ACCULTURATION LEVELS AND ITS ASSOCIATION WITH FRUIT AND VEGETABLE CONSUMPTION AMONG LATINAS

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Acculturation Levels and its Association with Fruit and Vegetable Consumption

Among Latinas

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DEDICATION

This thesis is dedicated to my parents, Modesto and Aileen Cordero, for their love and encouragement through this Master’s program. Without their total support and confidence in me, this project would not have been possible. I love you.
The difference between the impossible and the possible lies in a person’s determination.

--Tommy Lasorda
Latinos are the largest growing minority group in the United States. With the Latino population growing, their health is of major concern. Chronic diseases are prevalent among Latinos, with heart disease, cancer, stroke and diabetes, within the top five leading causes of death. Consuming diets high in fruit and vegetables have been linked to reducing rates in chronic diseases.

Acculturation has been studied across multiple health behaviors among Latinos, but the results are inconsistent. These inconsistencies lie in the measurement of acculturation. Current studies have measured acculturation and dietary quality by using different methods: language, generational status, years in the U.S., birthplace, and using acculturation scales. Inconsistencies in how acculturation and dietary quality are measured among Latinos have resulted in conflicting findings.

The purpose of this study was to examine the relationship between Latinas’ acculturation status and their fruit and vegetable consumption, specifically testing three models. Model 1 assessed acculturation based on years lived in the United States with more years lived in the United States representing higher acculturation. Model 2 was based on the respondent’s place of birth and that of their parents and grandparents (United States born vs. foreign born), with United States born representing higher acculturation. Models 3a and 3b were based on their preferred language spoken measured by a Hispanic (Model 3a) or Non-Hispanic domain (Model 3b), using the Marín bidimensional acculturation scale. The study also examined the total variety of fruits and vegetables consumed.

This cross-sectional study used baseline questionnaire data from the Entre Familia: Reflejos de Salud project, which regarded the healthy eating and parenting skills of mothers. The sample consisted of 120 mothers who reside in Imperial County.

Bivariate and multivariate analyses were conducted using PASW 17.0. Analyses revealed that none of the hypotheses were supported. The study displayed that mean fruit and vegetable consumption was high overall, 5.35 servings per day, and acculturation was not associated.

Results were inconsistent with previous research, and highlight the need to further explore acculturation research in relation to measurement in order to reach a consensus for public health research. More specifically, the study highlights that acculturation may not be a factor to consider within Imperial County while chronic diseases, indicated a need to further fruit and vegetable research in this population.
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SUMMARY

This study aimed to investigate the relationship between fruit and vegetable consumption and years in the United States, among a diverse group of participants. The results revealed significant associations between years in the U.S., acculturation domains, and fruit and vegetable variety. The findings contribute to the understanding of the role of acculturation in dietary habits and suggest potential interventions for improving fruit and vegetable intake in the U.S.

DISCUSSION

The summary of findings indicated that years in the U.S. and acculturation domains had a positive impact on fruit and vegetable consumption. This suggests that increased exposure to American dietary patterns is linked to higher fruit and vegetable intake. The study also highlighted the importance of cultural factors in dietary choices.

CONCLUSION

The study underscores the need for culturally sensitive interventions to promote fruit and vegetable consumption among individuals with varying years in the U.S. Future research should focus on developing tailored strategies to address the unique challenges faced by different acculturation groups.

REFERENCES

Further research is needed to validate these findings and to explore the underlying mechanisms behind the observed associations. Future studies could also consider the impact of other environmental factors, such as availability and policies, on fruit and vegetable intake.
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CHAPTER 1

INTRODUCTION

About 42 million Americans, or 14% of the total U.S. population, identified themselves as Hispanic or Latino (United States Census Bureau [USCB], 2000). Approximately 60% of these individuals were born in the U.S., while the other 40% were foreign born (USCB, 2000). Chronic diseases, such as heart disease, cancer, and diabetes, are the leading causes of death and disability in the United States (Centers for Disease Control and Prevention [CDC], 2009), with cancer affecting 1 in 3 Hispanic women in their lifetime. Cancer is the second leading cause of death, accounting for 20% of all deaths in Hispanics in the U.S. (American Cancer Society [ACS], 2006). Consuming diets high in fruits and vegetables reduces the risk for several cancers and for cardiovascular disease (Serdula et al., 1996). Studies have been published on the dietary habits of Hispanic Americans, but to properly address chronic diseases, studies need to focus on how acculturation influenced eating patterns (Neuhouser, Thompson, Coronado, & Solomon, 2004). Acculturation has been studied across multiple health behaviors among Latinos but the results are inconsistent. Acculturation is negatively and positively associated with the health of Latinos and requires further study (Lara, Gamboa, Kahramanian, Morales, & Bautista, 2005), especially on fruit and vegetable consumption.

RECOMMENDED FRUIT AND VEGETABLE SERVINGS

The Healthy People 2010 fruit objective and vegetable objective are to increase the proportion of Americans aged at least 2 years old who consume at least two servings of fruit to 75% (objective 19-5) and at least three servings of vegetables to 50% (objective 19-6) (United States Department of Health and Human Services [USDHHS], 2000). According to the Dietary Guidelines for Americans, adults are recommended to consume two cups of fruits and two and half cups of vegetables (4.5 cups total) per day for a 2,000-calorie diet (USDHHS & United States Department of Agriculture [USDA], 2005).
The United States Department of Agriculture (USDA) provided recommendations on the number of servings of fruits and vegetables the general population should consume daily, dependent on age, sex, and level of physical activity (USDA, 2009). They recommended 2 cups of daily fruit consumption for women between 19-30 years, and 1.5 cups for women between 31-50 (USDA, 2009). In general, one serving equals one cup of fruit, 100% fruit juice, or a half-cup of dried fruit (USDA, 2009). In addition, women aged 19-50 are recommended to consume two and a half cups of vegetables daily (USDA, 2009). A serving of vegetable equals one cup of raw or cooked vegetables or two cups of raw leafy greens (USDA, 2009). These recommendations considered to be the minimum women should consume daily and the more fruits and vegetables they consume the better. In the USDA Food guide, for a 2,000-calorie diet, the recommended levels are three cups of dark green vegetables, two cups of orange vegetables, three cups of legumes (dry beans), three cups of starchy vegetables, and six and a half cups of other vegetables per week (USDHHS & USDA, 2005). Consuming fruits and vegetables in each of these categories are essential as they provide vital nutrients.

**BENEFITS OF FRUIT AND VEGETABLE CONSUMPTION**

Fruits and vegetables are important for a healthy diet, providing a variety of micronutrients. Consuming fruits of various colors such as red, green, yellow, purple, orange and white, provide a broad range of nutrients, including fiber, folic acid, potassium, and vitamins A and C (CDC, 2009). These nutrients block or suppress the action of carcinogens and, as antioxidants, prevent oxidative DNA damage (World Health Organization [WHO], 2009). Individuals who consume generous amounts of fruits and vegetables are likely to reduce their risk of chronic diseases, including stroke, cardiovascular diseases, diabetes, and various cancers, which include but are not limited to cancers of the mouth, throat, lung, stomach, bladder, colon, breast, and prostate (Blanck, Gillespie, Kimmons, Seymour, & Serdula, 2008; Neumark-Sztainer, Hannan, Story, Croll, & Perry, 2003; USDA, 2009). Those who consume generous portions of fruits and vegetables as a part of their regular diet are likely to have reduced chronic diseases, including stroke, type 2 diabetes, and certain cancers (USDHHS & USDA, 2005). Hung et al. (2004) found that participants who consumed at least five servings of fruit and vegetables per day resulted in a 28% lower risk of
cardiovascular disease than participants who consumed fewer than 1.5 servings per day. Chronic diseases were found to be prevalent among Latinos with heart disease, cancer, stroke and diabetes being the top five leading causes of death (National Center for Health Statistics Health [NCHSH], 2009), therefore consuming fruits and vegetables are crucial for this population. Within Imperial County, California, where majority of the population consists of Latinos, data indicated that chronic diseases were a major issue. In a report that used the California Health Interview Survey from 2007, California counties were ranked from 1, where the population was considered as having the best health group, to 5, where the population was considered the worst health group (Lui & Wallace, 2010). Imperial County was given a 5 for having adults with more than one chronic condition, with diabetes observed as the most prevalent chronic disease. This data further displayed the need for fruit and vegetable consumption.

CURRENT FRUIT AND VEGETABLE CONSUMPTION

In the State Indicator Report on Fruits and Vegetables 2009, each state reported their progress toward meeting Healthy People 2010 recommendations in regards to both fruit and vegetable consumption. At the national level, 32.8 percent of adults consumed fruits two or more times per day and 27.4 percent of adults consumed vegetables three or more times a day (CDC, 2009). Greater than or equal to 35 percent of California adults aged ≥18 years consumed fruits two or more times per day while the percentage who consumed vegetables three or more times per day was between 25%-29% (CDC, 2009). Latinos tended to consume more fruits and vegetables (men: 6 servings; women: 4.8 servings) than the non-Latino white (men: 5.4 servings; women: 4.5 servings), seen nationally (representing the 48 contiguous states) using the National Health Interview Survey (NHIS) (Thompson et al., 2005). Neuhouser et al. (2004) in Washington State found similar results where Hispanics ate more fruits and vegetables (4.88 servings per day) than non-Hispanic white residents (3.91 servings per day) (p<.001). Yet Hispanic subgroups in California still consumed lower amounts of fruits and vegetables than the recommended intake for Americans, with a mean of 3.4 cups and 2.9 cups for men and women respectively (Colon-Ramos et al, 2009).
FACTORS IN FRUIT AND VEGETABLE CONSUMPTION

When considering fruit and vegetable consumption, it is important to also measure factors associated with consumption. One factor may be the person’s place of residence. Dubowitz, Subramanian, Acevedo-Garcia, Osypuk and Peterson (2008) found that women who lived in immigrant neighborhoods demonstrated a higher fruit and vegetable consumption than those who did not live in immigrant neighborhoods, even if they were not immigrants, which thus indicated that immigrant neighborhoods might have facilitated a healthy diet. This is likely due to the fact that the infrastructures in these neighborhoods were immigrant-run, which carried a better supply of produce and healthier foods and less unhealthy processed foods (Dubowitz et al., 2008). Although immigrant neighborhoods may have been associated with healthy diets, Hispanics, African Americans, and Caucasians alike, found that inaccessibility, cost, and time were the biggest barriers in fruit and vegetable consumption (Yeh et al., 2008). Yeh et al. found that among all ethnicities, the high cost of fruits and vegetables was one of the biggest concerns when it came to consumption. Along with high cost, other factors such as long work hours, busy schedules and time pressures, changed mothers’ meal routines, which resulted in greater consumption of fast foods (Sussner, Lindsay, Greaney, & Peterson, 2008). These factors all played into the reasons why fruit and vegetable consumption may have varied amongst individuals. With constant barriers and long work hours, Hispanic mothers’ moved away from their traditional diet and moved towards an American diet (Gray, Cossman, Dodson, & Byrd, 2005; Sussner et al., 2008). Major factors that determined the changes in food habits were their financial situations (Gray et al., 2005; Yeh et al., 2008), their relocation to the U.S. and their cultural background (Gray et al., 2005). Also, inaccessibility to certain ingredients and the cost of certain foods affected the immigrants purchasing decisions (Gray et al., 2005). Therefore it was important to study the diets of Hispanics as a function of acculturation to understand how it may have been related to this health behavior.

ACCULTURATION

Acculturation is used to signify the process by which individuals, normally from a minority group, adopt the cultural patterns of the dominant group (Ayala, Baquero, & Klinger, 2008; Cuéllar, Harris, & Jasso, 1980; Lara et al, 2005). Acculturation is defined as a
long-term process of adaptation to a new culture where individuals modify certain aspects of their values, norms, and behavior to maintain a connection to both cultures (Mendoza & Dixon, 1999).

Acculturation, a concept that has long been studied by social scientists, has evolved in its definitions. Two major issues found in acculturation research are directionality and dimensionality (Sam, 2006). With directionality, the process can be unidirectional with change taking place in one direction, from the culture of origin to the new culture, or bidirectional with mutual influence between both cultures (Sam, 2006). In addition, the process may be unidimensional, where it is assumed that one loses his/her culture of origin in acquiring a new one (Sam, 2006) or bidimensional, where one can identify with the new culture without losing his/her original one (Berry, 1980). For the purpose of this study, the focus was dimensionality. This study focused on dimensionality as acculturation occurred along various dimensions and at different paces (Zane & Mak, 2003). Acculturation is multifaceted which indicated that true assimilation may never happen (Trimble, 2003). Dimensionality takes into account that people change on more than one dimension. Focusing on dimensionality allowed for understanding of how acculturation affected individuals through various dimensions, rather than focusing on acculturation as a directional movement of moving from one point to the other.

Robert Park first looked at acculturation in 1914, where he developed the three-stage model, which consisted of contact, accommodations, and assimilation advanced (Padilla & Perez, 2003). This model focused on the idea that when people came to America, they learned how to accommodate to the dominant culture of the United States and that accommodation was irreversible (Padilla & Perez, 2003). Padilla & Perez (2003) mentioned in their text that researchers Redfield, Linton, and Herskovits further defined acculturation as the process by which individuals from different cultural groups have a continuous first hand contact with each other resulting in changes in either group, focusing on the importance of continuous contact.

Berry and Sam (1996) expanded the view of acculturation with their model, which suggested four categories of adaptation: assimilation, integration, separation, and marginalization. When individuals did not wish to maintain their original cultural identity and adapt to the norms of the new dominant culture, assimilation occurred. Integration is
when their culture of origin is maintained while seeking to adopt the norms of the new
dominant culture. Separation is when they maintained their original cultural identity and
wished to avoid interacting with others, while marginalization is when one had no interest in
their original cultural identity or in having interactions with others. Berry’s model takes into
consideration that individuals have a choice in how far they will acculturate and can revert
back to their original cultural identity.

multidimensional model that relied on cultural awareness and ethnic loyalty. Cultural
awareness represented inherent knowledge of the culture of origin and the host culture, with
individuals who displayed more knowledge of their culture of origin than their new contact’s
culture being considered as less acculturated. One would have been considered more
acculturated if he/she had more knowledge of the host culture. Ethnic loyalty depended on
the self-ascribed ethnicity of the individuals, which included the ethnic group’s connection
with their friends and their partiality for such things as recreational activities (Keefe &
cultural awareness declined from generations, first to fourth, with those of Mexican origin,
but their ethnic loyalty to the culture of origin remained consistently high from the first to the
fourth generation, with each generation preferring friends from the same ethnicity and
engaging in Mexican activities.

The concept of acculturation in public health literature has included both
unidimensional and bidimensional measurement models (Lara et al., 2005). The predominant
unidimensional measures used are nativity or generational status, length of residence in the
United States, or language use (Abraído-Lanza, Armbrister, Flórez, & Aguirre, 2006). Most
acculturation research has measured acculturation by comparing different generations
(Phinney, 2003). Generational status was indicated as a poor measure of acculturation as it
disclosed little on how specific changes, such as acquiring or losing language or evolving
cultural values, may relate to ethnic identity (Phinney & Flores, 2002). An important
indicator of acculturation was ones age at the time of immigration and length of time in the
new culture because it demonstrated that changes occurred during the lifetime of the
immigrants and their descendants (Phinney, 2003). Researchers referred to groups as being
“more” or “less” acculturated which indicated a linear change into the larger society,
dismissing the possibility of becoming bicultural (Phinney, 2003). Being bicultural was not defined as a midpoint between an ethnic and American identity, but was a way to indicate identification with both cultures (Phinney, 2003).

Unidimensional measures do not account for incorporating a new culture while maintaining their own, as bidimensional models do. The most popular bidimensional measures are the Bidimensional Acculturation Scale for Hispanics (BAS) and Acculturation Rating Scale for Mexican Americans II (ARSMA-II) (Cuéllar, Arnold, & Maldonado, 1995; Marín & Gamba, 1996). Both scales measure the two dimensions of interest by mirroring questions for both dimensions (Cabassa, 2003). For example the BAS asks, “How often do you think in Spanish” and “How often do you think in English” (Marín & Gamba, 1996). The BAS relies on language-based items to arrive at an acculturation score (Marín & Gamba, 1996), while the ARSMA-II includes different cultural domains instead of solely looking into language (Cabassa, 2003). ARSMA-II is considered to provide a stronger measurement than BAS because it includes different cultural domains and not focus solely on language-based items (Cabassa, 2003).

Research that only used unidimensional measures did not fully portray how acculturation involved retention of the cultural integrity of individuals when adapting to a new environment (Cabassa, 2003). Measuring acculturation by using bidimensional measures allowed for the opportunity to study how individuals incorporated different cultures in their everyday lives (Cabassa, 2003), which resulted in a better method to measure change.

Acculturation has been found to have both positive and negative associations with the health of Latinos (Lara et al., 2005). The strongest evidence suggested a negative association with behaviors. More acculturated Latinos abused substances, engaged in unhealthy dietary behaviors, and experienced worsened birth outcomes than those who were less acculturated (Lara et al., 2005). Chronic diseases and poor nutritional choices were a few of the negative health effects experienced by immigrants associated with acculturation (Edmonds, 2005). Although acculturation had a prominent negative presence, it also had positive effects on health care use and on self-perceptions of health (Lara et al., 2005). Researchers believed that this inconsistent result in acculturation research was due to the fact that all studies were not consistent in how they measured acculturation (Lara et al., 2005). Researchers have measured acculturation among Latinos solely on their generational status or their primary
language use, while others measured acculturation by using an acculturation scales which measured language or cultural preference. Both unidimensional (generational status and years in the U.S) and bidimensional (BAS and ARMSA-II) measures of acculturation have been used to understand various health outcomes among Latinos, including dietary intake. Measuring at the unidimensional level helped to determine how much exposure the individuals had with the dominant culture but it did not take into account how individuals got through the process of acculturation (Cabassa, 2003). Bidimensional measures accounted for the maintenance of the culture of origin and adherence to the dominant culture (Cuéllar et al., 1995; Marin & Gamba, 1996;). Assimilation to mainstream U.S. culture was not an isolated process but rather one that was referenced by socioeconomic factors, education, and language fluency (Lara et al., 2005).

The phenomenon of acculturation was that it consisted of a wide range of factors that are usually studied individually such as socioeconomic status, educational level, and age. Acculturation, rather than just focusing solely on a person’s socioeconomic status, took into account various dimensions to arrive to the conclusion of whether or not a person had changed. Acculturation, with its different dimensions, measured not only their skills or knowledge of different cultures but how they arrived to using these skills. A clear example would be if a Latina immigrant from a traditional family became employed with a business with white coworkers. The woman would have to adjust, adapt and to some extent become bicultural, with skills to function in different cultures. Measures of acculturation can indicate to what extent and with what elements the woman gained skills and knowledge to function in both cultures.

**ACCULTURATION AND DIET**

When members of a minority group adopt the eating patterns or food choices of the host country, it is known as dietary acculturation (Satia-Abouta, Patterson, Neuhouser, & Elder, 2002). For example it has been shown that Hispanics, who are highly acculturated, measured by their language and birthplace, eat fewer fruits and vegetables compared to those who were less acculturated (4.69; 5.10 servings per day, respectively). Further, Sharma et al. (2004) found that non-U.S. born Hispanics consumed more servings of fruits and vegetables than U.S.-born Hispanics. Acculturation is most often linked with a decline in dietary quality
(Bermudez, Falcon, & Tucker, 2000; Guendelman & Adams, 1995), however other studies have indicated that acculturation accounted for both healthy and unhealthy dietary adoption (Otero-Sabogal, Sabogal, Perez-Stable, & Hiatt, 1995; Woodruff, Zaslow, Candelaria, & Elder, 1997). Inconsistencies in how acculturation and dietary qualities are measured amongst Latinos have resulted in conflicting findings (Montez & Eschbach, 2008). Such inconsistencies are examined further in the following studies that measured acculturation using different methods: language, generational status, the year they entered into the U.S., birthplace, and using acculturation scales. These inconsistencies made it difficult to understand what the true relationship was between acculturation and diet.

**Acculturation Measured by Language**

Lin, Bermudez, & Tucker (2003), measured acculturation by looking solely at English and/or Spanish speaking, reading, and writing, and scored responses on a range from 1.0 (using only Spanish) to 5.0 (using only English). The study consisted of a representative sample from the Massachusetts Hispanic Elderly Study (MAHES), which included 449 Puerto Ricans and 133 Dominicans compared to a 243-selected non-Hispanic white elderly population from the same neighborhood. After participants completed the dietary assessment, responses were examined by five dietary clusters: (1) fruit and breakfast cereal, (2) starchy vegetables, including items such as breadfruit, white yam, green banana, and plantains, (3) rice, (4) whole milk and (5) sweets. Overall Puerto Rican elders consumed diets high in starchy vegetables, rice and whole milk, while Dominicans consumed diets of starchy vegetables and rice. Acculturation scores of the two groups, Puerto Ricans and Dominicans, differed across the different dietary clusters. The results indicated that Puerto Ricans and Dominicans with higher acculturation scores (e.g.: greater English language use), adjusted for age and sex, had a more diverse and nutrient-rich fruit and breakfast cereal diet, while those who were in the rice dietary cluster tended to be less acculturated (Lin et al., 2003). Overall, most participants consumed diets similar to the Caribbean Hispanic food diet, which consisted of diets high in rice and starchy vegetables.
Acculturation Measured by Generational Status

Guendelman and Adams (1995) measured the relationship between acculturation and dietary intake by stratifying generational statuses based on the birthplace of the participants and their parents. They separated their samples into two groups: first generation participants who were born in Mexico and whose parents were born outside the United States and second generation participants who were born in the United States and had at least one parent born in Mexico or of Mexican descent. Their study found that first generation Mexican-American women had a healthier nutrition intake, consuming more protein, carbohydrates, cholesterol, vitamins A and C, folic acid, and calcium, than second-generation Mexican-American women (Guendelman & Adams, 1995).

Acculturation Measured by Years in U.S. & Language

Bermudez et al. (2000) measured acculturation by the number of years the participants lived in the US, grouping them by those who had lived less than 20 years in the U.S. versus those who had lived 20 years or more in the U.S. They also used a modified version of the acculturation scale created by Cuéllar et al. (1980). They modified the scale to look at the language used by the participants for speaking, reading and writing in English, Spanish, or English and Spanish. The acculturation score was based on the mean of the three language variables with response options ranging from 1.0 (using only Spanish) to 5.0 (using only English). Participants were classified into two groups: 1.0-2.99=less acculturated and 3.0 or greater=more acculturated based on language (Bermudez et al., 2000). To properly measure dietary intake, data was collected from the Massachusetts Hispanic Elders Study (MAHES) that asked questions pertaining to diet, nutrition, and the health of elders in Massachusetts between 1993-1997. The study population consisted of elderly Hispanics (Puerto Ricans, Dominicans, and Other Hispanics from the rest of Latin American) in Massachusetts compared with elderly non-Hispanic whites. The modified language-based scale indicated that the majority of elderly Hispanic elders categorized as less acculturated had better dietary habits than Hispanics who were categorized as more acculturated, which was similar to the Non-Hispanic group. The diet of the Hispanic group who had lived in the U.S. for 20 years or more had a macronutrient intake similar to non-Hispanic whites, which consisted of
a lower consumption of complex carbohydrates and higher energy from simple sugars, than Hispanics who had resided in the U.S. less than 20 years.

**Acculturation Measured by Birthplace & Language**

Acculturation can be measured by examining both the birthplace and the language that is predominantly spoken by the individual. In the study by Duffey, Gordon-Larsen, Ayala, and Popkin (2008), acculturation was defined by two variables: whether they were U.S. born (USB) or foreign born (FB), and the predominant language spoken at home (Spanish or English). Data consisted of the NHANES 1999-2004 surveys, specifically from Mexicans (n=3375) and other Hispanics (n=622), in which the dietary intake information was collected by 24-hour recall. The participants were divided into two groups, Mexican or other Hispanics, and then further divided in their groups as FB versus USB. The study found that overall USB Hispanics consumed a lower percentage of daily energy from healthier food groups including fruits and vegetables than FB Hispanics, which was seen with the adjusted percent energy consumed of fruit consumption with FB Mexicans (1.85±0.30) versus USB Mexicans (0.28±0.20) (p≤0.05) and FB other Hispanics (1.42±0.34) versus USB other Hispanics (-0.35±0.24) (p≤0.05). Similar results were also displayed in vegetable consumption, with differences seen between the FB Mexicans (2.11±0.42) and USB Mexicans (1.24±0.15) (p≤0.05). They also found that those who spoke Spanish, compared with non-Spanish speakers, consumed more legumes and soybeans (p≤0.01), pasta, rice, and ready to eat cereals (p≤0.01), and fruits (p≤0.01). Thus those who were foreign born and spoke Spanish consumed a quarter percent of their calories from healthier food groups than their birthplace and language counterparts.

Montez and Eschbach (2008), similarly measured acculturation among Mexican-American women by accounting for the participant’s birthplace (Mexican Born (MB) vs. USB) and measuring language, this time by an abbreviated version of the Short Acculturation Scale created by Marin and colleagues (1987). The following questions were used to measure language: language usually spoken, language usually spoken at home, language used as a child, language used to think, and language usually spoken with friends. The responses were then coded on a scale ranging between one (only Spanish) to five (only English). They broke up the groups with a score less than 3 indicating a “predominantly Spanish-speaking” group.
and those with 3 or more a “predominately English-speaking” group. Dietary intake was measured using the food frequency screener created by the National Cancer Institute. The screener focused on three dietary intake measures: percent energy from fat, intake of fiber, and intake of fruits and vegetables. Means and standard deviation of the daily servings of fruits and vegetables for both Mexican-born (predominantly Spanish speaking=4.83±1.3 and predominantly English speaking=4.52±1.3) and US Born participants were reported (predominantly Spanish speaking=4.54±1.6 and predominantly English speaking=4.07±1.1). There was a trend to indicate that country of birth and language had an interactive association with the consumption of fruit and vegetables (β=-0.27, p≤0.10). Speaking English was associated with less fruit and vegetable consumption in both USB and MB women, but the disparity was greatest in USB women. This suggested that women who were USB and who spoke predominately English consumed fewer daily servings of fruit and vegetables (Montez & Eschbach, 2008).

**Acculturation Measured by Acculturation Scales**

Some studies have focused on measuring acculturation by using preexisting acculturation scales. In two studies, Marín’s Short (12-item) Acculturation scale for Hispanics was used to measure participants’ level of acculturation on the basis of language (Otero-Sabogal et al., 1995; Woodruff et al., 1997). Otero-Sabogal et al. (1995) study conducted in the San Francisco Bay area consisted of two randomly selected samples of Latinos and non-Latino whites from the Kaiser Permanente Medical Care Program (KPMCP) and from census tract-based areas. The study used demographic items and the validated five-item language-related scale (high acculturation for English speaking and low acculturation for Spanish speaking), which was dichotomized into more acculturated to the U.S. norm (score of >3) and less acculturated to U.S. norm (score of ≤3). The samples were then separated into four groups, KPMCP low acculturation and high acculturation and census tract-based, low and high acculturation. Dietary behavior was measured by recall from food eaten the day before the interview, including servings of fruits and vegetables. Those who reported “yes,” they did consume fruits and vegetables the day before, determined the percent total. Otero-Sabogal et al. (1995) reported that overall fruit and vegetable consumption was lower among the more acculturated in both samples. In the KPMCP
sample, 86% of less acculturated respondents reported consuming fruits the previous day compared with 83% of high-acculturated respondents. Similarly 83% of less acculturated respondents consumed vegetables the previous day compared with 82% of high-acculturated respondents (p ≤ .01). In the census tract sample 79% of less acculturated respondents reported consuming fruits the previous day while 71% of high-acculturated respondents reported consuming fruits the previous day (p ≤ .01). All who were sampled in the KPMCP and census tract displayed that fruit and vegetable consumption was lower with acculturation, except in the census tract-based sample, where vegetable consumption was higher amongst the more acculturated Latinos. 82% of high-acculturated respondents reported consuming vegetables the previous day while 74% of less acculturated respondents reported consuming vegetables the previous day (p ≤ .01).

Woodruff et al. (1997) used eleven items, which focused on assessing preferences for language and ethnicity of social contacts on a Likert-type scale. The scale was set so that 1 indicated having low acculturation and increased to 5, which indicated high acculturation. The mean acculturation score for all participants was 2.15 (SD = .65), which indicated a low level of acculturation overall. The Likert scale was further dichotomized into low or high acculturation groups based on a median split of the means across all items. To measure nutrition, five variables, fat avoidance (M = 3.74, SD = 1.11), knowledge (M = 4.91, SD = 2.35), self efficacy (M = 2.20, SD = .56), beliefs (M = 2.70, SD = .73), and intentions (M = 2.68, SD = .42) were measured on a self-report survey. Woodruff et al. (1997) found in their study that women with a high acculturation score reported more avoidance of dietary fat than low acculturated men (F (1, 130 = 4.84, p ≤ .05) and had greater beliefs that changes in diet would lead to better health than men (F (1, 130 = 5.08, p ≤ .05). The study further showed that low acculturated males had lower knowledge (M = 3.83) than high acculturated males (M = 5.50), while knowledge was the same regardless of acculturation level among women (low acculturation mean = 5.04 and high acculturation mean = 5.03) (p ≤ .05). The two studies yielded different results, likely due to the fact that they used different acculturation scales, which then measured different outcomes.

Cuéllar’s scales (Cuéllar et al., 1980) have also been used to measure acculturation. Research by Gregory-Mercado et al. (2006) used a modified version of the Acculturation
Rating Scale for Mexican Americans (ARSMA), which measured movement of cultural orientation from Mexican culture to U.S. culture. They measured all items on a five-point Likert-type scale for language, cultural identity, traditions, and pride in heritage. The language items were measured with response options that ranged from one (only Spanish) through five (only English) while cultural identity was measured using options that ranged from one (very Mexican) through five (very Anglo). Traditions were measured from one (always follow Mexican customs) to five (always follow American customs) with pride in heritage moving from one, very proud, to five, no pride. From the items measured, one dichotomous score was created: less than a score of 1.62 was less acculturated and a score of 1.62 or higher was more acculturated. In this study, education moderated the association between acculturation and fruit and vegetable consumption. Results indicated that among those with more education, there was a greater difference in fruit and vegetable intake between those who were less acculturated versus more acculturated (e.g., more than 12 years of education: less acculturated M=5.07 ± 2.83 and more acculturated M=4.09 ± 3.01 (p ≤ .05)) (Gregory-Mercado et al., 2006).

Garcia-Mass (1999) used a condensed and modified version of a longer acculturation scale developed by Cuéllar et al. (1980). In the shortened scale Garcia-Maas focused on the preferred language (Spanish or English) of the respondent, the country in which the respondent spent most of her childhood (Latin Country or United States), the ethnicity of closest friends (Hispanic or other), and the degree of pride the respondent felt toward her Hispanic heritage (1999). The General Acculturation Index measured acculturation with scores from 5 to 25, with higher scores representing a higher degree of acculturation. The fruit, vegetable, and fiber scores varied from 0 to 35, with 0 representing less than once per week and 35 representing 2 or more times per day. A higher score indicated more frequent fruit, vegetable, and fiber consumption. The mean acculturation scores of the daughters was 17.2 (SD=2.1) while the mothers was 15 (SD=3.1), with t=-4.20, df=46, p ≤ .001, indicating that the daughters were significantly more acculturated than their mothers. Garcia-Mass (1999), found that the total fruit, vegetable, and fiber scores for the mothers (M=16.3, SD=8.35) were higher than that of their daughters (M=14, SD=7.53), displaying that the mothers consumed fruit, vegetables, and fiber more frequently. The paired t-test indicated that mothers ate fruits and vegetables more frequently than their daughters (t=2.38, df=46,
Therefore this study found that the mothers who were lower acculturated consumed fruits and vegetables more frequently than their daughters who were more acculturated.

In a study done in Washington State, acculturation was measured using a scale developed by Coronado and colleagues specifically for Mexican-American populations (Neuhouser et al., 2004). The scale consisted of questions about language most often spoken, language most often used for thought, ethnic identifications of self, and birthplace of self. The scale consisted of a four items with level 1, which was considered as low acculturation, through level 4, which was high acculturation. Using this scale, they created a dichotomous variable that placed the two lowest levels of Hispanic participants (n=735) into low-acculturation (n=455) and the two highest levels as high-acculturation (n=280). To measure dietary intake, a modified version of the Behavioral Risk Factor Surveillance System and the National 5-A-Day for Better Health program instruments were used to assess the participants’ consumption of fruit and vegetables in the past month. Similar to most studies, Neuhouser et al., found that Hispanics in Washington who were in the high acculturation group consumed fewer fruits and vegetables (4.69 servings per day) compared to low acculturation Hispanic group (5.10 servings per day) (p≤.05), but both groups ate more fruits and vegetables (4.88 servings per day) than non-Hispanic white residents (3.91 servings per day) (p≤.001).

**Acculturation Measured Using Different Measures**

Across all of the studies, only one focused on comparing different acculturation measures when evaluating dietary habits. Norman, Castro, Albright, & King (2004) realized that there have been inconsistencies in measuring acculturation, and as such created 4 models to capture the dimensions of acculturation. Model 1 examined acculturation based on years in the U.S., for example more years living in the U.S. was equated to a higher acculturation. Model 2 consisted of the preferred language spoken at home, with speaking English at home representing higher acculturation. Model 3 categorized acculturation based on the respondent’s place of birth, with U.S. representing higher acculturation. And, Model 4 combined birthplace and language preference into three categories: (1) born outside of the U.S.; (2) born in the US with Spanish language preference; and (3) born in the U.S. with English language preference (the third category represented the highest level of
acculturation). The results varied based on which model was used to examine its association with dietary patterns. Dietary patterns were measured using the Eating Patterns Assessment Tool, which used self-reported dietary fat use and their frequency of food consumption from high and low fat categories. Model 1 found no significant associations between years in the U.S. and diet. Model 2 showed that greater English language use was associated with less consumption of beans and peas. Model 3 demonstrated that those born in the U.S. consumed more convenience foods and chocolate candy and Model 4 found that those born in U.S. with an English language preference consumed more convenient foods and salty snacks. Overall, the results displayed that acculturation based on English language use and U.S. birthplace were related to a less healthy diet.

As seen across the various studies, a pattern was observed such that lower acculturated individuals, recent first generation immigrants, and those who preferred speaking Spanish, consumed more fruits and vegetables while those who had lived in the U.S. for a long period of time, were second generation, or preferred English, consumed fewer fruits and vegetables. All but one study measured acculturation by using only one or two measures of acculturation, and therefore did not assess acculturation in the fullest way possible. To fully grasp acculturation, this study used multiple measures of acculturation (years in the U.S., generational status, and Hispanic and Non-Hispanic domains of an acculturation scale), similar to Norman et al. (2004) study, to evaluate its relationship with fruit and vegetable consumption. This study also focused on both fruit and vegetable consumption and variety, which has not been done in any other studies in relation to acculturation.

**PURPOSE OF THE STUDY**

The purpose of this study was to examine the relationship between Latinas’ acculturation status along with their fruit and vegetable consumption, specifically testing three models. Model 1 assessed acculturation based on years lived in the United States with more years living in the United States representing higher acculturation. Model 2 was based on the respondent’s place of birth and that of their parents and grandparents (United States born vs. foreign born), with United States born representing higher acculturation. Models 3a and 3b were based on their preferred language spoken measured by a Hispanic (Model 3a) or
Non-Hispanic domain (Model 3b), using the Marín bidimensional acculturation scale (Marín & Gamba, 1996). By using these three models for measuring acculturation, I was then able to examine their association with daily consumption of fruits and vegetables and total variety of fruits and vegetables consumed in the past month.

**HYPOTHESES**

This study used data from the Entre Familia baseline survey to examine acculturation using three models: years in U.S., generation status, and their acculturation score using the Bidimensional Acculturation Scale for Hispanics (Marín & Gamba, 1996), to test the following hypotheses:

**Model 1:** Examine how acculturation based on years lived in the United States is associated with Latina women’s fruit and vegetable consumption.

**Hypothesis 1:** Latinas who have lived less than 15 years in the United States will have a higher fruit and vegetable consumption.

**Model 2:** Examine how acculturation based on their generation status, United States born vs. foreign born, is associated with Latina women’s fruit and vegetable consumption.

**Hypothesis 2:** Latinas whose generation status is that of a first generation (foreign born) versus second or more generation (U.S.-born) will have a higher fruit and vegetable consumption.

**Model 3a:** Examine how the Hispanic domain of the acculturation scale is associated with the fruit and vegetable consumption of Latina women.

**Hypothesis 3a:** Latinas who more strongly endorse the Hispanic domain will have higher fruit and vegetable consumption than women who endorse it less.

**Model 3b:** Examine how the Non-Hispanic domain of the acculturation scale is associated with the fruit and vegetable consumption among Latina women.

**Hypothesis 3b:** Latinas who more strongly endorse the Non-Hispanic domain will have a lower fruit and vegetable consumption than women who endorse it less.

**Model 4:** Examine fruit and vegetable variety among Latina women.

**Hypothesis 4:** Latinas who have lived less than 15 years in the United States, who are first generation in the U.S. and more strongly endorse a Hispanic domain will have a higher fruit and vegetable variety.
CHAPTER 2

METHODS

This study is a cross-sectional data analysis using baseline data to examine the relationship between different measures of acculturation and participants’ fruit and vegetable consumption. The data source is from the research study “Entre Familia: Reflejos de Salud”, an American Cancer Society-funded intervention being delivered to families in Imperial County, California to improve the mother’s eating habits (specifically more fruits and vegetables) and her parenting skills to get her family to eat healthier food.

SETTING

Imperial County, located on the U.S.-Mexico border, has a population of over 160,000 people (USCB, 2000). According to the United States Census Bureau (2000), California has the largest Latino population of any state, with Latinos being the majority in this county, representing 76.8% of the total Imperial County population, compared with 36.6% in California. 57% of adults who live in Imperial County are married, 59.0% completed high school or higher education level, 48.3% are female, 50.5% are between the ages of 18 and 65 years, 32.2% were born in a foreign country, and 42.9% were “in the labor force” (employed) in 2000 (USCB, 2000). The median household income in this county is $33,576.

The demographic characteristics of the entire California population differs compared to Imperial County, with the following being reported in the 2000 United States Census about California: 36.6% were Hispanic or Latino, 50.0% were female, 55.9% were between the ages of 18 and 65, 26.2% were born in a foreign country, and 76.8% completed high school, its equivalent, or a higher level of education (USCB, 2000).

With Imperial County having such a large Latino population and because of its proximity to Mexico, this may explain why more are foreign-born individuals. With the possibility that there are more foreign-born individuals, examining differences by
acculturation may be difficult. In addition, higher fruit and vegetable consumption may be reported because Imperial County is an agricultural community.

**RECRUITMENT AND ELIGIBILITY**

All participants were recruited, using a convenience sampling method, by the Project Coordinator and three data collectors. Recruitment consisted of presentations to local organizations and schools, face-to-face recruitment at local events (i.e.: health fairs), and the distribution of fliers/posters within target locations and within the county including clinics, schools, family resource centers, and other community outlets. Announcements were also placed in the Penny Saver, a free community periodical that consists of various announcements, for four weeks.

Once potential mothers were identified, they were screened for eligibility into the program. The data collectors called potential participants to determine if they qualified for the study and if they were interested. The women had to meet the following criteria to be eligible:

- Mother must be at least 18 years of age
- Mother is resident of Imperial County
- Mother has a child between the ages of 7 to 13
- Mother and child identify as Latino
- Mother and child live in the same household at least 4+ days of the week
- Mother is the primary caregiver but not necessarily the biological parent
- Mother is able to read and understand the consent form in Spanish

Exclusion criteria included:

- Mother, child, or other family member living in the household is on a doctor-prescribed dietary regimen
- Mother plans on moving outside Imperial County within the study timeframe

Upon completion of screening if the mother was eligible, an appointment was scheduled to complete the baseline assessment. Each mother was assigned an identification number to protect her confidentiality. Each ID number consists of four numbers. The first number indicated which region of the county the participant resided in: Northern Region (Brawley,
Calipatria, Westmorland), Central Region (El Centro, Holtville, Imperial, Seeley), or Southern Region (Calexico, Heber), while the last three numbers indicated the family ID.

**DATA COLLECTION**

One hundred and twenty families have participated in the Entre Familia baseline measures. A bilingual, bicultural data collector collected all interview data electronically. The interviews were conducted at the participating health clinics, in the Entre Familia office, or at the participant’s home. Each participant was given an ID number so that all data associated with an individual was indicated by a number and not identified by name. The data collector administered each interview with each participant individually and read through each question with her. As the participant responded, the data collector inputted her responses into the computer.

Survey questions used were replicated or adapted from previously validated measures. The baseline survey was comprised of 12 sections with survey questions pertaining to their fruit and vegetable consumption, eating habits, behaviors, family relations, parenting styles, culture, acculturation, demographics, and their health status. The present study examines the extent to which three models of acculturation are associated with the mothers’ fruit and vegetable consumption: years in U.S., generation status, and acculturation score using the Bidimensional Acculturation Scale for Hispanics (Marin & Gamba, 1996). The specific variables analyzed are described below.

**Fruit and Vegetable Consumption**

To measure how many fruits and vegetables the participants consumed in the past month, 10 questions were asked using the National Cancer Institute (NCI) Fruit and Vegetable Screener (FVS) (NCI, 2009). To assess frequency, ten questions ask “During the past month, how often did you eat/drink”, with the answer choices being, “Never (coded 0), 1-3 times a month (coded 1), 1-2 times a week (coded 2), 3-4 times a week (coded 3), 5-6 times a week (coded 4), once a day (coded 5), twice a day (coded 6), three times a day (coded 7), four times a day (coded 8), five or more times a day (coded 9)”. The participant answered separately for the ten specific items: 100% fruit juice, fruit, salad consisting of lettuce,
French fries, other type of potatoes, beans, other vegetables, tomato sauce, vegetable soup, and food containing vegetables. In order to score the screener, the NCI expressed each reported frequency as a daily average. The screener standardizes the midpoint of each frequency category to the number of times per day as seen with ‘Never’ scored as 0.0 times per day, ‘1-3 times per month’ scored as 0.067, ‘1-2 times per week’ scored as 0.214, ‘3-4 times per week’ scored as 0.5 times per day, ‘5-6 times per week’ scored as 0.786, ‘1 time per day’ scored as 1.0, ‘2 times per day’ as 2.0, ‘3 times per day’ as 3.0, ‘4 times per day’ as 4.0, and ‘5 or more times per day’ scored as 5.0 (NCI, 2009).

Food models were used to help the participants identify different portion sizes. After the data collectors read the prompt for the portion size, they presented the appropriate food models and allowed the participants to choose the size they considered the most appropriate for their food consumption patterns. There were four categories that the participants could have chosen from in order to measure portion size. Each of the four categories was assigned MyPyramid cup equivalents for each portion size. As examples, one portion of juice translated into 0.5 MyPyramid cup equivalents, a portion of fruit translated to 0.25 MyPyramid cup equivalents, and vegetable soups translated to 0.3 MyPyramid cup equivalents (NCI, 2009).

To acquire the final score of average daily fruit and vegetable servings, the number of Pyramid/MyPyramid servings multiplied the average daily frequency for each food group. The final estimate of total daily servings consisted of summing up all food groups. Thompson et al. measured the validity of the fruit and vegetable screener and found that the screener produced estimates that differed from estimated true intakes by 0.3 to 1.2 servings per day (2002). The study further mentioned that for epidemiologic research, the use of both daily frequency and portion size (the complete screener) resulted in similarly correlated true intake at about 0.5 for women. They concluded that the screener versions that included portion size questions are useful to estimate the populations mean consumption for intervention research purposes. Although, in a recent study by Greene et al., that used the NCI FVS and multiple 24-hour recall interviews on an intervention study with a multiracial population, found that the FVS overestimated intake for women by 2.11 serving’s at all four sites of the study (2008). It is possible that this may not have generalized to other intervention studies, but may suggest a positive bias with participants over reporting.
Fruit and Vegetable Variety

To assess fruit and vegetable variety, the study team developed two questions that assessed whether the participants had consumed specific fruits and vegetables within the past month. The first question assessed fruit variety by asking, “Which of the following fruits did you eat in the past month or last 30 days?” The list consisted of 30 different fruit options from red apple to watermelon. The second question assessed vegetable variety by asking, “Which of the following vegetables did you eat in the past month or last 30 days?” The list consisted of 44 different vegetable choices ranging from asparagus to zucchini. Item inclusion was based on the fruits’ and vegetables’ relationship to cancer prevention (ACS, 2009). In order to analyze this variable, a sum score was created representing the total variety of fruits and vegetables. Due to the fact that there is no validity data on fruit and vegetable variety, its relationship to fruit and vegetable consumption was assessed to demonstrate construct validity (Wolfe, Frongillo, & Cassano, 2001). It was expected that there would be a positive relationship between daily fruit and vegetable consumption with the total fruit and vegetable variety, therefore displaying that the more servings of fruits and vegetables a person consumed would be related to a greater variety of fruits and vegetables consumed.

Generation Status

To properly measure the generational status of the participants, three questions were asked. The first question asked, “Where were you born?” The second question asked, “Where were your parents born?” The response choices available to choose from were U.S., Mexico, Central America, South America, or other country. The third question asked, “Where were your grandparents born?” The response choices available to choose from were U.S., Mexico, Central America, South America, or other country. For analysis purposes, the questions were combined to determine the participants’ generation status. Results were re-coded into first generation (coded 1) and 2nd and 3rd generation (coded 2), given that first generation are considered foreign born and all other generations are considered U.S. born. Examined differences between these two groups would determine whether being born in the U.S. or not is related to fruit and vegetable consumption. This recoding is similarly seen in Guendelman and Abrams (1995) study where they separated their sample into two groups: first generation were subjects born in Mexico whose parents were born outside the United States, and second
generation were subjects who were born in the United States who had at least one parent born in Mexico or of Mexican descent. The study found that first generation Mexican-American women had a healthier nutrition intake than second-generation Mexican-American women.

**Years in U.S.**

To calculate the women’s years in the U.S., they were asked “How many years have you lived in the U.S.?”. Participants then indicated the number of “years in the U.S.” or “Born in the U.S.”. If the participant was born in the U.S., her age was used to indicate how many years she had lived in the U.S. Participants’ answers were dichotomized as done in Abraído-Lanza, Chao, and Florez study (2005), into those who have lived less than 15 years in the U.S. versus those who have lived more than 15 years in the U.S. The participants were dichotomized as such based on the rationale that 15 years or more in the U.S. indicated that the participants had longer periods of exposure to the American culture compared with those who have resided less than 15 years in the U.S. Abraído-Lanza et al. (2005) found that having lived 15 years or more in the U.S. was associated with women who were likely to smoke, have a high BMI, have a moderate/high alcohol intake, and more likely to exercise, thus displaying differential association by acculturation dependent on the woman’s behavior. Dubowitz et al. (2008) divided years in the U.S. into five categories: U.S.-born, 15 years or more, 10-14 years, 5-9 years, and 4 years or less, and examined them in relation to fruit and vegetable consumption. The study reported mean daily servings of fruit and vegetable (n=662) for each category as follows: U.S.-born (M=4.0), 15 years or more (M=4.9), 10-14 years (M=5.8), 5-9 years (M=7.0), and 4 years or less (M=7.0). The study determined that women living in the U.S. for fewer years had a significantly higher consumption of fruits and vegetables than women who were born in the U.S.

**Acculturation Scale**

Currently, there is no consensus as to the best measure of acculturation. A difficulty that occurred in measuring acculturation is that some scales measured acculturation as a unidimensional process, in which acculturation is measured as a zero-sum behavior, which indicated that individuals moved linearly from Hispanic to non-Hispanic losing their culture (Lara et al, 2005; Marin & Gamba, 1996). Similarly, the Acculturation Rating Scale for
Mexican Americans (ARSMA) created by Cuéllar et al. in 1980, measured acculturation as a linear process with one end representing Mexican culture and American (U.S.) culture on the other end, not accounting for biculturalism (Cuéllar et al., 1995). Due to this factor, in 1995, Cuéllar et al., created the ARSMA-II, a revision to the original scale which allowed for the subject to obtain high or low scores for each cultural orientation, Anglo and Mexican. Bidimensional models best exemplified the acculturation process. Bidimensional models accounted for the fact that individuals may acquire a dominant culture but may still retain their original culture (Lara et al, 2005). Bidirectional models display what acculturation is considered, a fluid process that changes at different speeds and displays a growth over time (Marín, 1992).

The Bidimensional Acculturation Scale for Hispanics (BAS) developed by Marín provided an acculturation score for the two major cultural domains: Hispanic and Non-Hispanic. The scale measured bidirectional changes in language behavior between the two domains by measuring three language-related areas each consisting of 12 items (6 for each cultural domain) (Marín & Gamba, 1996). The first focused on language use, the second on how well the participants can speak, read, understand and write English and Spanish (linguistic proficiency), and third the participants’ frequency of listening or watching English- and Spanish-language electronic media (radio, television, and music). For the language use subscale, the responses ranged from 1-4 with 1 representing almost never and 4 representing almost always. For the linguistic proficiency subscale, the responses ranged from 1-4 with 1 representing very bad and 4 representing very well. Lastly for the electronic media subscale, the responses ranged from 1-4 with 1 representing almost never and 4 representing almost always. To properly score participants, the answers to the 12 items that measured each cultural domain were averaged (Marín & Gamba, 1996). Each respondent is then given two scores, one for the average of the 12 items for the Hispanic domain and the other for the Non-Hispanic domain. The possible total score ranged from 1 to 4 for each domain, which determined the participants’ level of acculturation. If the participant scored a higher score in the Hispanic domain, it denoted a low acculturation level, while if the participant scored a higher score in the Non-Hispanic domain; it denoted a high acculturation level. A score of 2.5 is used to determine low or high levels in each cultural domain. If the participant scored higher than 2.5 in both domains, it indicated biculturalism on the part of
the respondent. The scale has been found to be reliable and valid in two Hispanic subgroups (Mexican Americans and Central Americans). Previous research indicated that all subscales had high internal consistency for Mexican Americans (alpha= .93 for Hispanic domain and alpha= .97 for non-Hispanic domain) and for Central Americans (alpha= .87 for Hispanic domain and alpha= .95 for non-Hispanic domain) (Marín & Gamba, 1996). Montez and Eschbach (2008), using Marin’s short acculturation scale found a trend, which indicated that country of birth and language had an interactive association with the consumption of fruit and vegetables (β=-0.27, p<0.10). Greater English language acculturation and USB was associated with lower consumption of fruits and vegetables. Otero-Sabogal et al. (1995) also used Marín’s scale and reported that overall fruit and vegetable consumption was lower amongst high-acculturated samples. The percent totals were those who reported that “yes” they consumed fruits and vegetables the day before. In the KPMCP sample, 86% of less acculturated respondents reported consuming fruits the previous day compared with 83% of high-acculturated respondents. Similarly 83% of less acculturated respondents consumed vegetables the previous day compared with 82% of high-acculturated respondents (p<.01). In the census tract sample 79% of less acculturated respondents reported consuming fruits the previous day while 71 % of high-acculturated respondents reported consuming fruits the previous day (p<.01). All samples in the KPMCP and census tract displayed that fruit and vegetable consumption was lower with acculturation, except in the census tract-based sample, where vegetable consumption was higher among more acculturated Latinos. 82% of high-acculturated respondents reported consuming vegetables the previous day while 74% of less acculturated respondents reported consuming vegetables the previous day (p<.01).

**Demographics**

To better understand the demographics of the mother, questions were asked pertaining to her age, marital status, education, employment status, and income based on the 2005 BRFSS survey.

In order to assess the mother’s age, “What is your age?” was asked as a continuous variable, which was used in the analysis in its raw form. She was then asked, “What is your marital status?” Seven response choices were available: married, living with spouse, married, not living with spouse, common law, divorced, widowed, separated, or single. For coding
purposes, the marital status variable was collapsed into a dichotomous variable of married (married, living with spouse, married, not living with spouse, or common law) (coded 1) and not married (divorced, widowed, separated, or single) (coded 0), consistent with most research. Studies have shown that for males, being married is associated with fruit and vegetable consumption as seen somewhat in Serdula et al. study (1995). The mean servings for married males were 3.4 (CI: 0.08) and those who were not married were 3.1 (CI: 0.12).

The mother’s education level was measured on an eight-point scale to obtain the highest grade or year completed. The answer choices were, Never attended school or only Kindergarten, Elementary through 6th grade, Grades 7 to 8 (Secondary), Grades 9 to 11 (Preparatory), Grade 12 (or GED), 1-3 years of college, including Technical colleges, College, 4 years or more, Post Graduate work. For data analysis purposes, participants were re-coded into three categories: (1) Never attended school or only Kindergarten and Elementary through 6th grade, (2) Grades 7 to 8 (Secondary) and Grades 9 to 11 (Preparatory), and (3) Grade 12 (or GED), 1-3 years of college, including Technical colleges, College, 4 years or more, and Post Graduate work. This type of coding was not usually seen in literature; one study dichotomized education into high school or less and some college or more (Otero-Sabogal et al., 1995) and another separated them into multiple groups of elementary or less, some high school, high school graduate or more (Gregory-Mercado et al., 2006). Breaking the categories into these three groups allowed for presentation of the distribution of the mother’s education level, possibly creating evenly distributed groups. In this study, education moderated the association between acculturation and fruit and vegetable consumption. Results indicated that amongst those with more education, there was a greater difference in fruit and vegetable intake between those who were less acculturated versus more acculturated (e.g., more than 12 years of education: less acculturated M=5.07±2.83 and more acculturated M=4.09±3.01 (p≤.05)). While Otero-Sabogal et al. (2004), who dichotomized education, did not find specific results with education as they used it as a covariate for Latino ethnicity, which was a significant predictor of dietary consumption.

The mother’s employment status was assessed by eight possible response categories: employed outside of the home full-time, employed outside of the home part-time, self-employed, employed in seasonal work (farm/agriculture), homemaker, student, retired, or unable to work? For data analysis purposes, the mother’s employment status was re-coded
into two categories, employed (coded 1) or unemployed or homemaker (coded 0). Although no study examined employment status in relation to fruit and vegetable consumption, Otero-Sabogal et al. (1995) discussed in their article that a higher vegetable consumption with those who were more acculturated (low acculturation total vegetable=74%, high acculturation total vegetable=82% (p< .01)) might be related to a higher socioeconomic status, one dimension of which is employment.

Household income was asked of the mother in terms of monthly amount using the following ranges of “less than $500, $500 to 999, $1,000 to 1,499, $2,000 to 2,499, $2,500 to 2,999, $3,000 to 3,499, $3,500 to 3,999, $4,000 to 4,499, $4,500 to $4,999, or $5,000 or more. Literature commonly reported yearly income (Gregory-Mercado et al., 2006); however this study assessed it by using monthly income. Each range was multiplied by 12 to obtain the participants’ yearly income. Yearly income was then re-coded as (1) less than or equal to $24,000 or (2) more than $24,001, as the average yearly income in Imperial Valley is around $34,000 (USCB, 2000). Gregory-Mercado et al. (2006), found that higher incomes were not associated with fruit and vegetable consumption, rather people with higher incomes tended to purchase convenience foods and foods eaten away from home compared with those with lower income.

**DATA ANALYSES**

Data was analyzed using the PASW Statistics 17.0. Alpha levels of .05 indicated significance. Prior to running any analyses, data was checked for any problems among the responses and data cleaning occurred. Descriptive statistics such as frequencies, means, and standard deviations were used to describe the study population. For Model 1 and 2, a t-test was performed comparing the fruit and vegetable consumption of those living in the U.S. 15 years or less versus more than 15 years and between 1st generation versus 2nd and 3rd generation mothers. ANCOVAs were run to explore the potential covariates of age, years of education and income in Models 1 and 2. To test for models 3a and 3b, correlations assessed the relationship between the Hispanic domain and the Non-Hispanic domain with fruit and vegetable consumption and variety. It was expected that for Model 3a there would be a positive correlation for both fruit and vegetable consumption and variety in relation to being of the Hispanic domain, while a negative correlation was expected for Model 3b for the Non-
Hispanic domain. To further test for covariates, two linear regressions were done, controlling for age, years of education, and income.
CHAPTER 3

RESULTS

Upon running analyses for this study, a few limitations were noted in the data. The initial sample consisted of 121 participants, but one participant was removed from the study. The participant was removed due to the fact that she reported that she was born in the U.S. but lived in Mexico for 32 years. Due to this reporting, the participant could not be properly identified for acculturation purposes because although she was born in the U.S., she grew up in Mexico. Thus the final sample was 120.

Model 2 which examined acculturation based on generation status and its association with fruit and vegetable consumption could not be reported. This hypothesis could not be tested because there was no variance in generation status. Of the 120 participants, only 4 were 2nd generation, therefore Model 2 was not tested.

DESCRIPTION OF PARTICIPANTS

Descriptive statistics, including demographics, acculturation, and total fruit and vegetable consumption and variety are reported in Table 1. Of those eligible and included in the sample (n=120), 96.70% reported that they were currently married, 45.80% had completed at least a high school education, 30.00% were employed, and 57.70% earn ≤$24,000 annually. The mean age of the study sample was 37.92 (SD=7.77) years. Of the study sample, 54.20% had lived in the U.S. for more than 15 years. The average Hispanic domain acculturation score was 3.54 and the average Non-Hispanic domain score was 2.18 on a 4-point scale. This resulted in 34.20% of the sample characterized as bicultural and 65.80% as traditional. The mean total fruit and vegetable consumption of the women in this population was 5.35 servings per day. In terms of variety, the women reported a higher variety of vegetables with a mean score 16.55 compared with a mean of 10.36 in terms of fruit variety.
Table 1. Descriptive Statistics on Demographic, Acculturation, and Total Fruit and Vegetable Consumption and Variety (N=120)

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Mean (Standard Deviation)</th>
<th>% of total (n)</th>
<th>NR/Missing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Married</td>
<td>96.70%</td>
<td>(116)</td>
<td>0</td>
</tr>
<tr>
<td>High School Completion</td>
<td>45.80%</td>
<td>(55)</td>
<td>1</td>
</tr>
<tr>
<td>Employed</td>
<td>30.00%</td>
<td>(36)</td>
<td>0</td>
</tr>
<tr>
<td>Age</td>
<td>37.92</td>
<td>(7.77)</td>
<td>0</td>
</tr>
<tr>
<td>Years in U.S. &gt;15 years</td>
<td>54.20%</td>
<td>(65)</td>
<td>0</td>
</tr>
<tr>
<td>Income (≤$24000/annually)</td>
<td>57.50%</td>
<td>(69)</td>
<td>0</td>
</tr>
<tr>
<td>Acculturation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic Domain</td>
<td>3.54</td>
<td>(0.38)</td>
<td></td>
</tr>
<tr>
<td>Non-Hispanic Domain</td>
<td>2.18</td>
<td>(0.89)</td>
<td></td>
</tr>
<tr>
<td>Traditional</td>
<td>65.80%</td>
<td>(79)</td>
<td>0</td>
</tr>
<tr>
<td>Bicultural</td>
<td>34.20%</td>
<td>(41)</td>
<td>0</td>
</tr>
<tr>
<td>Fruit and Vegetable (F&amp;V)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total F&amp;V Consumption</td>
<td>5.35</td>
<td>(3.35)</td>
<td>0</td>
</tr>
<tr>
<td>Total Fruit Variety</td>
<td>10.36</td>
<td>(4.21)</td>
<td>0</td>
</tr>
<tr>
<td>Total Vegetable Variety</td>
<td>16.55</td>
<td>(6.01)</td>
<td>0</td>
</tr>
</tbody>
</table>
FRUIT AND VEGETABLE CONSUMPTION AND YEARS IN U.S.

An independent samples t-test was conducted to compare total fruit and vegetable consumption amongst those who had lived in the U.S. for 15 years or less and those who had lived in the U.S. more than 15 years (Table 2). There was no significant difference in the consumption of fruit and vegetables for those who had lived in the U.S. for 15 years or less (M=5.15, SD=2.60) compared with those who had lived in U.S. for more than 15 years (M=5.52, SD=3.89). These results suggested that this dichotomy of years in the U.S. was not associated with total fruit and vegetable consumption amongst the mothers.

Table 2. T-test between Years in the U.S. and Fruit and Vegetable Consumption

<table>
<thead>
<tr>
<th></th>
<th>15 years or less (n=55)</th>
<th>More than 15 years (n=65)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total F&amp;V Consumption¹</td>
<td>5.15 (2.60)</td>
<td>5.52 (3.89)</td>
</tr>
</tbody>
</table>

¹t (118) = .11, n.s.

To control for potential covariates of age, years of education, and income, an ANCOVA was performed. The results indicated that after adjusting for age, education and income, total fruit and vegetable consumption still did not differ by the dichotomy of years in the U.S.

FRUIT AND VEGETABLE CONSUMPTION AND ACCULTURATION DOMAINS

Pearson’s correlations were performed to test the hypothesis that the Hispanic domain would be associated with higher fruit and vegetable consumption and that the Non-Hispanic domain would be associated with a lower fruit and vegetable consumption. Table 3 revealed that there was no significant association between total fruit and vegetable consumption and the two domains. For the Non-Hispanic domain, the p value of .07 indicated a trend in the right direction. The lack of significance may be due to the small sample size.

The acculturation domains were collapsed into two categories: traditional and bicultural (Table 4). There was no significant difference in the consumption of fruit and
Table 3. Correlation between Fruit and Vegetable Consumption and Hispanic and Non-Hispanic Domains

<table>
<thead>
<tr>
<th></th>
<th>Hispanic domain</th>
<th>Non-Hispanic domain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total F &amp;V</td>
<td>r= .08</td>
<td>r= -.14&lt;sup&gt;^&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>^</sup> p≤.10

Table 4. T-test between Traditional and Bicultural Categories on Fruit and Vegetable Consumption

<table>
<thead>
<tr>
<th></th>
<th>Traditional (n=79)</th>
<th>Bicultural (n=41)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>Total F&amp;V Consumption&lt;sup&gt;1&lt;/sup&gt;</td>
<td>5.74 (3.73)</td>
<td>4.60 (2.35)</td>
</tr>
</tbody>
</table>

<sup>1</sup> t (118)= .06, n.s

vegetable for those who were traditional (M=5.74, SD=3.73) compared with those who were bicultural (M=4.60, SD=2.35) (p= .08). Although the results were not significant, these results indicated that those who were traditional consumed about one more serving of fruits and vegetables than those who were bicultural.

To control for potential covariates of age, years of education, and income, an ANCOVA was performed. The results indicated that after adjusting for age, education and annual income, the total fruit and vegetable consumption still did not differ by the two-acculturation categories (p= .23).

**FRUIT AND VEGETABLE VARIETY**

To determine if fruit and vegetable variety differed by acculturation, each method of acculturation was examined. The relationship between years in the U.S. and fruit and vegetable variety is shown in Table 5. An independent samples t-test was conducted to compare total fruit and vegetable variety among those who had lived in the U.S. 15 years or less and those who had lived in the U.S. more than 15 years. There was no significant difference in the consumption of fruit and vegetable variety for those who had lived in the U.S. for 15 years or less (M=26.67, SD=8.21) compared with those who had lived in the U.S. for more than 15 years (M=27.11, SD=10.39). These results suggested that this dichotomy of
Table 5. T-test between Years in the U.S. and Fruit and Vegetable Variety

<table>
<thead>
<tr>
<th></th>
<th>15 years or less (n=55)</th>
<th>More than 15 years (n=65)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>Total F&amp;V Variety</td>
<td>26.67 (8.21)</td>
<td>27.11 (10.39)</td>
</tr>
<tr>
<td>Fruit Variety</td>
<td>10.25 (3.48)</td>
<td>10.45 (4.77)</td>
</tr>
<tr>
<td>Vegetable Variety</td>
<td>16.42 (5.60)</td>
<td>16.66 (6.37)</td>
</tr>
</tbody>
</table>

\(^1 t (118) = .06, \text{n.s.} \quad ^2 t (118) = .03, \text{n.s.} \quad ^3 t (118) = .37, \text{n.s.} \)

years in the U.S. was not associated with total fruit and vegetable variety amongst the mothers. When examining fruit and vegetable variety individually, no significant differences were observed by years in the U.S. Those who had lived in the U.S. for 15 years or less consumed a similar total variety of fruits (M=10.25, SD=3.48) compared with those who had lived in the U.S. for more than 15 years (M=10.45, SD=4.77). Similar results were seen for vegetable variety for those who had lived in the U.S. for 15 years or less (M=16.42, SD=5.60) compared with those who had lived in the U.S. for 15 years or more (M=16.66, SD=6.37). Although there was no significance, the results indicated that the mothers consumed a greater variety of vegetables than fruits.

When total fruit and vegetable variety was compared with the acculturation domains, no significant associations were observed (Table 6). The Hispanic Domain was correlated at -.01 and the Non-Hispanic Domain was correlated at -.09. No significant associations were observed when fruit and vegetable variety were analyzed individually with each domain. Fruit variety and the Hispanic Domain were correlated at -.00 and the Non-Hispanic Domain was correlated at -.07. Vegetable variety and the Hispanic Domain were correlated at -.01 and the Non-Hispanic Domain was correlated at -.08.

To further analyze the acculturation domains, an independent samples t-test was conducted to compare total fruit and vegetable variety among those who were traditional versus bicultural (Table 7). There was no significant difference in the fruit and vegetable variety for those who were traditional (M=27.61, SD=8.92) versus those who were bicultural (M=25.56, SD=10.29). When examining fruit and vegetable variety individually, no
significant differences were observed by acculturation category. The results for fruit variety for those who were traditional (M=10.66, SD=4.16) versus bicultural (M=9.78, SD=4.29) were nearly equivalent. Similar results were seen for vegetable variety for those who were traditional (M=16.95, SD=5.60) compared with those who were bicultural (M=15.78, SD=6.77). These results indicate that although not significant, those who are traditional consume a greater variety of fruits and vegetables than those who are bicultural.

**Multivariate Analysis**

Table 8 shows the results of a multiple linear regression examining acculturation domains on fruit and vegetable consumption controlling for age, income, and education. In the first block, there was a trend to indicate that education was associated with fruit and vegetable consumption (p=.09). This trend indicated that there was a possibility of a positive association between education and fruit and vegetable consumption. The positive association signified that the higher the educational level, the higher fruit and vegetable consumption.
Table 8. Linear Regression between Total Fruit and Vegetable Consumption with Hispanic and Non-Hispanic Domains

<table>
<thead>
<tr>
<th>Block</th>
<th>$R^2$</th>
<th>$\beta$</th>
<th>Std. Error</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block 1</td>
<td>.03</td>
<td>.04</td>
<td>.000</td>
<td>.71</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Education</td>
<td>.17</td>
<td>.49</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Age</td>
<td>.08</td>
<td>.04</td>
</tr>
<tr>
<td>Block 2</td>
<td>.04</td>
<td>.03</td>
<td>.000</td>
<td>.80</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Education</td>
<td>.13</td>
<td>.57</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Age</td>
<td>.08</td>
<td>.04</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hispanic Domain</td>
<td>.04</td>
<td>.93</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-Hispanic Domain</td>
<td>-.07</td>
<td>.46</td>
</tr>
</tbody>
</table>

Dependent Variable: Total Fruit and Vegetable Consumption

However once the acculturation domains were added in the second block, education was no longer significant. Block 2 shows the overall model of total fruit and vegetable consumption controlling for annual income, education, and age.
CHAPTER 4

DISCUSSION

Consuming fruits and vegetables reduces the risk of chronic diseases and several cancers (Blanck et al., 2008; Neumark-Sztainer et al., 2003; USDA, 2009). Consuming a variety of fruits and vegetables of various colors provides the nutrients needed to fight such diseases (CDC, 2009). According to the USDA (2009), women should be consuming two cups of fruit and two and a half cups of vegetables daily. Hispanics tend to consume more fruits and vegetables than their non-Hispanic counterparts (Bermudez, Ribaya-Mercado, Talegawkar & Tucker, 2005; Neuhouser et al., 2004; Sharma et al., 2004), yet many factors hinder consumption among Hispanics (Gray et al., 2005; Sussner et al., 2008; Yeh et al., 2008). One factor associated with Latino health is acculturation (Lara et al., 2005). Understanding how acculturation is linked to diet quality is an important area of research (Bermudez et al., 2000; Guendelman & Abrams, 1995).

SUMMARY OF FINDINGS

The primary aim of this study was to examine the relationship between Latinas’ acculturation status and their fruit and vegetable consumption, both quantity and variety. Acculturation was measured based on years in the U.S., place of birth and their preferred language measured using the Marin bidimensional acculturation scale (Marin & Gamba, 1996). It was hypothesized that fruit and vegetable consumption would be higher for those Latinas who (1) had lived fewer versus more years in the U.S., (2) whose generational status was that of a first generation (foreign born) versus a second or third generation (U.S. born), and (3) who more strongly endorsed the Hispanic domain versus those who more strongly endorsed the Non-Hispanic domain on the acculturation scale. It was also hypothesized that fruit and vegetable variety would be greater among Latinas who had lived fewer years in the U.S. and more strongly endorsed the Hispanic domain. Study findings failed to find support for these hypotheses. There were no associations between the various models of acculturation and fruit and vegetable consumption and variety.
Fruit and Vegetable Consumption

Descriptive statistics presented that the mean total fruit and vegetable consumption among the women was 5.35 servings per day. These results indicated of the group of women from Imperial County are eating the recommended 5 servings of fruits and vegetables each day (ACS, 2009). The total daily serving size within Imperial Valley was higher than California as a whole, where the mean fruit and vegetable consumption amongst women from different Hispanic subgroups (Mexican, Central American, Caribbean, Spanish American, South American, and those who reported being in more than one group) was 2.9 cups (Colon-Ramos et al., 2009).

The high mean total of fruits and vegetables consumed daily was likely due to the sample consisting of primarily foreign-born individuals. Foreign-born individuals are known to consume more servings of fruits and vegetables than their U.S. born counterparts (Neuhouser et al., 2004; Sharma et al., 2004). Another possibility for such high fruit and vegetable consumption could be due to the agricultural community the women live in providing them easier access to fruits and vegetables than in an urban community. The high fruit and vegetable consumption could also be due to the use of the National Cancer Institute (NCI) Fruit and Vegetable Screener (FVS). Thompson et al. examined the validity of the fruit and vegetable screener in a primarily white highly educated population and found that the screener produced estimates that differed from estimated true intakes by 0.3 to 1.2 servings per day (2002). In a multiracial population, Greene et al. (2008) found that the FVS overestimated intake for women by 2.11 servings compared to a 24-hr recall. Therefore similar to Greene’s study, this may explain the higher than average consumption seen in the present study sample.

Years in U.S.

The present study did not find a significant association between the dichotomy of 15 years or less versus more than 15 years in the U.S. and fruit and vegetable consumption. This result was similar to what was seen in Norman et al. (2004) who used 4 different models to capture the dimension of acculturation. The models included (1) years in the U.S., (2) preferred language spoken at home, (3) place of birth, and (4) combined birthplace and
language preference. Number of years lived in the U.S. was not significantly associated with
differences in dietary patterns, including fruits and vegetables.

However, current results differed from those reported by Dubowitz et al. (2008) who
observed that immigrants who had lived in the U.S. for 14 years or less consumed more fruit
and vegetables than those who were born in the U.S. The study divided years in the U.S. into
five categories and observed the following levels of intake: U.S.-born (M=4.0), 15 years or
more (M=4.9), 10-14 years (M=5.8), 5-9 years (M=7.0), and 4 years or less (M=7.0). Kasirye
et al. (2005) dichotomized years in the U.S as those who had lived in the U.S. for 10 years or
more and those who had lived in the U.S. for less than 10 years. Fruit and vegetable
consumption was reported as a percentage of those who consumed 3 or more servings of
fruits a day and 3 or more servings of vegetables per day. It was reported that women who
had lived in the U.S. for 10 years or more had consumed more fruits than those who had
lived in the U.S. for less than 10 years (63% vs. 43%, p ≤ .05). Although significance was
found in fruit consumption, this was not seen in daily vegetable consumption. Although
studies that measure years in the U.S. in relation to fruit and vegetable consumption have
found both positive and negative results the longer one has lived in the U.S., it is possible
that no significant results were seen in this study as the participants are not assimilating to the
U.S. norm and therefore still maintaining a similar diet to their country of origin. It is also
possible that the dichotomy of more than 15 years and less than 15 yeas was not the best to
show results in this sample. It may have been best to determine results following Dubowitz et
al. (2008) example of dividing the participants into five categories. By dividing the sample
into the five categories, it may have shown significance in fruit and vegetable consumption in
one or more of the categories indicating an association in acculturation.

Acculturation Domains

No association was found between Marín’s acculturation domains (Marín & Gamba,
1996) and fruit and vegetable consumption. The mean score within the Hispanic domain was
3.54 displaying stronger tendencies to use the Spanish language than English as seen with the
mean Non-Hispanic domain of 2.18. This is further reflected when the women were divided
into traditional (65.8%) and bicultural (34.2%) groups. Compared with other studies that
used Marín’s acculturation scale, our results were inconsistent. Otero-Sabogal et al. (1995)
reported that overall fruit and vegetable consumption was lower amongst the more acculturated in both samples. In the KPMCP sample, 86% of less acculturated respondents reported consuming fruits the previous day compared with 83% of high-acculturated respondents. Similarly 83% of less acculturated respondents consumed vegetables the previous day compared with 82% of high-acculturated respondents \((p \leq .01)\). In the census tract sample 79% of less acculturated respondents reported consuming fruits the previous day while 71% of high-acculturated respondents reported consuming fruits the previous day \((p \leq .01)\). All samples in the KPMCP and census tract displayed that fruit and vegetable consumption was lower with acculturation, except in the census tract-based sample, where vegetable consumption was higher among more acculturated Latinos. 82% of high-acculturated respondents reported consuming vegetables the previous day while 74% of less acculturated respondents reported consuming vegetables the previous day \((p < .01)\).

Montez and Eschbach (2008), who used the Marín short acculturation scale, reported that country of birth and language had an interactive association with the intake of fruit and vegetables. English speaking was associated with less fruit and vegetable intake in both U.S.-born (USB) and Mexican born (MB) women, but the disparity was greater in USB women. They found that those who were MB and predominantly spoke Spanish consumed a mean of 4.83 (SD=1.30) servings and those who were MB and predominantly spoke English consumed a mean of 4.52 (SD=1.30). In addition those who were USB and predominantly spoke Spanish consumed a mean of 4.54 (SD=1.60) servings and those who were USB and predominantly spoke English consumed a mean of 4.07 (SD=1.10). Thus the study found that women who were USB and who spoke predominately English consumed the fewest servings of fruits and vegetables.

Using Cuéllar’s Acculturation Rating Scale for Mexican Americans (ARSMA) (Cuéllar et al., 1980) Gregory-Mercado et al. (2006) reported that education moderated the association between acculturation and fruit and vegetable consumption. Results indicated that among those with more education, there was a greater difference in fruit and vegetable intake between those who were less acculturated versus more acculturated \(e.g.,\) more than 12 years of education: less acculturated \(M=5.07 \pm 2.83\) and more acculturated \(M=4.09 \pm 3.01\) \((p \leq .05)\). Garcia-Mass (1999) also used Cuéllar’s scale and found that the mothers who were less
acculturated consumed more fruits and vegetables (M=16.30; SD=8.35) than their daughters who were highly acculturated (M=14.00; SD=7.53) (scores varied from 0 representing less than once per week and 35 representing 2 or more times per day).

Although this study did not find significance between Marín’s acculturation scale to fruit and vegetable consumption, it did display that once the respondents were divided into traditional and bicultural groups, total fruit and vegetable consumption was greater in the traditional group. This result is similar to what has been seen in other studies, but it is possible that this finding was not significant as the entire sample displayed a high mean of fruit and vegetable consumption.

Another aspect to consider in the results of the participants displaying a stronger endorsement of the Hispanic domain and those who fell in the traditional group could be due to the sample. Participants, in order to be part of the study, needed to be able to read and understand Spanish to be eligible. Therefore individuals who may have been interested in the study but were not strong in their Spanish language capabilities were excluded from the study. This exclusion criterion may be the result to why participants more strongly endorsed the Hispanic domain. Therefore the results may have been skewed and may not be generalizable to the Imperial Valley Latina population.

**Fruit and Vegetable Variety**

Overall no significant differences were observed in analyses examining the association of fruit and vegetable variety and the various acculturation models. In this sample, the mothers consumed a greater variety of vegetables (16.55) than fruits (10.36), but nothing significant in relation to acculturation. Currently there are no studies specific to fruit and vegetable variety and acculturation. A study that looked into socioeconomic differences in fruit and vegetable variety among Australian adolescents and adults found that income was significantly associated with fruit and vegetable variety amongst adults only (Giskes, Turrell, Patterson, & Newman, 2002). Income was divided into five groups with 5 considered as high income to 1, which was low income. In order to measure variety, a 24-hour recall was done where participants reported what fruits or vegetables they consumed. Different types of the same fruit or vegetables were not considered as a different variety. Each variety of fruit or vegetable that was consumed was given a score of 1 and mixed dishes of fruits and
vegetables were given a score of 2. The scores were summed and then square-root-transformed (to approximate normal distribution) to obtain the final score of fruit and vegetable variety. An income difference in vegetable variety was seen between the highest (3.5; SD: 0.6) and lowest income groups (3.3, SD: 0.5) among female adults (p≤0.01). An income difference in fruit variety was also observed among women between the highest income group (2.2; SD: 0.5) and all other income groups (1.8; SD: 0.4, 1.9; SD: 0.4, 1.8; SD: 0.4, 1.9; SD: 0.4, for groups 4 through 1 respectively) (p≤0.01). It is possible that no significance was found between variety and acculturation, as acculturation was not found to be significant in any other measure. It is also possible that since their fruit and vegetable consumption was high, it is related to the variety consumed resulting in a high fruit and vegetable variety.

**STUDY STRENGTH**

The major strength of this study was the measurement of acculturation. Acculturation is currently measured with three main types: unidimensional, bidimensional, and multidimensional (Lara et al., 2005; Thomson & Hoffman-Goetz, 2009). Unidimensional instruments, such as Cuéllar et al. (1980) Acculturation Rating Scale for Mexican Americans (ARSMA), measures acculturation as a linear process ranging from un-acculturated to an assimilated individual. Bidimensional models accounted for the fact that individuals may have acquired the dominant culture while still retaining their own (Lara et al, 2005), while multidimensional instruments examine multiple dimensions individually to try to capture the acculturation process better (Thomson & Hoffman-Goetz, 2009). Multidimensional scales looks at elements of acculturation such as attitudes, values, and ethnic interaction, as seen in the Acculturation Rating Scale for Mexican Americans II (ARSMA II) (Thomson & Hoffman-Goetz, 2009). While most acculturation scales attempt to capture changes in language use and proficiency (Coronado, Thompson, McLerran, Schwaartz, & Koepsell, 2005), other scales measure acculturation on cultural and ethnic interactions. In public health research, acculturation is measured using acculturation scales, as well as using unidimensional measures such as years in the U.S. or generational status. With the different models available to measure acculturation, it is difficult to grasp which method best measures acculturation.
Because acculturation was measured in several ways, this study attempted to determine if one method was better than another in helping to understand fruit and vegetable consumption. This study used a bidimensional scale (BAS), which captured the language use of the women. The BAS measures both dimensions, English and Spanish, to obtain an acculturation score (Marín & Gamba, 1996). The BAS asked the same questions for both dimensions, specifically looking at what language the women prefer to use and listen to. By measuring both dimensions it assessed the involvement of the respondents in both cultures independently to understand how they balance both cultures (Cabassa, 2003). The study also used unidimensional measures, place of birth and years in the U.S. to capture acculturation. Although unidimensional measures are not considered to be the best way to measure acculturation, this study used them to determine if they showed an association with fruit or vegetable consumption. As Phinney & Flores (2002) indicated, generational status is a poor measure of acculturation. This study measured generational status to determine if it would be associated with fruit and vegetable consumption. As seen in this study, with a large sample of first generation women, this measure was unable to be fully examined. The other measure of unidimensional acculturation used was years in the U.S., which has been considered to be a useful way to gauge acculturation as it displays how people change over their lifetime toward the new culture (Phinney, 2003). Thus this study used this measure to determine if years in the U.S. was associated with fruit and vegetable consumption. However since no significance was displayed, years in the U.S. may not be an important correlate of fruit and vegetable consumption.

Acculturation is a complex concept that needs to be further researched to determine a consensus in how acculturation should be measured in future research. Currently public health research focuses on either unidimensional or bidimensional measures. Due to the fact that public health research has used various methods, acculturation results have been inconsistent (Lara et al., 2005), which makes it difficult to properly compare studies to determine which form of acculturation measurement is the best.

**STUDY LIMITATIONS**

A limitation of this study was that it was cross-sectional. This study design focused on all variables at one point in time, which did not allow causality or temporality to be
determined (Hulley, Cummings, Browner, Grady, & Newman, 2007). Due to this limitation, we cannot determine if living more years in the U.S. is associated with a positive or negative change in fruit and vegetable consumption.

A shortcoming of the study is the small sample size and the inclusion of only Mexican origin adults. The sample was comprised of 120 women from Imperial County. This specific population may not closely parallel the demographics of Latinas in the larger country or even the state, limiting generalizability. Imperial County consists of a population of about 160,000 people where 76.8% are Latinos, while the California population consists of about 33,900,000 people with 32.4% who are Latinos. This is further contrasted with the Latino population in the United States, which consists of 12.5% (USCB, 2000). In addition given that approximately 92,700 of the 160,000 are of Mexican origin, the sample does not fully represent all Latina subgroups. The small sample size may have precluded finding significant results between fruit and vegetable consumption with the Non-Hispanic domain as the p-value approached significance at p ≤ 0.07. In addition, no variability was found in generational status, which may have been seen with a larger sample size. Larger samples are better because they tend to minimize the probability of errors and increase the generalizability of the results. Larger sample sizes lead to increased precision and more accurate parameter estimates.

Recall bias is present because participants were asked to self-report their fruit and vegetable consumption in the past month. Recall bias can introduce threats to the validity of the study as participants may exaggerate their consumption (Hulley et al., 2007). Self-report data depends on memory, which can serve as an unreliable measure as people tend to have difficulty recalling what they have done in the past (Hulley et al., 2007). Other biases that are quite often seen in dietary literature are social desirability and social approval (Miller, Abdel-Maksoud, Crane, Marcus, Byers, 2008). Social desirability is the tendency to respond in a way to avoid criticism while social approval is the tendency to seek praise (Miller et al., 2008). Miller et al. (2008) did a randomized controlled trial where those who were in the intervention received information on health benefits of fruits and vegetables prior to receiving the survey while those in the control received no prior information. The study did 24-hour recalls and found that more intervention subjects reported consumption of fruits and vegetables the day before than did controls, therefore suggesting that social approval bias
may affect short-term recall of foods consumed. Social desirability is a trait seen more in
women than men (Hebert, Clemow, Pbert, Ockene, & Ockene 1995), therefore it could be
possible that the women in this study felt the need to over report their fruit and vegetable
consumption since they were personally being interviewed by the data collectors.

Although the data collectors were trained to administer the Entre Familia mother
survey the same way, the setting in which the mothers completed the survey varied. Most
mothers completed the survey in their homes while others completed the survey in other
public locations. The setting in which the mothers completed the survey could have
influenced their responses depending on how comfortable the mothers felt with their
surroundings. Completing the survey in a public location may have added pressure to the
participant to respond quickly depending on whether the mother had other obligations to
attend to at home. This was likely not a problem with those who completed the survey at
their home as it may have given the mother an opportunity to relax and take her time
completing the survey therefore allowing her to respond more accurately. Furthermore, the
survey took about 45 minutes to complete, which may have been too long and overwhelming
for participants, resulting in the mothers not paying full attention to the questions or their
responses. Recruitment efforts at health fairs and the health clinics may have also introduced
bias to the study population on the assumption that the people attending these places may
already be concerned with their health and their well being. Thus people who attend these
fairs are likely to already consume fruits and vegetables in their daily diet.

A limitation in relation to fruit and vegetable variety is the lack of a validated
instrument to properly measure variety. Fruit and vegetable variety needs to be further
researched to create a suitable instrument (Hulley et al., 2007).

**CONCLUSIONS**

Results from this study demonstrated that the various acculturation models were not
associated with fruit and vegetable consumption or variety in this sample. The findings in
this study was not consistent with previous research indicating that those who are less
acculturated (Gregory-Mercado et al., 2006; Otero-Sabogal et al., 1995) or who have lived in
the U.S. for less than 15 years (Dubowitz et al., 2008) consumed greater amounts of fruits
and vegetables than those who have higher acculturation scores (Gregory-Mercado et al.,
2006; Otero-Sabogal et al., 1995) and who have lived in the U.S for longer periods of time (Dubowitz et al., 2008). It is important to continue to explore this area of research in order to clarify research on this topic and better understand the relationship between acculturation and fruit and vegetable consumption.

Further research examining acculturation and health will help researchers determine the best methods for measuring acculturation, whether it is on a bidimensional or multidimensional level. Public health researchers need to fully understand this concept of acculturation as it is affecting the Latino population with both positive (Lara et al, 2005) and negative (Edmonds, 2005; Lara et al, 2005) outcomes. Once a consensus on acculturation measures is decided upon, acculturation research may help determine what factors are associated with fruit and vegetable consumption among Latinos.

Due to the fact that this study found no association between fruit and vegetable consumption and acculturation, it is possible that acculturation is not an important factor to measure within the Imperial Valley population. Of the total population of 160,000, 76.8% are Latinos (USCB, 2000), and of the 120 participants all were first generation Latinas except 4 participants. This is important to note as many studies indicate that Latinos who are foreign born consume more fruits and vegetables (Duffey et al., 2008; Sharma et al., 2004). Therefore because the majority of the individuals in this county are foreign born, it is possible that their fruit and vegetable consumption still mirrors their dietary consumption patterns from their country of origin.

Acculturation sometimes is thought to occur not because of personal choice but because of political, social, and/or economic conditions that would make cultural adaptation favorable for them (Marin, 1993). This may not be the case in the Imperial County as the majority of the population is Latino; there is no need for them to acculturate to the US norm. Being surrounded by a large population of foreign born individuals and individuals who still endorse their Latino culture, acculturation may not be a factor of importance for this population.

**Future Directions**

A great deal of research needs to be conducted on acculturation in relation to fruit and vegetable consumption, specifically focusing on different acculturation models. Current
acculturation studies found that Hispanics who are more acculturated to the U.S. norm consume fewer fruits and vegetables than their foreign born counterparts (Duffey et al., 2008; Gregory-Mercado et al., 2006; Montez & Eschbach, 2008); therefore understanding this association is necessary. Many studies focused on diet and energy intake (Duffey et al., 2008; Guendelman & Abrams, 1995; Lin et al., 2003; Otero-Sabogal et al., 1995), but not on fruit and vegetable consumption alone. This is an important factor as consuming fruits and vegetables has been known to reduce chronic diseases, such as cancer, type 2 diabetes and stroke (USDHHS & USDA, 2005). Currently cancer is the leading cause of death in for the Hispanic population in the United States (ACS, 2006), therefore more studies on fruit and vegetable consumption will help to determine what factors play a role in their consumption to help the Latino population decrease their chronic disease rates. This would be important to look into within the Imperial County population since the majority of the population consists of Latinos and data indicates that chronic diseases are a major issue amongst them. In a report using the California Health Interview Survey from 2007, California counties were ranked from 1 where the population was considered as being the best health group to 5 where they were considered the worst health group (Lui & Wallace, 2010). Imperial County was given a 5 in having adults with more than one chronic condition, with diabetes being the most prevalent chronic disease. This data therefore indicates that chronic diseases are a major problem in this population and needs to be addressed.

Studies should also focus on how acculturation is associated with consumption, considering other factors such as their socioeconomic status, income, and education. The high cost of fruits and vegetables is a barrier to consumption among those who have lower incomes or socioeconomic status (Yeh et al., 2008). Using these factors in future acculturation studies will help determine if they are positively or negatively associated with fruit and vegetable consumption or not.

Future studies should also consider looking at populations consisting of other Hispanic ethnicities, rather than just Mexicans, in order to determine if there are fruit and vegetable consumption differences among various acculturation groups. Most acculturation studies focuses on persons of Mexican origin (Lara et al., 2005). Studying differences in Latino subgroups is important because, for example, diabetes in pregnancy is prevalent among island-born Puerto Ricans while its not in foreign-born Mexicans (Kieffer, Martin,
Herman, 1999). Therefore to properly understand and diagnose Latinos, understanding each subgroup and acculturation factors would be necessary. In the Lin et al. (2003) study which looked into the dietary intake of Puerto Ricans and Dominicans found that Puerto Rican elders consumed diets high in starchy vegetables, rice and whole milk, while Dominicans consumed diets of starchy vegetables and rice. This study showed that although their diets were similar, there were still some differences between the ethnicities. This further displays that all Latinos cannot be grouped as having the same dietary practices. Latinos from the Caribbean have very different diets from Mexicans or other Latin American countries, making each ethnicity unique. If future research looks into fruit and vegetable consumption by ethnicities and differences are found, interventions could then be targeted to specific ethnicities and tailored according to their own ethnic diet.

Future chronic disease intervention studies within Imperial County, which are targeted toward Latinos, should continue to encourage fruit and vegetable consumption. Although this study found that fruit and vegetable consumption is already high, it is necessary to continue to encourage this behavior. Fruit and vegetable consumption helps to lower the risk of chronic diseases and cancers alike. Making sure to encourage fruit and vegetable consumption will help individuals realize that this dietary behavior is beneficial for their health. Focusing on fruit and vegetable consumption may help Latinos move away from processed and fast foods (Sussner et al., 2008).

Finally more research should be done on fruit and vegetable variety. Fruit and vegetable variety is overlooked with consumption, but should be considered in future studies. Consuming fruits of different colors provides a broad range of nutrients (CDC, 2009), which serves as antioxidants to prevent oxidative DNA damage (WHO, 2009). Consuming a variety of fruits and vegetables helps to prevent chronic diseases (USDHHS & USDA, 2005). Diet is a modifiable risk factor for many chronic diseases (Neuhouser et al., 2004). Understanding what variety of fruits and vegetables Latinos are consuming may allow nutritionists to target their disease prevention efforts. Studying variety would also help to determine what nutrients Latinos may be lacking and allow nutritionists to know how to target and promote specific fruits or vegetables to decrease disease rates among Latinos. Also with continuous research done in fruit and vegetable variety, a validated instrument can be created.
In order to understand acculturation research, it is important to note that it is defined and measured in various ways, which leads to inconsistencies in acculturation studies. This study indicates that acculturation is not associated with fruit and vegetable consumption. However, it highlights several research questions that should be considered, as well as suggestions as to why acculturation may not be the best construct to consider in this population.
REFERENCES


