents less than one year experience in the U.S.

Predictor Variables

Marital status

Marital status was determined by asking respondents their current relationship status. Answer responses included: married, living together in a marriage-like relationship but not married, separated, divorced, widowed, never married (not living with someone in a marriage like relationship), refused, or don't know. Only, married, living together in a marriage-like relationship but not married, and never married (not living with someone in a marriage like relationship) were included in the analysis based on the research questions of interest. Responses were coded as '1' for married or living together in a marriage-like relationship and '2' for single.

Spousal ethnic identity

Spousal ethnic identity was assessed by determining if married couples were in an intra-ethnic or inter-ethnic relationship. Intra-ethnic relationship is operationalized as an immigrant who is married to an individual who has the same country of birth than their own, and inter-ethnic relationship is operationalized as an immigrant who is married to an individual of a different country of birth than their own. One question asked "In what country were you born?" In addition, respondents were asked "In what country was your [husband/wife]/born?" A new variable was created and if the respondent's country of birth matched the spouse's country of birth, answer responses were coded as '1' (intra-ethnic). If the countries of birth of the respondent and the spouse did not match, answer responses were coded as '0' (inter-ethnic).

Outcome Variable

Body Mass Index

Body Mass Index (BMI) was measured by asking respondents to self-report their height and weight. Respondents were asked "About how much do you weigh?" and "About how tall are you?" Respondents were able to report in either the metric or English system. All measurements were converted to the English system, and thus heights were converted to inches and all weights were converted to pounds for ease of computing BMI. The subsequent heights and weights were computed into BMI by the following formula: BMI = weight (lb) / [height (in)]^2 x 703. BMI was then coded into the following Centers for Disease Control and Prevention guidelines: underweight (< 18.5), normal (18.5-24.9), overweight (25.0-29.9), and obese (>30) (Centers for Disease Control and Prevention, 2013).

Data Analysis

The data were analyzed using IBM SPSS Statistics 22. Data were cleaned and recoded prior to data analysis. Data cleaning involved merging abovementioned datasets, including only respondents that self-identified as Hispanic or Latino and only those who noted they were married, were living together but not married, or were not married. Through listwise deletion, if either of these variables were missing, they were removed from the final dataset. Further, observations with height or weight variables that were missing were deleted. If data were missing for other variables, the variable was coded as missing. Weighted data analyses were performed for all analyses, unless otherwise noted.

First, descriptive statistics were conducted to determine simple frequencies and means. Next, bivariate analyses were used to determine the relationship between all predictor variables and the outcome variable (BMI). Variables with a significance level of $p<0.20$ were entered into

the subsequent overall linear regression models. All acculturation variables were initially entered based on theoretical grounds. Two separate multiple linear regressions were run; one including marital status as a predictor and the other including spousal ethnic identity as a predictor.

If these predicator variables were of statistical significance ($p<0.05$) in the model, a mediation model was developed between the proposed predictor, acculturation, and BMI. The following steps were performed to determine mediation.

1. Bivariate analyses were run between the predictor variable (i.e., marital status or spousal ethnic identity) and acculturation. The significance level was set at $p<0.05$ and a significant relationship between these variables was required to advance to the subsequent step.
2. Bivariate analyses were run between the predictor variable (marital status or spousal ethnic identity) and BMI. The significance level was set at $p<0.05$ and a significant relationship between these variables was required to advance to the subsequent step.
3. A multiple linear regression model was built containing only the significant ($p<0.05$) variables from both bivariate analyses, while controlling for the predictor variable and covariates significant at the $p<.20$ level.

Results

Background Demographics and Control Variables

A total of 2,680 Latino immigrants were included in the study and the sample was weighted to ensure representativeness of the Latino lawful permanent resident population. The subsequent descriptive statistics and analyses were conducted using these weights. Among Latino lawful permanent residents, 46.9% were male and 53.1% were female. Ages ranged from 18 to 85 years old, with the average age being 35.89 years (sd=11.89). The number of years of completed school ranged from 0 to 18 (mean=10.48; sd=4.51).

Latino lawful permanent residents identified their country of birth as follows: 43.7% Mexican, 15.9% El Salvadorian, 12.4% Latin American & the Caribbean, 6.4% Guatemalan, 5.7% Dominican, 5.2% Colombian, and 10.6% were from other which consisted of countries of birth endorsed by less than 5% (Table 1). Country of birth is also stratified by marital status seen in Table 1.

Table 1. Latino lawful permanent residents' country of birth in weighted sample (n=2,680)

	Overall (n=2,680)	**Married or in marriage-like relationship** (n=2,172)	**Single** (n=507)
	%	**%**	**%**
Country of birth			
Mexico	43.7	47.1	29.0
El Salvador	15.9	14.2	23.3
Latin American & the Caribbean	12.4	12.1	13.6
Guatemala	6.4	6.0	8.3
Dominican Republic	5.7	3.9	13.5
Colombia	5.2	5.8	3.0
Other	10.6	10.9	9.3

Only about a quarter identified current smoking status. Among those who identified smoking status, 34.4% were current smokers and 65.5% were non-smokers. Among those who identified level of physical activity, 66.5% were active and 33.5% were inactive. Latino lawful permanent residents self-reported low rates of hypertension and diabetes. Among those who reported these chronic diseases, only 8.4% reported high blood pressure and only 4.3% reported that they had diabetes. The majority of Latino lawful permanent residents lived with immediate family (63.1%), some lived with both immediate family members and others (32.4%), and very few lived with others that were not immediate family (4.5%) (Table 2).

Among the sample demographics, there were statistically significant differences by marital status in hypertension and living with others in the household. This means that that those who were married or in a marriage-like relationship reported more hypertension than those were are single (x^2=5.13, df=1, p=.024). Additionally, being single was a more significant predictor of living with others in the household than being married (x^2 =163.99, df=2, p<0.05).

Table 2. Chi squares comparing demographic background of married or in marriage-like relationship and single Latino lawful permanent residents in weighted sample (n=2,680)

	Overall (n=2,680)	**Married or in marriage-like relationship** (n=2,172)	**Single** (n=507)	
	%	**%**	**%**	**Significance**
Gender				
Male	46.9	79.7	20.3	$x^2(1)=2.79$, p=.095
Female	53.1	82.2	17.8	
Smoking status				
Current smokers	34.4	83.5	16.5	$x^2(1)=.35$, p=.553
Not current smokers	65.5	85.1	14.9	
Physical activity				
Inactive	33.5	80.3	19.7	$x^2(1)=2.47$, p=.116
Active	66.5	75.7	24.3	
High blood pressure				
Have high blood pressure	8.4	86.7	13.3	$x^2(1)=5.13$, p=.024*
Do not have high blood pressure	91.6	80.6	19.4	
Diabetes				
Have diabetes	4.3	83.6	16.4	$x^2(1)=.51$, p=.475
Do not have diabetes	95.7	81.0	19.0	
Living with others in household				
Immediate family	63.1	87.9	12.1	$x^2(2)=163.99$, <0.05*
Others not in immediate family	4.5	43.5	56.5	
Immediate family and others	32.4	79.0	21.0	

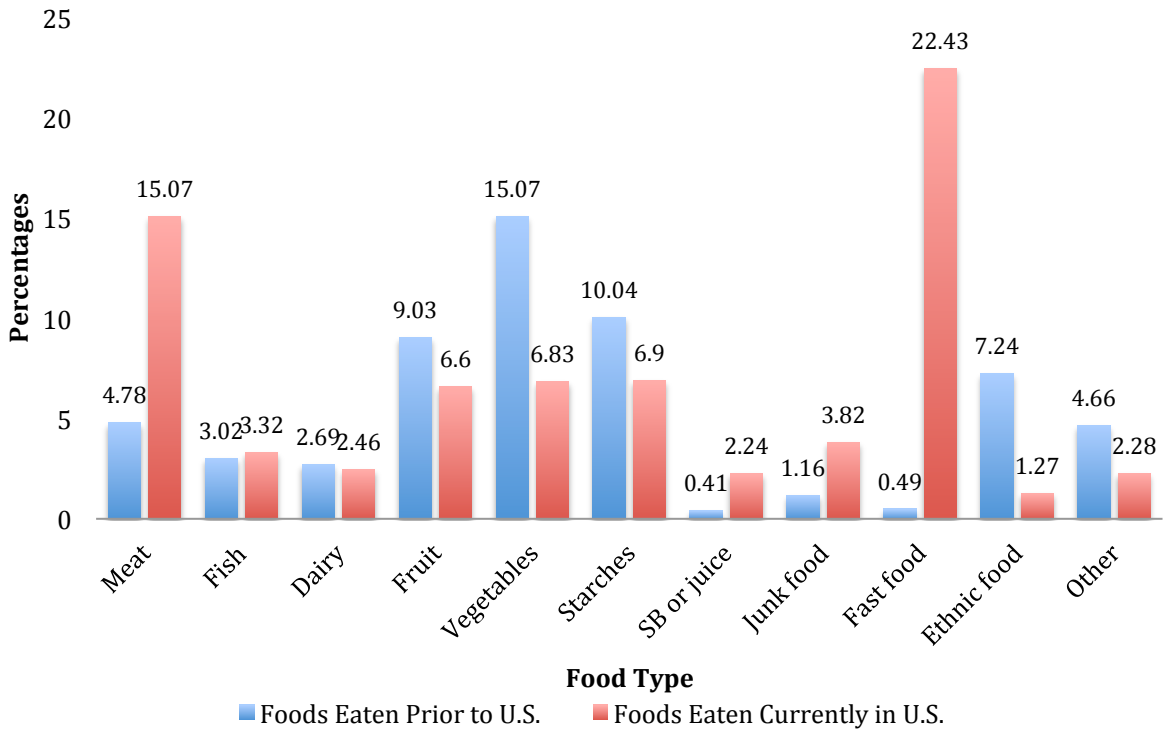
***** Statistically significant at p<0.05

Acculturation Variables

In determining the level of dietary acculturation, respondents were asked the amount of change in their diet after arriving in the U.S., on a scale where 1 represented completely different and 10 represented completely the same. The average change in diet score was 4.89 (sd=3.410). Respondents identified the most important foods they ate prior to immigrating as well as post immigration. The majority of Latino lawful permanent residents (99.4%) who said that there is

something they eat a lot now that they rarely coming to the U.S. Among Latinos, the most important foods respondents eat now are fast foods (22.43%), meat (15.07%), vegetables (6.83%), starches (6.90%), fruit (6.60%), junk food (3.82%), fish (3.32%), dairy (2.46%), other (2.28%), sweetened beverages or juice (2.24%), and ethnic foods (1.27%). The majority of Latino lawful permanent residents (99.2%) also indicated that there was something they ate regularly before coming to the U.S. that they rarely eat now. For these Latino lawful permanent residents, the most important foods eaten prior to arrival in the U.S. included vegetables (15.07%), starches (10.04%), fruit (9.03%), ethnic foods (7.24%), meat (4.78%), other (4.66%), fish (3.02%), dairy (2.69%), junk food (1.16%), fast food (0.49%), and sweetened beverages or juice (0.41%) (Figure 1).

Figure 1. Most important foods eaten by Latino lawful permanent residents in weighted sample (n=2,680)



Frequencies were noted of all foods the respondent used to eat a lot of before coming to the U.S. and all foods that the respondent eats regularly now (Table 3). A manual count of each food item was recorded and thus the unweighted dataset was used. A full list of the food frequency table can be found in the Appendix A.

Table 3. Frequency tables of verbatim food responses among Latino lawful permanent residents in unweighted sample*

Most important food that you used to eat before U.S.	**#**	**Most important food regularly eat now in U.S.**	**#**
Beans/legumbres	214	Meat	268
Fruits	97	Hamburgers	254
Tortillas	84	Pizza	158
Vegetables	74	Fruits	142
Rice	62	Vegetables	104
Mangos	39	Chicken	77
Meat	36	Fast food	59
Fish	35	Milk	53
Tamales	26	Chinese food	52
Bread	24	Fish	39
Milk	23	Beef	37
Pupusas	23	Cereal	35
Soups/sopas/consommes	23	Salads	33
Tropical fruits	21	French fries	32
Seafood	21	Bread	29
Cheese	20	Juice	28
Tacos	19	Sodas	23
Pork/pig	18	Ice cream	20
Eggs	17	Seafood	20
Corn/maiz/chocolo/elotes	17	Beans	19
Chicken	15	Tortilla	19
Plantains or fried plantains	13	Apples	18
Fresh fish	12	Shrimp	18
Mole	11	Grapes	17
Cactus/nopales	11	Rice	17

*Only top 25 food responses noted in table.

Primary and secondary languages were analyzed to determine language assimilation. Similar trends were seen with languages spoken with spouses, at home, and with friends. The majority of Latino lawful permanent residents indicated that they spoke Spanish. There were 63.2% who selected Spanish as their primary language spoken with their spouse and 15.1% who selected Spanish as primary and English as their secondary language. Similarly, 60.4% spoke Spanish only at home and 24.2% spoke Spanish primarily and English secondary at home. Finally, 63.7% spoke Spanish only with their friends and 18.0% spoke Spanish primarily and English secondarily when talking with friends. Overall, the average primary language score was 0.3846 (sd=0.801) on a scale from 0 to 3, where 0 signified only Spanish and 3 signified only English. When asked how well they understood spoken English, Latino lawful permanent residents had an average score of 2.51 (sd=1.006) on a scale from 1 to 4, where lower scores signified better English comprehension. When asked how well they spoke English, Latino lawful permanent residents had an average score of 2.74 (sd=0.984), where lower scores signified better English comprehension. The average experience in the U.S. in years was 8.46 years (sd=7.22).

Predictor Variables

The majority of Latino lawful permanent residents (81.1%) were married or living together in a marriage-like relationship and 18.9% were not married. Among those who were married, 62.4% were in an intra-ethnic relationship and 37.6% were in an inter-ethnic relationship (Table 4).

Table 4. Descriptive statistics of predictor variables among Latino lawful permanent residents in weighted sample (n=2,680)

	%
Marital Status	
Married or in marriage-like relationship	81.1
Not married	18.9
Spousal Ethnic Identity	
Intra-ethnic relationship	62.4
Inter-ethnic relationship	37.6

Outcome Variable

Among Latino lawful permanent residents who indicated height and weight measurements, BMI ranged from 12.2 to 58.95 with a mean of 26.49 (sd=4.94). There were very few who classified as underweight (1.2%), 43.2% who classified as normal, 43.0% who classified as overweight, and 12.6% who classified as obese (Table 5).

Table 5. BMI among Latino lawful permanent residents in weighted sample (n=2,680)

	Min	Max	Mean	sd
BMI	12.2	58.95	26.49	4.94
	%			
BMI Categories				
Underweight	1.2			
Normal	43.2			
Overweight	43.0			
Obese	12.6			

Bivariate Analyses

Demographic and control characteristics

To determine which demographic and control characteristics should be included into the multiple linear regression model, simple linear regressions and ANOVAs were run between these variables and the outcome variable, BMI (Table 6). There were numerous statistically significant variables, which included age ($p<0.05$), sex ($p<0.05$), country of birth ($p<0.05$), years of education ($p<0.05$), physical activity ($p=0.002$), and certain chronic conditions. More specifically, older Latino lawful permanent residents had a BMI that was 0.084 points higher than younger individuals. Females had a BMI that was 0.837 points lower than males. More educated individuals also had a lower BMI by 0.247 points. Those who participated in vigorous activity had a mean BMI score that was 0.909 points lower than those who did not participate in vigorous physical activity. On average, those with high blood pressure had a mean BMI that was 2.501 points higher than those without hypertension. In addition, those with diabetes had a mean BMI that was 3.632 points higher than those without diabetes.

Acculturation variables

Bivariate analyses were run between all acculturations variables and BMI using simple linear regression. Experience in the U.S., English language abilities, and primary language were all statistically associated with the outcome ($p<0.05$ for all variables). This signifies that on average, Latino immigrants who had more years of experience in the U.S. had a BMI that was 0.134 points higher. Additionally, those who understood spoken English more poorly had a BMI that was 0.547 points higher than those who understood English better ($p<0.05$). Latino lawful permanent residents who spoke English more poorly had a BMI that was 0.545 points higher

than those who spoke English better ($p<0.05$). Those who spoke English more primarily had a BMI that was 0.722 points lower than those who spoke Spanish primarily ($p<0.05$).

Marriage variables

Bivariate analyses were run between marriage variables and BMI using simple linear regression. Marital status was significantly associated with BMI ($p<0.05$). This means that on average, those who were married or living in a marriage-like relationship had a mean BMI that was 1.056 points higher than those who were single. Spousal ethnic identity was also found to be statistically related to BMI ($p<0.05$), indicating that those who were in an intra-ethnic relationship had a mean BMI that was 0.812 points lower than those who were in an inter-ethnic relationship.

Table 6. Bivariate analysis of demographic and control variables, predictor variables, acculturation variables with outcome variable (BMI) among Latino lawful permanent residents in weighted sample (n=2,680)

	Beta		p-value
Demographic and control			
Age	0.084		<0.05*
Sex	-0.837		<0.05*
Years of education	-0.247		<0.05*
Current smoker	-0.115		0.762
Physical activity	-0.909		0.002*
High blood pressure	2.501		<0.05*
Diabetes	3.632		<0.05*
Acculturation			
Experience in U.S.	0.134		<0.05*
Changes in diet	-0.040		0.158
Most important food eaten in U.S.	0.051		0.881
Most important food eaten prior U.S.	0.172		0.835
Understand spoken English	0.547		<0.05*
Speak spoken English	0.545		<0.05*
Primary language	-0.532		<0.05*
Marriage			
Marital status	1.056		<0.05*
Spousal ethnic identity	-0.812		<0.05*
	F	**df**	**p-value**
Demographic and control			
Country of birth	15.061	8, 2658	<0.05*
Living with others	2.841	2, 2558	0.059

*Statistically significant at p<0.05

Multivariate Analyses

Two initial multiple linear regressions were performed to determine overall models for the variables of interest while controlling for statistically significant covariates. All acculturation variables were entered into the initial models regardless of statistical significance and were later assessed for final inclusion into the models. The resulting model was created for marital status (Table 7). The multiple linear regression model with spousal ethnic identity was not statistically significant (p=0.583).

Table 7. Multiple linear regression with marital status as a predictor among Latino lawful permanent residents in weighted sample (n=2,680)

	Beta	p-value
Marital status	0.566	0.027*
Age	0.035	<0.05*
Sex	-0.779	<0.05*
Years of education	-0.126	<0.05*
High blood pressure	1.247	0.001*
Diabetes	2.005	<0.05*
Primary language	-0.371	0.009*
Understand spoken English	0.202	0.322
Speak spoken English	-0.148	0.480
Experience in U.S.	0.110	<0.05*

* Statistically significant at $p<0.05$

Table 7 shows that those that were married or living in a married-like relationship had a BMI that was 0.566 points higher than those who were single, while controlling for all other variables (p=0.027). For each unit increase in age, BMI increased by 0.035 points, while controlling for all other variables (p<0.05). Females had a BMI that was 0.779 points lower than males, while controlling for all other variables (p<0.05). For each additional year of education, Latinos lawful permanent residents'' BMI decreased by 0.126 points while controlling for all other variables (p<0.05). Those with high blood pressure (p=0.001) and those with diabetes (p<0.05) had a BMI that was 1.247 and 2.005 points higher, respectively, while controlling for all other variables. For each additional year spent in the U.S., BMI increased by 0.110 points (p<0.05). Those who spoke English more primarily had a BMI that was 0.371 points lower than those who spoke Spanish more primarily (p=0.009).

Mediation Models

Since two acculturation measures were significant (p<0.05) in the overall multiple linear regression, two separate mediation models were investigated. For the first model, experience in

the U.S. was used as the measure for acculturation as it was statistically significant in the overall multiple linear regression ($p<0.05$). To examine whether experience in the U.S. mediated the association between marital status and BMI, two simple linear regressions were conducted. First, a statistically significant association between marital status and BMI was determined ($B=1.056$, $p<0.05$), indicating that on average, those who were married or living in a marriage-like relationship had a BMI that is 1.056 points higher than those who were single. Second, the simple linear regression between marital status and experience in the U.S. ($B=0.709$, $p=0.056$) was only marginally significant. A multiple linear regression was not performed since a statistically significant relationship between both the predictor variable (marital status) and the outcome variable (BMI), as well as statistically significant relationship between the predictor variable (marital status) and the mediator (experience in the U.S.) was required to create a mediation model.

The second model used primary language as the acculturation variable. First, a statistically significant association between marital status and BMI was determined ($B=1.056$, $p<0.05$), indicating that on average, those who were married or living in a marriage-like relationship had a BMI that is 1.056 points higher than those who were single. Second, the simple linear regression between marital status and primary language was not statistically significant ($B=0.044$, $p=0.278$). A multiple linear regression was not performed since a statistically significant relationship between both the predictor variable (marital status) and the outcome variable (BMI), as well as statistically significant relationship between the predictor variable (marital status) and the mediator (primary language) was required to create a mediation model.

Since there was not a statistically significant relationship in the multiple linear regression

model with spousal ethnic identity as the predictor ($p=0.583$), a mediation model with spousal ethnic identity as a predictor was not performed.

Discussion

This study examined whether acculturation mediated the relationship between marital status (e.g., married/living together but not married vs. single) and BMI among new Latino lawful permanent residents, and (2) whether acculturation mediated the relationship between spousal ethnic identity (e.g., intra-ethnic relationship vs. inter-ethnic relationship) and BMI among new Latino lawful permanent residents using data from the 2003 NIS. Overall, Latino lawful permanent residents who were married or living in a marriage-like relationship had higher BMI than single counterparts, when controlling for age, sex, years of education, chronic conditions (i.e. hypertension and diabetes), acculturation (i.e. experience in the U.S. and primary language), and English abilities (i.e., understand spoken English and speak spoken English). There was no evidence that acculturation mediates the relationship between marital status and BMI. Further, there was not a relationship between spousal ethnic identity and BMI. Therefore, mediation could not be tested between spousal ethnic identity and BMI.

Main Findings by Hypothesis

Hypothesis 1: Latino lawful permanent residents who are married or living in a marriage-like relationship will have higher BMIs than Latino lawful permanent residents who are single

The results support the first hypothesis that Latino immigrants who are married or living in a marriage-like relationship had higher BMIs than single Latino immigrants. This was evidenced in a multiple linear regression which found a statistically significant relationship between marital status and BMI while controlling for age, sex, years of education, chronic conditions (i.e. hypertension and diabetes), acculturation (i.e. experience in the U.S. and primary language), and English abilities (i.e., understand spoken English and speak spoken English). This finding is supported by the literature as studies have found that those who are married have

a higher prevalence of overweight and obesity that those in other marital status categories (Averett et al., 2008; Schoenborn, 2004). While the majority of studies on marriage and health outcomes are focused on the native-born population, this study adds to the literature by in taking to account foreign-born immigrants.

The current study also confirms that Latino lawful permanent residents who are married or in a marriage-like relationship have a higher BMI than single Latino lawful permanent residents. This corroborates other research which found that BMI increased for both men and women during marriage and throughout their cohabitating relationship (Averett et al., 2008). This finding is of particular interest because although there have been studies about marital status and weight status among natives, there is little evidence that this same phenomenon is seen in other immigrant groups.

Despite other studies finding marriage to be a protective factor for certain health conditions, such as mental health or self-perceived health, both of which studies have found to be better compared to their single counterparts (Umberson et al., 2009), this study did not examine other health outcomes.

Hypothesis 2: Among Latino lawful permanent residents who are married, those in an intra-ethnic relationship will exhibit lower BMIs than Latino lawful permanent residents in an inter-ethnic relationship

Based on this study, there is not a relationship between spousal ethnic identity and BMI. Although this hypothesis was not supported, this may be due to the way items were coded from the NIS-2003-1 dataset. Spousal ethnic identity served as a measure of type of marital relationship, either intra-ethnic or inter-ethnic. Since the NIS-2003-1 did not ask specific questions about spousal ethnic identity, this variable was based solely on determining if the

Latino lawful permanent residents and partner were born in the same country or not. Despite this finding, there is a lack of research on inter-ethnic marriage and health outcomes. While Giuntella (2014) investigated birth outcomes of third-generation children of Latinos in endogamous and inter-ethnic relationships, there currently exist no other studies on inter-ethnic marriage and how it affects health.

Hypothesis 3: Acculturation mediates the relationship between marital status (e.g., married/living together but not married vs. single) and BMI among new Latino lawful permanent residents

Acculturation was not found to mediate the relationship between marital status and BMI. That is, acculturation does not account for the relationship between martial status and BMI. Even though a mediation model was not supported by the data, there are numerous factors that may have impacted this finding. First, there were numerous measures of acculturation present in the dataset. This study included multiple measures of acculturation to give a more inclusive approach and included dietary acculturation, time in the U.S., and language, all of which have been previously shown to be acculturation measures (Teruya & Bazargan-Hejazi, 2013). Years in the U.S. and language were the only acculturation variables associated with BMI in the final multiple regression model.

There are numerous postulations as to why the dietary variables were not significantly related to BMI. First, operationalizing dietary acculturation is difficult as there are no firm standards by which foods represent more or less acculturated. By analyzing the food frequency table, it is evident that there are changes in diet before and after immigration (Appendix A). Latino lawful permanent residents noted that the top five responses for the question "Please tell me the most important thing that you ate regularly before coming to the United States that you

rarely eat now" were beans, fruits, tortillas, vegetables, and rice, with answer responses from most to least frequent. This is compared to the answer responses for the question "Please tell me the most important thing you eat a lot now that you rarely ate before you came to the United States" and Latino immigrants noted meat, hamburgers, pizza, fruits, and vegetables, with answer responses from most to least frequent. In comparing these responses, it is evident that Latino immigrants adopt more American dietary habits and eat more meat, hamburgers, and pizza as compared to plant-based foods of beans, fruits, and vegetables. In addition, the wording of these questions may have not truly captured the diet of Latino immigrants before and after immigrating. These questions assessed saliency since they asked respondents about the most important foods eaten pre- and post-immigration. This may not necessarily address foods that immigrants eat on a daily basis, but instead are foods that are most memorable or traditional of their home country or in the U.S.

Second, this study not only analyzed the types of foods, but also whether they were deemed healthy or unhealthy. Healthy included fruit and vegetables, and unhealthy included sweetened beverages and juice, junk food, and fast food. This may have limited analyses as this is a conservative approach to coding these variables and resulted in many responses not being coded due to not fitting into this dichotomous variable. That is, many food categories, such as starches, fish, etc. were not included into this dichotomous coding. However, the descriptive statistics presented in Table 1 show that the most important foods eaten prior to the U.S. were vegetables, starches, and fruits, and the most important foods currently eaten in the U.S. were fast food, meat, and starches, suggesting that dietary acculturation is occurring.

Hypothesis 4: Acculturation mediates the relationship between spousal ethnic identity (e.g., intra-ethnic relationship vs. inter-ethnic relationship) and BMI among new Latino lawful permanent residents

Based on this study, acculturation did not mediate the relationship between spousal ethnic identity and BMI. Since there was not a statistically significant relationship between spousal ethnic identity and BMI, there was no basis for testing whether this relationship was mediated by another variable (i.e., acculturation). This proposed model with acculturation as a mediator was mainly exploratory due to the paucity of research on spousal ethnic identity and health outcomes.

Limitations

This study is not without limitations. Given that this was a cross-sectional analysis, it is difficult to determine change over time. The follow-up interview (NIS-2003-2) was publically released in April 2014 and should be used for future longitudinal analyses to determine changes in BMI, as this will give a more valid depiction of the acculturation process for Latino immigrants in the U.S. and its effect on weight status. The NIS project aims to continue to collect data over the years that will provide a better picture around the topic of acculturation. In addition, since the NIS is a self-reported survey, measures of acculturation and height and weight may not accurately answer questions due to social desirability and recall bias.

It is important to note that acculturation is a complex topic since it is tied to a myriad of socio-ecological factors. Similarly, consistent with the literature, measuring acculturation is difficult to operationalize. This study only addressed some of the indicators of acculturation including language, diet, and time in the U.S. It is also critical to note that obesity is a multifaceted issue as food alone does not solely contribute to ones' BMI. Therefore, food and dietary choices are only inputs into BMI.

In examining the variable of marital status, there are numerous limitations. First, this study groups those who are married with those who are in a marriage-like relationship together into the same category. While the literature supports that those who cohabitate with a partner are more similar to those who are married than those who are single, the literature also suggests that cohabitation may also impact a partners' health, but to a lesser extent (Averett et al., 2008). This is a possible explanation as to why the relationship between marital status and experience in the U.S. (acculturation) was only marginally significant ($p=0.056$). Other information that would add to the richness of these findings would incorporate more about the current marriage. This study did not take into account length of marriage or length of marriage-like relationship or whether the couples were living in the same place; however, these would be important factors to include in future studies as there may be differences due to whether a couple was married or in a marriage-like relationship for a longer period of time. Further, this study does not assess whether those who are married or are in a marriage-like relationship are currently living in the same physical location.

Despite the inclusion of spousal ethnic identity as a variable of interest, the NIS-2003-1 dataset had few variables related to this construct. The operationalization of this variable may not portray an accurate picture of spousal ethnic identity, which may be one reason as to why spousal ethnic identity was not related to BMI when controlled for other factors. Future studies should expand upon this construct and incorporate more measures of spousal ethnic identity. Perhaps a qualitative study would be a better way to identity indicators of spousal ethnic identity among immigrants.

Implications and Recommendations

The study adds to the literature as it examines a unique subgroup of immigrants, Latino lawful permanent residents, from the NIS and analyzes the relationship between marital status, spousal ethnic identity, and BMI. As other research has indicated, immigrants are a vulnerable population, and regardless of country of origin, the risk of overweight and obesity increase with the amount of time spent in the U.S. (Akresh, 2007; Koya & Egede, 2007; Sanchez-Vaznaugh et al., 2008). While the evidence is clear that overweight and obesity are linked to serious health conditions such as coronary heart disease, type 2 diabetes, certain types of cancers, hypertension, and stroke (Centers for Disease Control and Prevention, 2013), the obesity epidemic is still of concern in the U.S. for both the native- and foreign-born.

This research sheds light on social and dietary acculturation factors that may influence BMI among Latino immigrants. Even though some findings were not statistically significant, there are still implications from this study and recommendations for future public health research, policy, and practice. There are branching points that can be taken from this study which would help contribute to the field of public health, and ultimately aim to improve the lives and health of immigrants as a whole. Since this was one of the first studies assessing spousal ethnic identity and its effect on health, other studies can expand upon these findings in order to determine how and if this construct is tied to health, especially that of immigrants. Many times acculturation does not include this particular social factor, and it could have implications for how immigrants adjust to American culture and what types of resources they may need in making it a smother transition into their new society.

Future research can also further investigate the interesting relationship between marital status and health among Latino immigrants. This study provides a basis into testing differences

in BMI between marital status groups, but future research should seek the reason for these differences. It suggests that Latino lawful permanent residents who are married or living in a marriage-like relationship and their partners would benefit from an intervention that addresses obesity prevention. Marital status is difficult to change; however, it is essential to understand the specific behaviors that lead to these differences among Latino immigrants. This involves broadening the scope of the research beyond social, dietary, cultural factors that impact BMI, but also examining behaviors such as physical activity, and environmental factors such as the built environment.

The current study has implications that also extend beyond the field of public health and involve the work of policymakers and local immigrant and refugee organizations. Using an interdisciplinary approach and involving players from multiple sectors could help ease the transition of new lawful permanent residents into the country. This includes providing resources to lawful permanent residents in a culturally appropriate manner. Resources could include linking immigrants to appropriate social services upon arrival as well as developing interventions that are specific to Latino immigrants in helping them adopt healthy habits. Ideally, these programs would use a family-based approach, encouraging partners to attend sessions, highlighting Latinos' strong bond of familism (Andalo, 2004). Organizations such as the U.S. Committee for Refugees and Immigrants currently have resources available for community-based organizations, public health officials, and local and national policymakers and address barriers for immigrants and refugees the country (U.S. Committee for Refugee and Immigrants, 2015). In addition to the development of these tools and resources, there is a call to action for health professionals and providers to be trained in cultural competence and understand which immigrants sub-groups are more at risk for certain health conditions than others.

Conclusion

This study provides preliminary conclusions on how marital status and spousal ethnic identity are associated with BMI among Latino lawful permanent residents in the U.S. The findings show that there is a relationship between marital status and BMI, and that Latino lawful permanent residents who are married or in marriage-like relationship have higher BMIs than those who are single. In addition, this study investigated spousal ethnic identity and its association with BMI. Even though spousal ethnic identity was not related to BMI in this study, it adds to the literature on this subject, as few studies attempt to understand the relationship between spousal ethnic identity and health.

This research highlights that the process of acculturation is a complicated and complex issue; however, it is a topic that needs to be underscored due to the sheer number of immigrants coming into the country as well as the research that supports that the longer immigrants stay in the U.S., the worse their health status. The results of this study may have important implications as it points to what types of needs and services should be prioritized for Latino immigrants. While new immigrants are faced with a multitude of challenges through the immigration process, more emphasis should be placed on guiding immigrants through this process, connecting them with necessary services, and building support networks so they can live productive, healthy lives in the U.S.

Appendix A. Frequency tables of verbatim food responses among Latino lawful permanent residents in unweighted sample

Most important food that used to eat before U.S.	#	Most important food regularly eaten now in U.S.	#
Beans or legumbres	214	Meat	268
Fruits	97	Hamburgers	254
Tortillas	84	Pizza	158
Vegetables	74	Fruits	142
Rice	62	Vegetables	104
Mangos	39	Chicken	77
Meat	36	Fast food	59
Fish	35	Milk	53
Tamales	26	Chinese food	52
Bread	24	Fish	39
Milk	23	Beef	37
Pupusas	23	Cereal	35
Soups or sopas or consommes	23	Salads	33
Tropical fruits	21	French fries	32
Seafood	21	Bread	29
Cheese	20	Juice	28
Tacos	19	Sodas	23
Pork/pig	18	Ice cream	20
Eggs	17	Seafood	20
Corn/maiz/chocolo/elotes	17	Beans	19
Chicken	15	Tortilla	19
Plantains or fried plantains	13	Apples	18
Fresh fish	12	Shrimp	18
Mole	11	Grapes	17
Cactus or nopales	11	Rice	17
Guava/Guayaba	10	Pasta	17
Home cooking or homemade food	10	Cheese	16
Mexican food	10	Broccoli	15
Beef	9	Chocolate	12
Fresh meats	9	Red meat	12
Avocado	8	Ham	10
Papaya	8	Junk food	10
Fresh fruits	8	Candies	9
Fresh food or natural fresh food	8	Eggs	8
Fresh and/or homemade cheese	7	Hot dogs	8

Bananas or platanos	7	Sandwich	7
Yucca	6	Ribs	7
Ceviche	6	Pears	6
Potatoes	6	Burrito	6
Candies	6	Tacos	6
Sopes	6	Pancakes	6
Pozole	6	Chips	6
Jocotes	6	Steak	6
Arepa	5	Corn flakes	6
Lentils	5	Cookies	5
Hamburgers	5	Turkey	5
Taquito	5	Pork	5
Black beans	5	Salmon	5
Grains	5	Mexican food	5
Pinto beans	5	Coffee	5
Sapotes/Mamey/Limincillos	5	Peaches	4
Chicken soup	5	Cherries	4
Empanada	4	Strawberries	4
Shrimp	4	Potatoes	4
Salad	4	Lettuce	4
Plums/Ciruelas	4	Canned food	4
Red meat	4	Cakes	4
Sopa/caldo de rez (beef soup)	4	Desserts	4
Ethnic food from El Salvador	4	Coca cola	4
Native foods	4	Sweets	4
Enchiladas	3	Frozen foods	4
Yogurt	3	Everything	4
Goat	3	Bananas	3
Hot dogs	3	Mangos	3
Coffee	3	Cauliflower	3
Rabbit	3	Waffles	3
Fruit juice	3	Lasagna	3
White cheese	3	Sushi	3
Steak	3	Yogurt	3
Sour cream	3	Greasy food	3
Pitayas	3	Balanced diet	3
Iguana or garrobo	3	Poultry	3
Ice cream	3	Italian food	3
Traditional food	3	Watermelon	2
Carnitas	2	Bagels	2
Pizza	2	Cheeseburger	2
Watermelon	2	Carbohydrates	2
Green beans	2	Pastries	2

Spinach	2	Soy milk	2
Native fruits	2	TV dinners	2
Regional fruits	2	Tuna	2
Fresh squeezed juice	2	Soups	2
Queso fresco	2	Lobster	2
Carne asada	2	American food	2
Birria	2	Peppers	2
Sweets	2	Oriental food	2
Sweet bread	2	Drinks	2
Fresh seafood	2	Fried food	2
Fried food	2	Almonds	1
Sancocho	2	Pineapples	1
Coconut	2	Avocado	1
Gorditas	2	Carrots	1
Milanesa	2	Cabbage	1
Cream or crema	2	Lentils	1
Water	2	Plums	1
Fat or fatty foods	2	Kiwi	1
Lobster	2	Peanut butter	1
Mamones	2	Butter	1
Chipilin	2	Ketchup	1
Tuna	2	Bologna	1
Root vegetables and regional roots	2	Cactus	1
Seafood soup	2	Apple pie	1
Homemade soup	2	Cheesecake	1
Spicy food	2	Tofu	1
Soya or soy beans	2	Sprite	1
Garbanzos or chick peas	2	Whole wheat	1
Deer	2	Vegetarian food	1
Quelites	2	Typical foods	1
Pumpkin (auyama) or calabaza	2	Meatloaf	1
Ollucos	2	Sweet breads	1
Churrascos	2	Snacks	1
Specific type of chips	2	Pupusas	1
Gallina india (native hen)	2	Prunes	1
Fritos	2	Proteins	1
Chile	2	Peanuts	1
Chicharones (fried pig skin)	2	Eggos	1
Barbeque	2	Oatmeal	1
Barbacoa	2	Nestea	1
Anonas	2	Native dishes	1
Ecuadorian food	2	Vitamins	1

Peruvian foods	2	Gelatin	1
Apples	1	Durian	1
Broccoli	1	Wheat products	1
White beans	1	Middle Eastern food	1
Red beans	1	Fats	1
Butter	1	Grills	1
Mushroom	1	Legumes	1
Figs	1	Starches	1
Exotic fruit	1	Sugar	1
Typical fruits	1	Japanese food	1
Orange	1	Iguana	1
Pineapple	1	Liquids	1
Natural juice	1	Hot and spicy sauce	1
Country cheese	1	Healthy food	1
Fast food	1	Fritos	1
Dairy products	1	Pork rinds	1
Salami	1	Cherimoya	1
Salsa	1	French bread	1
Strawberries	1	Food is heavier here in US	1
Sausage	1	Pies	1
Crab	1	Flan	1
Bangus fish	1	Flour	1
Melon	1	Fajitas	1
Milkshake	1	Ethnic foods	1
Squash	1	Breakfast	1
Water with sugar	1	Donuts	1
Coconut water	1	Diet bars	1
Engera	1	Cup of noodles	1
Starchy foods	1	Corn	1
Maranones	1	Corn flour	1
Honey	1	Dip	1
Intestines	1	Chiles rellenos	1
Nances	1	Cherry pie	1
Loquats	1	Cheese steaks	1
Rondon	1	Buffalo wings	1
Lucuma	1	Garlic	1
Mandarina	1	Buffalo meat	1
Mangos verdes	1	Buffet	1
Flour	1	Brownies	1
Turtle	1	Brans	1
Turtle eggs	1	Birria	1
Yucca fritters	1	Taquitos al pastor	1
Malanga	1	BBQ	1

Yams	1	Seafood soup	1
Special dishes	1	Alcapurrias	1
Sopa de queso (cheese soup)	1		
Lobster soup	1		
Iguana soup	1		
Conch soup	1		
Colombian soups	1		
Fish soup	1		
Torta ahogadas	1		
Torrejas	1		
Buñuelo	1		
Toxotes	1		
Sour sauce	1		
Spice	1		
Spaghetti	1		
Quesadilla	1		
Pan de bono	1		
Saladitos	1		
Sabritas	1		
Roast beef	1		
Snacks made with masa and cheese	1		
Potato stew	1		
Mofongo	1		
Pitos	1		
Pacaya	1		
Pica pollo victorina	1		
Pepian	1		
Pastries	1		
Papaturros	1		
Granadillas	1		
Panucho	1		
Tostada	1		
Lechon	1		
Pamonha	1		
Palm oil	1		
Paella	1		
Bledo	1		
Hot sauce	1		
Tortas	1		
Lard	1		
Korean food	1		
Sushi	1		

Honduran ice cream	1		
Hot chocolate which comes in bars	1		
Carapulcra	1		
Ocopa	1		
Tacu tacu breaded	1		
Huancaina potatoes	1		
Herbs	1		
High amounts of carbohydrates	1		
Guienos verdes	1		
albondigas (meatballs)	1		
Chilian corn cream	1		
Oatmeal made of cashews	1		
Iguana eggs	1		
Abas	1		
Guatamelo	1		
Guanabana	1		
Green chili	1		
Guamuchil	1		
Jicama	1		
Fritters	1		
Bollos (type of corn ball)	1		
Fresh mashed potatoes	1		
Fresh greens	1		
Fongo	1		
Flat bread	1		
Cuyes	1		
Hot peppers	1		
Ecuadorian bread	1		
Corn flour	1		
French bread	1		
Mesquite	1		
Chufles	1		
Frijol mono	1		
Chile (hot sauce)	1		
Chicozapote	1		
Loroco	1		
Chapulines	1		
Atol (maiz, terno, azucar)	1		
Cachapa	1		
Bologna	1		
Boniato	1		
Pork ribs	1		

Barbequed pork	1	
Barbeque Mexican style	1	
Almibar	1	
Antojitos	1	
Pito	1	
Mom's cooking	1	
Argentinian home cooked meals	1	
Argentinian sweets	1	
Bolivian food	1	
Brazilian fruits and vegetables	1	
Cuban food	1	
Fruits that grow in Ecuador and Brazil	1	
Fruits from Colombia	1	
Fruits from my country	1	
Good Mexican food	1	
Guatemalan food - traditional food	1	
Junk food from Mexico	1	
Local cuisine	1	
Soup from my home country	1	
Mexican appetizers	1	
Mexican bologna	1	
Mexican bread	1	
Mexican drinks	1	
Mexican snacks	1	
National Brazilian dish	1	
Salvadorian bread	1	
Different green vegetables that are typical from Guatemala	1	
Typical Colombian soup	1	
Typical food from my country	1	
Traditional Salvadorian fried food	1	

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