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Rates Of Obesity And Incidence Of Diabetes In Hispanics In The United States: An Examination Of The Epidemiological Paradox

Lucy Dean
Bucknell University, lgd002@bucknell.edu

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An Examination of the Epidemiological Paradox

By

Lucy Dean

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pproved by: S. Elizabeth Durden

Dr. Elizabeth Durden
Assistant Professor of Sociology
Thesis Advisor

Dr. Alexander T. Riley
Professor of Sociology
Chair, Department of Sociology and Anthropology

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Abstract

Using pooled data from the 2008-2011 National Health Interview Survey and employing multinomial and binomial logistic regression methods, this research examines disparities in rates of obesity and incidence of diabetes between individual Hispanic subgroups in comparison to non-Hispanic whites and blacks. Immigration status (including nativity, duration in the United States, and citizenship status) is hypothesized to play a central role in rates and obesity and incidence of diabetes. Unlike Cuban-Americans, Mexican-Americans, Puerto Ricans, and other Hispanics were more likely to be overweight as well as obese when compared to non-Hispanic whites. Mexican-Americans had the only significance in prevalence of type 2 diabetes in comparison to non-Hispanic whites. Both of these health outcomes are strongly associated with the various immigration variables.

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Chapter 1
Introduction

This research explores race/ethnic differences in health outcomes. Health outcome disparities among different race/ethnic groups within the United States have been documented within the discipline of Sociology since the 19th century when W.E.B. Du Bois published *The Philadelphia Negro* discussing the lower health status among blacks (Du Bois [1899] 1996). Today, race/ethnic health differences continue exist, with some groups having more positive health outcomes in comparison to others (Nazroo 2003). For example, non-Hispanic blacks have a significantly higher mortality rate when compared to non-Hispanic whites (Orsi et al. 2010). Non-Hispanic blacks also have the highest rates of infant mortality whereas non-Hispanic whites have the lowest (Nazroo and Williams 2009). Additionally, congestive heart failure and strokes have also been found to be more common among non-Hispanic blacks than non-Hispanic whites (Mensah et al. 2005). As the United States population is becoming more ethnically diverse, research is now broadening to include health outcomes among Hispanics and Asians. The 2010 census showed that Hispanics accounted for more than half the total population growth in the United States since 2000 while Asians were the fastest growing racial group over the past ten years. When compared to other race/ethnic groups, Asian Americans have the highest rates of certain cancers such as cancer of the liver and stomach (Jemal et al. 2004). Moreover, Hispanics have significantly higher rates of death caused by digestive cancers, stomach caner, liver cancer and cervical cancer, when compared to the rest of the U.S. population (Vega et al. 2009).

These race/ethnic health differences have been attributed to minorities' more stressful lives as a result of racial biases and discrimination (Williams et al. 2003). On the other hand, these health disparities have also been linked to health care professionals and health communication not taking the "influence of culture on the attitudes, beliefs, and practices of minorities" into consideration when reaching out to these marginalized groups (Thomas and Fine 2004: 2050). Moreover, it has also been suggested that although previous research has found differences in race/ethnic health outcomes, future research needs to further explore the impact of other factors upon this relationship such as socioeconomic status as well as environmental and social influences (LeVeist 2005).

Obesity and type 2 diabetes has received growing attention from health researchers, as both epidemics are dramatically growing within the United States and are not affecting all race/ethnic groups equally. Over the past 30 years, rates of obesity nearly doubled for adults and tripled for children while incidence of type 2 diabetes more than tripled (Centers for Disease Control and Prevention 2012b; Centers for Disease Control and Prevention 2013).

Previous research has found that both of these diseases are associated with the onset of other negative health outcomes. Obesity is strongly correlated with the onset of cardiovascular diseases and type 2 diabetes as well as higher rates of mortality (Flegal et al. 2013; Behan and Cox 2010). Type 2 diabetes, on the other hand, is linked to increased risk for higher blood pressure, heart disease, strokes and kidney failure in addition to a higher mortality rate (World Health Organization 2013a). Furthermore, these diseases also inflict a large financial burden on the rest of society. The financial cost of obesity

has been estimated to account for 1 of every 6 dollars allocated to health care, which could amount to as much as $956.9 billion, if the epidemic continues to rise (Wang et al. 2008). The American Diabetes Association (2013) estimates that health costs costs related to diabetes rose from $174 billion in 2007 to $245 billion in 2010, $176 billion for direct medical costs and another $69 billion for indirect costs such as unemployment, disability, or premature mortality.

This paper examines the rates of obesity and incidence of diabetes among various Hispanic subgroups --- Mexican-Americans, Puerto Ricans, Cubans-Americans, and other Hispanics --- as well as non-Hispanic whites and blacks. The focus on Hispanics is essential as they are now the largest minority group within the United States, accounting for 16.7% of the entire U.S. population (Saenz 2010; U.S. Census Bureau 2013). This research adds to the growing literature on race/ethnic health differentials by breaking down the over-generalized Hispanic ethnicity into specific subgroups. Additionally, this research will explore the impact of various immigration variables, including nativity, duration and citizenship, on obesity and diabetes. More immigrants of Hispanic origin, documented and undocumented, migrate to the United States each year, thus it is central to consider the role of immigrant status on these health outcomes as well as how they may affect the health outcomes differently for each individual subgroup.

Chapter two will provide a basic literature review of the substantial differences between the various Hispanic subgroups by describing their unique migration histories as well as current socioeconomic statuses. Additionally, this chapter will explore the obesity and type 2 diabetes epidemics and the impact they have had within the Hispanic

community. Chapter three will describe the data and methods used in this research while chapter four documents the descriptive statistics between the race/ethnic groups and each variable under consideration. Chapter five includes the results for the relationship between race/ethnicity and both obesity and type 2 diabetes. Lastly, chapter six provides a discussion of the results as well as possible policy implications.

Chapter 2
Literature Review

This chapter will provide a basic literature review of the substantial differences between the various Hispanic subgroups by describing their unique migration histories as well as current socioeconomic statuses. Additionally, it will define the epidemiological paradox and assimilation as well as discuss importance of these concepts when studying both native and foreign-born Hispanics. Lastly, this chapter will explore the obesity and type 2 diabetes epidemics and the impact they have had within the Hispanic community.

Hispanics at Large

Over the past two decades, it has become increasingly more important to understand the extremely diverse Hispanic population within the United States. Between 1980 and 2009, the Hispanic population more than tripled in the United States and now accounts for 16.7% of the total U.S. population today making it the largest minority group within the country (Saenz 2010; U.S. United Stated Census Bureau 2013; National Research Council 2006). This growth in population is attributed to two main demographic factors, fertility and migration. On average, Hispanic women have about one more child than non-Hispanic white women (McKay 2013). Hispanics' young child bearing age combined with their significantly younger population in comparison to non-Hispanic whites has resulted in the Hispanic population growing at a faster rate (Saenz 2010). While high birth rates have contributed significantly to the expanding Hispanic population within the U.S., birth rates vary within Hispanic subgroups depending on their

education, socioeconomic status, generation, and legal status. For example, Cuban women have the highest levels of educational attainment "which prompts many to postpone marriage and childrearing in order to begin careers" resulting in their having the lowest birthrates of all Hispanic subgroups (National Research Council 2006: 24).

The dramatic Hispanic population growth within the U.S. is also affected by immigration. The United States receives more immigrants of various Hispanic origin, documented and undocumented, each year than any other ethnic group. While, there are currently just over 40 million immigrants in the U.S. today, making up 13% of the country's population, 18.8 million or 47% of these immigrants are Hispanic (Pew Research Hispanic Center 2013; Batalova and Lee 2012). Hispanic immigration peaked in the 1990s with about 1.5 million migrants, documented and undocumented, entering the United States every year (Passel and Suro 2005). During this present period of increased Hispanic migration, the number of illegal Hispanic immigrants has increased while the number of legal Hispanic immigrants has been decreasing. At present, the number Hispanic immigrants crossing the border illegally is greater than the number crossing lawfully (Passel and Suro 2005).

Documentation shifts in population status are not the only change in the Hispanic immigrant population. Geographic destinations and settling patterns have also changed. These new Hispanic immigrants are no longer settling in traditional destinations such as California, Texas and New York but rather they are migrating to non-traditional regions such as the South and Midwest with historically low Hispanic populations (Leach and Bean 2008; Light and von Scheven 2008; McConnell 2008). Although just under 50% of

Hispanics live in California and Texas, the Hispanic population in seven states (Alabama, Arkansas, Kentucky, Mississippi, North Carolina, Tennessee, and South Carolina) has more than doubled over the past decade. Additionally, the Hispanic population growth accounted for the entire population growth in another six states (Maryland, Mississippi, South Dakota, Delaware, Georgia, and Virginia) (Passel et al 2011).

The categories 'Hispanic' and 'Latino' are generalizing classifications created in the United States for the purpose of labeling Spanish-speaking people. It is an umbrella term that masks the very real heterogeneity, as 'Hispanic' composes of various ethnic groups. These ethnic groups have various cultures, histories, and immigration patterns, as well as a range of socioeconomic and political opportunities once in the United States. Thus, it is essential to separate the Hispanic population into specific, homogeneous subgroups founded in country of origin. This research explores the disparities in health outcomes, specifically obesity and diabetes, among Mexican-Americans, Puerto Ricans, Cuban-Americans, and other Hispanics. Special attention is paid to the impact of various immigration variables, which allow us to better understand the effect assimilation has on race/ethnic health disparities. As a result, it is necessary to discuss migration histories as well as and basic demographic and socioeconomic profiles for each of the subgroups. These factors greatly impact how Hispanics from each subgroup are incorporated into American society.

Mexican-Americans -Migration History

Mexican-Americans are the only Hispanic group that can legitimately assert a historical claim over a portion of the U.S. territory as Mexico previously controlled the southwestern region of the United States. At the end to the Mexican-American war in 1846, the United States seized large parts of the Southwest including the present day states of California, Nevada, Utah, New Mexico, Texas and parts of Wyoming and Colorado, which were formerly part of Mexico. As a result, historically, Mexicans passed freely within the region since there was not a heavily patrolled border. The Bracero Program, however, marks the first time Mexican migration was regulated. The Bracero Program was created in 1942 in an attempt to replenish the diminishing labor force as a result of workers going to fight in World War II (Zolberg 1999). Mexicans were allowed into the country as 'temporary agricultural workers.' During the first five years of the program, the government was heavily involved with the oversight of the program by "qualitatively controlling transportation, wages, and working and living conditions" as well as worker recruitment (126). However, after 1947, the government's supervision diminished, making it easier for employers to be more active in the recruiting of workers directly from Mexico. Over the 22 years this program was in existence, it is estimated that 5 million temporary workers crossed the border (Marcell 1994; Massey and Liang 1989). The termination of this program in 1964, brought about a new wave of illegal Mexican immigration into the United States because employers still wanted the cheap migrant labor. Therefore, Mexican migrants continued crossing the border to work the same jobs even though the U.S. government no longer condoned their working in the country (Zolberg 1999).

Three pieces of legislation obstructed Mexican migration throughout the latter half of the twentieth century. The first piece of legislation, the Hart-Celler Act, was an amendment created in 1978 that tightened requirements for legally authorized immigration. As a result, this amendment inadvertently increased pressure for undocumented entry into the United States in an attempt to skirt around the new requirements for legal entry. The second piece of legislation, the Immigration Reform and Control Act of 1986 (IRCA), was created to further discourage illegal immigration flows into the U.S. This law had three major parts: it provided a pathway to legalization for illegal immigrants who have resided in the United States since 1982, it created sanctions for companies who hire illegal immigrants as employees and it improved border patrol (U.S. Citizenship and Immigration Services 2012). The third piece of legislation, the 1996 Illegal Immigration Reform and Immigrant Responsibility Act, further impacted Mexican migration by providing amnesty for undocumented immigrants who met specific residence requirements. This legislation also imposed sanctions on employers who hired illegal immigrants and launched initiatives to close the border through tough surveillance measures. Therefore, this law, similar to the Hart-Celler Act, encouraged further illegal migration. Immigrants were still going to cross the border in search for jobs, however, more immigrants would enter illegally as they attempted to avoid the new requirements for legal entry (National Research Council 2006). Thus, it can be determined that legislation designed to curb the flow of undocumented immigrants during the 1980s and 1990s actually had the opposite effect. Although all three of these pieces of legislation were not specifically directed towards Mexican immigrants,

Mexican immigrants felt the greatest effect of these bills as a result of their incredibly high immigration rates when compared to other Hispanic subgroups.

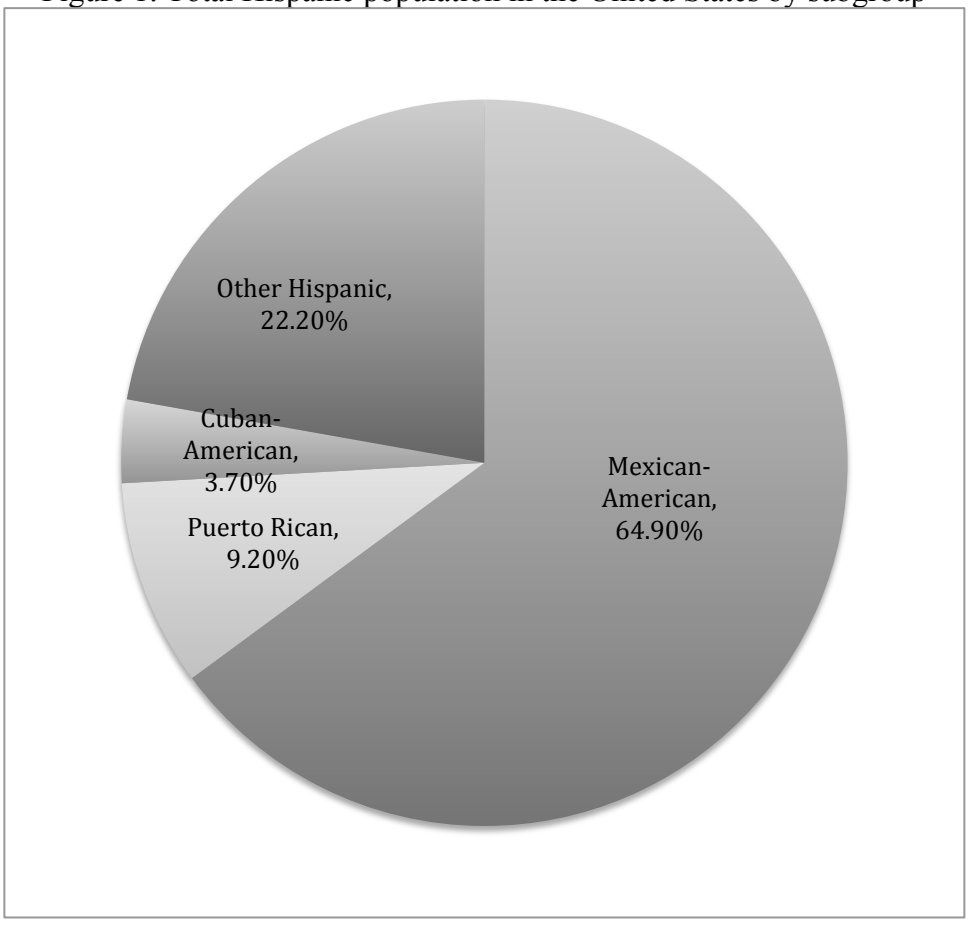
It is also essential to understand Mexican migrants' naturalization process. Naturalization occurs when a foreigner gains citizenship in a country where he or she was not previously a citizen. In comparison to other Hispanic subgroups (58%), Mexican-Americans (34%) have the lowest naturalization rate (Fix et al. 2003). However, the number of Mexican-Americans becoming naturalized citizens has increased by 144% between 1995 and 2005 (Passel 2007).

Illegal immigrants make of 51% of Mexican migrants (Passel et al. 2012). Many of these illegal immigrants are using migration to supplement their household incomes as they are maximizing income while they simultaneously minimizing risk by expanding into multiple industries. Sending Mexican-American migrants to the Untied States diversifies household incomes allowing them to no longer be dependent on a single, unreliable industry such as agriculture (Massey 1999). This economic motive in addition to separation from their family makes it evident that a majority of illegal Mexican American migrants come to the United States seeking temporary employment with the intention of eventually returning home (Durand and Massey 2004). However, over the past five years there has been a negative trend in Mexican-American net migration as fewer migrants are coming to the U.S. from Mexico and more migrants are returning to Mexico. This trend has been associated with migrants being more hesitant to repeatedly cross the border as a result of heightened border control and higher number of as well as the United States weakened economy (Passel et al. 2012).

Mexican-Americans - Socioeconomic Profile

There are currently about 32.9 million Mexican-Americans living in the United States today, which constitutes approximately two thirds of the total Hispanic population (Figure 1). Mexican Americans tend to be younger than the U.S. population as their median ages are 25 and 37 respectively. Additionally, of all Mexican-Americans migrated to the United States, two-thirds came after 1990. Mexican-Americans also tend

Figure 1: Total Hispanic population in the United States by subgroup



Source: Motel and Patten 2012a, 2012b and 2012c

to be regionally clustered as just over half the population lives in the West, 36% of which live in California. Another third reside in the South, 25% of which are in Texas (Motel and Patten 2012a). Yet, recently there has been a diversification of this in other states.

Mexican-Americans also tend to have considerably lower socioeconomic status when compared to the larger Hispanic and U.S. population. Only 9% of Mexican Americans over the age of 25 have at least a bachelor's degree. However, two- thirds of Mexican-Americans over the age of 5 are considered proficient in English. The average earning per person is $20,000 per year. Additionally, 27% of Mexican-Americans live below the poverty line compared to 15% of the U.S. population. One-third of Mexican-Americans do not have health insurance, which is more than double the United States average (Motel and Patten 2012a).

Puerto Ricans - Migration History

Puerto Ricans, in comparison to other Hispanics, have a unique 'migration' profile, as all Puerto Ricans have U.S. citizenship since they are born in a U.S. territory. A constant flow of migration exists between the mainland, the United States, as migration is more assessable for Puerto Ricans in comparison to other Hispanic subgroups. Thus, unlike other Hispanic immigrants, they are able to freely move between the island and the mainland without facing any legal barriers and gain access to the social services when in the United States (Sotomayor 2009). Thousands of Puerto Ricans every year choose to migrate to the U.S. mainland based on Puerto Rico's longstanding high rate of unemployment, which is currently just under 15 % (Bureau of Labor Statistics 2013).

Consequently, about 60-70% of Puerto Ricans choose to temporarily leave the island with the intention of finding work in the mainland, which has lower unemployment rates and higher wages (Enchautegui 2007). As a result, about 44% of all adults born in Puerto Rico are considered "migrants" whether they are currently migrating or have migrated in the past (Enchautegui 2007).

Puerto Ricans - Socioeconomic Profile

Puerto Ricans are the second largest Hispanic subgroup in the United States as there are currently about 4.7 million Puerto Ricans living on the U.S. mainland (Figure 1). Puerto Ricans have a median age of 27 making their population younger than the larger U.S. population. Puerto Ricans tend to be regionally clustered with just over half the population living in the Northeast, 23% of which live in New York. Just under a third reside in the South, 18% of which live in Texas (Motel and Patten 2012b).

Puerto Ricans also have considerably higher socioeconomic statuses and educational attainment when compared to the overall Hispanic population. The average earning per person is $25,000 per year, whereas for the total Hispanic population it is $20,000. Additionally, 27% of Puerto Ricans live below the poverty line. However, only 15% of Puerto Ricans do not have health insurance, which is slightly lower than that of non-Hispanic whites. Moreover, sixteen percent of Puerto Ricans over the age of 25 have at least a bachelor's degree and 82% of Puerto Ricans over the age of 5 are considered proficient in English (Motel and Patten 2012b).

Cuban-Americans - Migration History

Cuban migration history differs greatly from the other Hispanic subgroups due to their refugee status. The United States welcomed fleeing Cubans as they fled from Castro's communist revolution during the era of the cold war. Cuban migration can be grouped into four different waves, the first of which started in1959. Over the next four years, more than 200,000 Cubans entered the United States seeking asylum (Masud-Piloto 1988). A majority of this group of refugees were members of the upper class earning them the title of the "Golden Exiles." The U.S. government made great efforts to incorporate the Cubans into society by creating several aid programs such as the Cuban Refugee Program, which provided the Cubans with necessities such as food, clothing, and shelter (Masud-Piloto 1996).

The second wave of migration began in 1965 after Castro announced he would allow any Cuban to emigrate and reunite with their relatives in the United States. In response, the U.S. created Freedom Flights, providing flights for 4,000 Cubans per month over a span of eight years (Alberts 20025; Garcia 1996; Masud-Piloto 1996). Since many of the migrants coming over during this time were reuniting with family members already residing in the U.S., these Cubans tended to also be members of the upper class (Alberts 2005). All Cubans at the time were awarded citizenship through the Cuban Adjustment Act of 1966 (CAA). This legislation allowed Cubans to obtain citizenship after being in the United States for one year, providing them access to social services such as Supplemental Security Income and Temporary Assistance for Needy Families (Fullerton 2004).

The third wave of Cuban migrants known as "the Mariel Boatlift" began in 1980 as Castro allowed Cubans to emigrate. However, this time, the United States attempted to stop the boats from landing in Florida, but were unsuccessful (Masud-Piloto 1996). The profile of these migrants did not share the high socioeconomic status as the previous waves. Instead, some of the Cubans in this wave had criminal backgrounds and were mentally ill (Garcia 1996). Since the U.S. was not as accepting of this group of migrants and they did not offer them the same level of benefits previously given to Cubans upon arrival (Garcia 1996; Skop 2001).

The last wave of migration known as "the Balsero Crisis" started in 1994. During this period, President Clinton attempted to limit the number of Cubans entering the Unites States by slightly altering the Cuban migration policy so not all Cubans would be accepted as refugees. If Cubans landed in Florida they were accepted as refugees, however, if they were caught in the water they would not be permitted to enter the United States (Nackerud et al. 1999). Today, the United States allows 20,000 Cubans to migrate into the country every year (Fullerton 2004).

Cuban-Americans - Socioeconomic Profile

There are currently about 1.9 million Cuban-Americans living in the United States today, making them the third largest Hispanic subgroup (Figure 1). About 60% of these Cuban-Americans migrated to the United States, the remaining 40% are U.S.-born Cuban-Americans. Cuban-Americans are the most geographically concentrated Hispanic

group within the U.S. with just under 70% living in Florida. Cuban-Americans also tend to be older, with a media age of 40 (Motel and Patten 2012c).

Cuban-Americans also have the highest socioeconomic status of all Hispanic subgroups. The average earning per person is $25,000 a year. Additionally, 18% of Cuban-Americans live in poverty, which is significantly lower than the Hispanic population (25%). One-quarter of Cuban-Americans are lacking health insurance. Furthermore, 24% of Cuban-Americans over the age of 25 have at least a bachelors degree, which is the highest of all Hispanic groups and 58% of Cuban-Americans over the age of 5 are proficient in English (Motel and Patten 2012c).

Epidemiological Paradox and Assimilation

There are dramatic health inequalities between non-Hispanic whites and Hispanic subgroups. It is essential to more fully understand these race/ethnic disparities as the 2010 census showed that Hispanics accounted for more than a third the total population in the United States. Although, the causes of these health differences have not been fully examined in previous research, immigration status plays an important role.

Even though Hispanics appear to be a disadvantaged minority group, their better health outcomes made them advantaged when compared to other minority groups such as non-Hispanic blacks. Despite Hispanics having lower socioeconomic statuses and levels of education, they often have better health statuses in comparison to non-Hispanic whites. In 1986, Markides and Coreil realized this unique relationship between Hispanics and their positive health outcomes, which they described as the epidemiological paradox.

Research continues to find that the epidemiological paradox holds true for a variety of health outcomes such as infant mortality, adult mortality, and mental health. Hispanic infant mortality rates are 10% lower than non-Hispanic whites, even when taking into consideration migration (Hummer et al. 2007). Similarly, adult mortality rates for foreign-born Hispanics are 25% to 30% lower when compared to non-Hispanic whites. However, native-born Hispanics and non-Hispanic whites have little to no difference in adult mortality rates because this ethnic advantage disappears through generations (Eschbach et al. 2006). Hispanics, immigrants as well as first and second generation, fare significantly better than non-Hispanic whites in terms of mental health (Taningco 2007).

There are three common theories for the epidemiological paradox (Morales et al. 2002;Yang et al. 2009). First, there is the healthy migrant effect that states healthy people are more likely to migrate. As a result of this 'selection effect,' migrants tend to be both healthier and younger than the U.S. population as a whole. Secondly, the moribund migrant effect, otherwise known as the 'salmon bias,' hypothesizes that older, less healthy migrants return back to their countries of origin to pass away. This end of life emigration from the United States inflates the life expectancy rates of Hispanics because their deaths are not accounted for in U.S. data. Lastly, the acculturation hypothesis says immigrants' cultural norms protect them from the negative health outcomes associated with low socioeconomic status in the United States and as they become more integrated into U.S. society their heath outcomes will deteriorate; therefore, Hispanics will not keep their healthy advantages (Morales et al. 2002; Yang et al. 2009).

Assimilation is a key social science concept that explains the integration of ethnic newcomers into U.S. society (Alba and Nee 1997). However, over the past century social theorists have argued over exactly how immigrants are incorporated into host societies. Straight-line and segmented assimilation are the two main theories sociologists often refer to today. The theory of straight-line assimilation states that immigrants will gradually assimilate towards the host society's middle-class *over generations*. Each new generation will be more incorporated into the middle class than the previous generation (Alba and Nee 1997). In contrast, segmented assimilation argues that assimilation is generation based and there are three different possible outcomes: integration into the middle-class, assimilation into the underclass, or assimilation into the upper class (Zhou 1997).

Immigrants go through a process of assimilation upon arrival in a new host country. The process of assimilation is neither voluntary nor conscious but rather an outcome of immigrants and their families attempting to better their chances in society (Parrado and Morgan 2008). Assimilation is a progression that is generational, not merely individual (Alba and Nee 1997). Assimilation can occur in three separate aspects of life. Structural assimilation integrates these ethnic minorities into the host society's institutions such as education and government. Socioeconomic assimilation occurs as ethnic minorities being to obtain higher levels of educational attainment, occupational prestige, and income. Additionally, cultural assimilation includes obtaining the host society's language, clothing, and social norms (Arias 2001). However, assimilation in

one aspect of life does not imply assimilation in the other two (Parrado and Morgan 2008).

Overall, in the journey to become assimilated, progress is largely contingent upon human and financial capital immigrant parents bring, social conditions from which their families exit as well as the context that receives them, and their cultural patterns, including values, family relations, and social ties. (Zhou 2008) It is important to understand assimilation as it is an important factor when examining health disparities between Hispanics and non-Hispanic whites. Greater incorporation into U.S. society could have either a positive or negative effect on Hispanic health outcomes and the epidemiological paradox.

Obesity

Obesity has also captured the attention of researchers as it is a growing epidemic and greatly impacts other health outcomes. Some previous research has found that being overweight, especially when the fat is stored on the hips and thighs, can have a positive effect on some health outcomes such as healthier bone densities and decreased risk of cardiovascular and heart disease (Campos et al. 2005; Kirchengast et al. 2002). However, a majority of research has discovered that weight gain has a negative impact on health outcomes as it increases risk for cardiovascular disease, type 2 diabetes and mortality (Flegal et al. 2013; Behan and Cox 2010). Over the past 30 years, people with a Body Mass Index, of 30 or more nearly doubled for adults and tripled for children (Centers for Disease Control and Prevention 2012b). Body fat percentages are commonly measured

through Body Mass Index (BMI), which is correlated to body fat but does not directly measure it. BMI is calculated through an equation using a person's weight and height (weight (lb)/ [height (in)^2 x 703). A person with a BMI between 18.5 and 24.9 is considered to be healthy, between 25.0 and 29.9 is overweight, between 30 and 40 is obese and over 40 is chronically obese (Centers for Disease Control and Prevention 2012a).

More than one-third of the current adult population is obese. Increases in obesity rates are seen across racial/ethnic groups as well as people with varying socioeconomic and cultural statuses (Centers for Disease Control and Prevention 2012b). Chronic obesity, BMI over 40, is growing at rates significantly higher than those of moderate obesity. The increase of adults with BMI between 40 and 50 was twice as large as those with a BMI of 30. Adults with a BMI of 50 or higher grew three times faster when compared to adults with a BMI of 30 (Strum 2007). Health officials have taken this vast increase in obesity rates seriously, as evident by the General Surgeon's "Call of Action to Prevent and Decrease Overweight and Obesity" in 2001 (Centers for Disease Control and Prevention 2012b). It is important to understand the obesity epidemic as it has grave implications for the greater society. The Center for Disease Control estimated that health care costs related to obesity in 2008 were $174 billion (Centers for Disease Control and Prevention 2012b). It has been projected that if obesity continues to rise, it could account for 1 of every 6 dollars allocated to health care, which could amount to as much as $956.9 billion (Wang et al. 2008).

Although causes of obesity are extremely complex, previous research has determined several main factors that have helped create the current obesity epidemic (Philipson 2001; Stukard et al. 1990) First, it must be noted there are genetic and biological factors that can lead to obesity. Some research claims that the body is biologically oriented to overeat for survival in the future when there is a lack of food. Today, this biological instinct is still inherent even though overeating is no loner necessary for survival. As a result, people are constantly eating more energy than they can expend, leading to the obesity epidemic (Rosin 2008). Additionally, Stunkard et al. (1990) compared identical twins raised in the same environments versus those raised in different environments and found genetics do have an impact on BMI. However, despite this correlation, the obesity epidemic is growing too quickly to be attributed to genetics, which change at a slower rate (Philipson 2001). Consequently, modern obesity problems are mostly a product of the environment rather than biological or genetic factors.

There are four main factors that have altered the current environment leading it to foster an increasingly obese population. First, Americans are consuming larger amounts of food with higher levels of calories and sugar such as processed foods and soft drinks (Rolls 2003; Putnum et al. 2002). Secondly, these unhealthy foods are more readily available in supermarkets, fast food restaurants and vending machines and are relatively inexpensive resulting in their more readily being consumed in larger amounts (Rolls 2003; Wright and Aronne 2010). Prices of processed and sugary foods are increasing at a lower rate than produce, meat and dairy prices resulting in their greater levels of consumption (Putnum et al. 2002). Thirdly, there has been a subsequent decline in

physical activity as a result of technological advancements. In 2007, the Centers for Disease Control and Prevention predicted that only one-fifth of adults participate in the recommended amount of physical activity. People more frequently travel in cars rather than walk or ride a bike and leisure time today is often spent watching television or playing computer and video games (Anderson et al. 1998). Technological advances have also made daily tasks easier resulting in the use of fewer calories (Wright and Aronne 2012). As a result, Americans are taking in more energy than they expend thus leading to their weight gain. And finally, social networks have also been found to affect obesity rates as there is a positive correlation between various social relationships and weight gain (Christakis and Fowler 2007). A person who has an obese friend, sibling, or spouse has a 57%, 40%, and 37% higher chance of becoming obese, respectively, creating a chain reaction.

The obesity epidemic has not affected all parts of the U.S. population equally. Both Hispanics and immigrants have obesity rates that differ from the non-Hispanic white population. When compared to non-Hispanic whites, Hispanics' rates of obesity are 21% higher (Pan 2009). It has also been found that Hispanics' BMIs increase between the 1st and 2nd generation as well as between the 2nd and 3rd generation (Bates et al. 2008). Upon arriving to the United States, immigrants have lower rates of obesity as the BMIs of foreign-born Hispanics are lower in comparison to native-born Hispanics and non-Hispanic whites in the U.S. (Wen and Maloney 2011; Goel et al. 2004; Barcenas et al. 2007). Only 16% of immigrants were found to be obese compared to 22% of the U.S.-born population (Goel et al. 2004). However, length of residence has an enormous effect

on immigrant BMI levels (Wolin et al. 2009; Barcenas et al. 2007). Previous research has found Hispanic immigrants that have been here for fifteen years or more are four times as likely to be obese than recent immigrants who have resided in the U.S. for five or fewer years (Kaplan et al. 2004). It must be noted that immigrants living in the United States for fifteen or more years still have BMI levels lower than those of native-born Hispanics (Singh and Siahpush 2011; Kaplan et al. 2004).

The increasing rates of obesity over time among Hispanics and immigrants have been attributed to acculturation. Integration into U.S. culture changes their diet as well as levels of physical activity leading them to live a progressively unhealthy lifestyle (Seefeldt et al. 2002; Antecol and Bedard 2006). Once in the Untied States, immigrants go through "nutrition transition" as they start to adapt to the United States mainstream diet and take in larger amounts of saturated fats and carbohydrates which can lead to weight gain (Lin et al. 2003). Thus, the convergence of Hispanic and immigrant BMI levels to that of non-Hispanic whites provides evidence of cultural and environmental factors affecting the obesity epidemic.

Other demographic variables - gender, marital status, and geographic region of residence- have also been found to affect rates of obesity. Gender is of central importance as women are more likely to be obese and less likely to be overweight than men. Although previous research has identified this trend, reasoning has yet to be discussed (Wang and Beydoun 2007; Paeratakul et al. 2002). Marital status is important to consider because while entering marriage has minimal effect on men's health, it has negative effects on women's health as they are more likely to gain weight upon marrying (Sobal et

al. 2003). Lastly, regional differences exist in rates of obesity. Previous research has found that obesity prevalence can range from 13.3% to 30% across the country (Ford et al. 2005). The Centers for Disease Control and Prevention (2012a) found that the South has the highest rate (29.5%) followed by the Midwest (29.0%), the Northeast (25.3%), and the West (24.3%).

Socioeconomic variables – educational attainment, household income, occupation, and health insurance – also influence the prevalence of obesity. Previous research has documented the inverse relationship between educational attainment and weight. More specifically, the higher the education level, the lower the BMI (Martin et al. 2008). Wardle et al. (2002) also found a similar relationship as their findings showed that the earlier a person quit school the more likely they were to be obese yielding a "graded effect across years of education" (1301). People who end school earlier are also more prone to lower health outcomes since a low education often leads to a less prestigious occupations, lower employment rates, and low household incomes (Robbins et al. 2004; Haas et al. 2003; Martin et al. 2008). Employment and income are positively correlated with health outcomes because they allow people to receive benefits and resources to lead a healthier lifestyle (Subramanian and Kawachi 2004). Access to private health insurance is a major benefit employees often receive for themselves and their family. Private health insurance leads to better health outcomes as it allows people to gain access to more affordable preventative care and cures (Kasper et al. 2000).

Type 2 Diabetes

Type 2 diabetes is also a new focus within health research and, similar to obesity, its rates are increasing within the United States' population. Researchers are also interested in studying type 2 diabetes as it impacts other health outcomes such as higher mortality rates as well as increased risk for higher blood pressure, heart disease, strokes, and kidney failure (World Health Organization 2013a).

This research solely focuses on type 2 diabetes as opposed to type 1 diabetes. Type 2 diabetes is the most common type and can be developed at anytime throughout the lifecycle as a result of the body not efficiently using its insulin. Type 1 diabetes, on the other hand, is diagnosed in children and adolescents and occurs because their body is unable to produce insulin (National Diabetes Information Clearinghouse 2011).

The number of adults diagnosed more than tripled over the past 30 years. As a result, 8.3% of the adult population in the United States has type 2 diabetes and about 2 million more cases are diagnosed every year (Center for Disease Control and Prevention 2011). Increases in type 2 diabetes are seen across all age groups. However, adults 65 or older have the largest incidence of type 2 diabetes (26.9%) and children under the age of 20 have the lowest rates of type 2 diabetes (.26%) (American Diabetes Association 2011). Health officials have taken this steady increase in incidence of diabetes seriously, as is evident in the President's goal of *2010* to "through prevention programs, reduce the disease and economic burden of diabetes, and improve the quality of life for all persons who have or are at risk for diabetes" (Healthy People 2010 : 5-3). The type 2 diabetes epidemic has grave implications for the greater society as evident through the American Diabetes Association estimates that health care costs related to diabetes in 2007 were

$174 billion, $116 billion for direct medical costs and another $58 billion for indirect costs such as unemployment, disability, or premature mortality. It has been predicted that if type 2 diabetes continues to rise, rates could more than triple resulting in 1 of 3 adults having type 2 diabetes due to "an aging population more likely to develop type 2 diabetes, increases in minority groups that are at higher risk for type 2 diabetes, and people with diabetes living longer" (Centers for Disease Control and Prevention 2010).

Causes of type 2 diabetes are complicated, as previous research has determined many factors that contribute to the diagnosis of type 2 diabetes. Type 2 diabetes occurs when "the body's tissues are unable to sue its own limited amount of insulin effectively" (Healthy People 2010: 5-3). Recently, research has made major breakthroughs by discovering some genetic variants impact on the development of type 2 diabetes. A majority of the genetic linkages to development of type 2 diabetes occurs in the beta-cells, where insulin is stored and released (Billings and Florez 2010). It has been discovered that two basic functions lead to increased susceptibility of type 2 diabetes, reduced insulin secretion and insulin resistance. Reduced insulin secretion can occur as a result of reduced beta-cell mass and beta-cell dysfunction whereas insulin resistance is often a result of obesity (Feero and Guttmacher 2010).

Causes of type 2 diabetes can include various environmental factors in addition to genetic predisposition. However, just like obesity, the recent dramatic increase in incidence can not be attributed to genetics. The environmental factors that lead to development of type 2 diabetes, decreased physical activity and increased carbohydrate intake, are the same as those describes for obesity because obesity is a major trigger for

the disease (Hardeman et al. 2005; Boden and Shulman 2002). Previous research has found that the obese have larger concentrations of plasma free fatty acids (FFA). These acids have been positively correlated with insulin resistance which often results in onset of type 2 diabetes (Boden and Shulman 2002). As a result of obesity being a major cause of type 2 diabetes, rates of diabetes could be greatly reduced with increased physical activity and healthier dietary intake (Hardeman et al. 2005) Overall, many people are genetically susceptible to diabetes and as a result of current environmental factors such as decreased physical activity and increased carbohydrate intake, there is increased rates of obesity resulting in those previously susceptible to diabetes actually acquiring the disease (Kahn et al. 2006).

As with obesity, the type 2 diabetes epidemic has not affected all portions of American society equally. Non-Hispanic blacks have the highest rates of diabetes (12.6%) followed by Hispanics (11.8%) and non-Hispanic whites (7.1%). Additionally, Hispanic subgroups also vary in their rates of diabetes. The Cuban-Americans have significantly lower rate of type 2 diabetes at 7.6% when compared to Mexican-Americans (13.3%) and Puerto Ricans (13.8%) (American Diabetes Association 2011). These racial/ethnic disparities have been attributed to access to healthcare as minority groups often lack health insurance, means of proper transportation, and are confronted with language barriers which impede their ability to receive proper information about diabetes prevention (Coronado et al. 577). Type 2 diabetes has been found to be higher among the foreign-born population, although limited research has not determined the causes (Cunningham et al. 2008). This finding is interesting because it goes against the

epidemiological paradox. It has also been found that type 2 diabetes prevalence increases with duration even when controlling for age and obesity (Oza-Frank et al. 2011). Foreign-born Mexicans have higher risk of type 2 diabetes than native-born Mexicans. When taking duration into consideration, foreign-born Mexicans in the United States for more than 20 years have a higher chance of getting diabetes when compared to those in the U.S. for less than 20 years (Oza-Frank et al. 2012). However, other research discovered a negative relationship between Hispanics level of acculturation and incidence of diabetes due to the less acculturated being "more likely to be without a routine place for health care, have no health insurance, and have low levels of education" (Mainous et al. 2006: 63). Thus, it is evident more research is needed to fully determine risk of diabetes among the immigrant population within the United States.

Certain demographic variables - gender, marital status, and geographic region of residence- also influence incidence of diabetes. Type 2 diabetes use to be more prevalent in women than men. However, today, with changing environmental factors, this gender gap is quickly closing (Gale and Gillespie 2001). Previous research has also found marriage brings a decreased likelihood of developing type 2 diabetes due to the decreased amount of stress (Azimi-Nezhard et al. 2008). Lastly, regional differences do exist in incidence of diabetes, which range from 5.2% to 11.3% among all the states. The highest rates of type 2 diabetes are in the South as many counties have rates of about 10.6%. (Centers for Disease Control and Prevention 2012c).

Socioeconomic variables – educational attainment, family income, occupation, and health insurance- also affect incidence of type 2 diabetes. Previous research has

found an inverse relationship between educational attainment and prevalence of type 2 diabetes (Robbins et al. 2004). However, over the past 20 years, incidence of type 2 diabetes has risen significantly for all levels of education (Centers for Disease Control and Prevention 2012c). As previously mentioned, educational attainment directly effects employment and family income and therefore greatly determines available resources such as health insurance (Subramanian and Kawachi 2004). Access to private health insurance allows for people to more readily and easily take part in more affordable preventative care and cures (Kasper et al. 2000).

Chapter 3
Data and Methods

This research explores the rates of obesity and incidence of diabetes among various Hispanic subgroups ---Mexican-Americans, Puerto Ricans, Cuban-Americans and other Hispanics --- as well as non-Hispanic whites and non-Hispanic blacks. The data for this research comes from the National Health Interview Survey (NHIS) (http://www.cdc.gov/nchs/nhis. htm). Since 1957, the National Center for Health Statistics has administered the NHIS to collect health related data through household interviews continuously every year. NHIS is a nationally representative sample as it includes data from every state as well as Washington D.C. Blacks and Hispanics have been over sampled in the NHIS since 1995. The data specifically comes from the Sample Adult File Supplement, Sample Person Supplement, and Sample Family Supplement of the NHIS. Data was merged from these three samples for years 2008-2011 resulting in a sample size of 52,585. This research only includes respondents ages 20-64. I limit my sample to adults 20-64 because respondents under 20 and over 65 have other characteristics that make their rates of obesity and incidence of type 2 diabetes different. According to the Center for Disease Control and Prevention (2010), 18% of both children and adolescents are obese. Although adults 65 and older (34.6%) have a similar rate of obesity as compared to adults ages 20-64 (35.7%), but the obesity rates of adults 65 and older are predicted to grow faster due to Americans living longer and the shifting age distribution. Additionally, children under the age of 20 have the lowest rate of type 2 diabetes (.26%) and adults over 65 have the largest incidence of type 2 diabetes (26.9%)

(American Diabetes Association 2011). This research excludes Asian-Americans as well as people who responded "other" for race/ethnicity.

Variables

This research has two dependent variables, obesity and type 2 diabetes. Obesity is measured by three categories healthy (BMI less than 25), overweight (BMI equal to or greater than 25 and less than 30), and obese (BMI equal to or greater than 30). Respondents were asked their weight and height and NHIS computed their BMI. Using BMI to determine obesity is problematic because it does not properly account for those who weigh more due to their excess muscle mass, such as athletes. However, respondents who have high BMIs as a result of their high muscle mass probably account for a small percentage of the overall sample. Type 2 diabetes is measured in two categories, the respondent either does or does not have diabetes in response to the question, "Has a doctor ever told the respondent he/she has diabetes?"

The independent variable is the respondents' race/ethnicity. This research analysis four Hispanic subgroups: Mexican-Americans, Cuban-Americans, Puerto Ricans (mainland), and Other Hispanics. Other Hispanics includes respondents who claimed identities from other countries in the Caribbean and Central/South America. In addition, non-Hispanic whites, the reference group, and non-Hispanic blacks, are included for comparison.

This research also takes into account the impact of various immigration variables in order to explore the impact of assimilation on the primary relationship. First, I measure

the effect of nativity, whether the respondent is foreign-born or born in the United States. In the next model, duration is included in the analysis. Duration is measured in three categories: less than five years, five to nine years, and ten or more years. Lastly, the nativity and duration variables are removed and replaced with a naturalization variable that I created to better measure levels of assimilation as well as the epidemiological paradox. This variable includes seven categories taking into consideration immigration, duration, and citizenship (Lopez-Gonzalez et al. 2005). These multiple categories offer a more nuanced assessment of possible assimilation and its impact on health outcomes including obesity and type 2 diabetes (Akresh 2008; Kandula et al. 2008; Goel et al. 2004; Roshania et al. 2008).

Various demographic and socioeconomic variables are included as controls. The demographic variables used are gender, marital status, and geographic region of residence. Gender is a bivariate variable with the categories male and female. The variable marital status separates respondents into those who are married, widowed, divorced or separated, and never married. Finally, geographic region is measured by states in the Northeast, South, Midwest, and West.

The socioeconomic variables accounted for are educational attainment, family income, occupation and health insurance. The respondents' level of education is measured in five categories ranging from "up to 8th grade" to "college degree and beyond." Additionally, family income was created into a categorical variable with five different categories: less than $35,000, $35,000 to $49,999, $50,000 to $74,999, $75,000 to $99,999 and $100,000 and more. Occupation is divided in various different categories

such as employed-fulltime, employed part time, unemployed, or not working. The three categories for the variable health insurance are respondents who reported having private insurance, miscellaneous government insurance, or no insurance. Finally, in the diabetes model, obesity is also considered as a control variable.

Analysis

Cross-tabulations are presented in table 1 to display the demographic and socioeconomic characteristics of each race/ethnic group. To analyze the relationship between race/ethnicity and rates of obesity, a multinomial logistic regression is utilized to show the statistical significance between the variables (Table 2). This is an appropriate method because there are multiple categories in the dependent variable. Incidence of diabetes and race/ethnicity, on the other hand, is explored by a binomial logistic regression since there are only two outcomes in the dependent variable (Table 3). Each analysis, that of obesity and type 2 diabetes, consist of six progressively built models as "progressive adjustment constitutes the single most valuable procedure for explaining associations since it peels away the layered components of an association" (Mirowsky 1999: 144). The statistical program SAS-callable SUDAAN is also used to analyze the data and check for sampling bias within NHIS.

Chapter 4
Descriptive Results

Table 1 details the descriptive analysis of the data for this research. Cross-tabulations are displayed to analyze the demographic and socioeconomic qualities of race/ethnicity. This table allows the relationship between all variables of interest and each individual race/ethnic group to be analyzed and more fully understood.

The cross-tabulations present patterns between race/ethnicity and both obesity and diabetes, which are strong and consistent with previous literature (American Diabetes Association 2011; PAN 2009). More Mexican-American respondents are overweight (38.9%) and obese (37.7%) as opposed to a healthy weight (23.4%). Similarly, more Puerto Rican respondents are also more likely to be overweight (36.4%) and obese (37.9%) than a normal weight (25.7%). On the other hand, 30.5% of Cubans are obese, while 35% and 34% of Cuban respondents are overweight and a healthy weight, respectively. Moreover other Hispanics are also overweight (38.9%) as opposed to a healthy weight (33%) or obese (28.1%). In comparison, about 35% of non-Hispanic whites are a normal weight, while the other 34% and 31% are overweight or obese, respectively. Non-Hispanic blacks have the highest obesity rate of 44% while about 33% are overweight and only 23% are a healthy weight. These results are consistent with previous research that has found Hispanics and non-Hispanic blacks have higher rates of obesity when compared to non-Hispanic whites (Pan 2009).

The descriptive statistics also indicate there is a pattern between race/ethnicity and diabetes. Puerto Ricans have the highest rate of type 2 diabetes of just over 21%,

while Mexican-Americans have next highest incidence of diabetes of 9.3%. Additionally Cuban-Americans (8.0%) have a slightly higher rate than non-Hispanic whites (7.0%). Other Hispanics have the lowest occurrences of type 2 diabetes with only 6.7% of the population claiming to have the disease. Lastly, non-Hispanic blacks (11.2%) also have high incidence of type 2 diabetes. These results are consistent with previous findings that state within the Hispanic population, Puerto Ricans have the highest rate of type 2 diabetes and Cubans have one of the lowest rates (National Diabetes Information Clearinghouse 2011a).

Immigration status varies greatly by race/ethnicity. Almost 40% of all Mexican origin respondents are foreign-born while just over a quarter of Cuban-Americans were not born in the United States. A majority of other Hispanics (95.3%) were also not born in the United States. In contrast, virtually all Puerto Ricans are considered native born due to their commonwealth status. A majority of Non-Hispanic whites and non- Hispanic blacks were also born in the United States. A majority of the foreign-born Other Hispanics (72.2%) and non-Hispanic whites (79.2%) have been in the United States for less than five years. Where as a majority of Mexican Americans (76.4%), Cuban Americans (71.7%), non-Hispanic blacks (71.5%) and Puerto Ricans (66.7%) born outside of the U.S. have been in the country for more than nine years. Additionally, just over half of the foreign-born Cuban American respondents are citizens while only 29.3% of the foreign-born Mexican American respondents have become citizens. These combination of these three variables make it apparent that Mexican Americans naturalize

TABLE 1

Percentages of Obesity, Diabetes, Immigration, Demographic, and Socioeconomic Variables by Race/Ethnicity in the United States, Adults Aged 25-64, 2008-2011

	Mexican American	Puerto Rican	Cuban American	Other Hispanic	Non-Hispanic White	Non-Hispanic Black
Dependent Variables						
Obesity						
Healthy	23.4	25.7	34.4	33	35.1	23
Overweight	38.9	36.4	35.1	38.9	33.9	32.9
Obese	37.7	37.9	30.5	28.1	31	44.1
Unknown	3.8	2.9	3.2	3.2	3.5	3.8
Incidences of Diabetes						
Yes	9.3	21.3	8.0	6.7	7.0	11.2
No	90.6	87.7	92.0	93.2	93.0	88.8
Unknown	0.1	0.0	0.0	0.1	0.1	0.1
Immigration Status						
Nativity						
U.S. born	39.5	96.4*	26.4	24.5	95.3	89.3
Foreign born	60.5	3.6*	73.6	75.5	4.7	10.8
Duration for Foreign Born						
Less than 5 Years	6.4	7.7*	12.8	8.5	9.3	10.0
5 to 9 Years	15.4	25.6*	15.6	18.3	10.1	17.9
More than 9 Years	76.4	66.7*	71.7	72.2	79.2	71.5
Unknown	1.8	0*	0.0	1.0	1.4	0.6
Citizenship for Foreign Born						
Citizen	29.3	**	53.0	37.4	64.4	52.8
Noncitizen	73.2	**	47.0	62.1	35.3	46.9
Unknown	1.0	**	0.0	0.5	0.3	0.3

TABLE 1 CONTINUED

	Mexican American	Puerto Rican	Cuban American	Other Hispanic	Non-Hispanic White	Non-Hispanic Black
Demographic Variables						
Sex						
Male	46.6	37.9	45.6	43.3	47.0	39.5
Female	53.4	62.1	54.4	56.7	53.0	60.5
Marital Status						
Married	64.4	45.7	58.0	56.0	60.8	34.3
Widowed	2.0	2.3	2.8	2.3	2.7	3.6
Divorced or Seperated	16.4	23.0	22.9	21.0	19.3	25.4
Never married	17.0	28.6	16.1	20.4	17.0	36.2
Region of country						
Northeast	2.5	55.5	6.7	29.0	16.9	15.8
Midwest	10.7	9.8	2.5	4.2	28.7	18.6
South	32.6	26.8	84.6	36.0	33.4	55.0
West	54.2	8.0	6.2	30.8	21.0	10.6
Socioeconomic Variables						
Education						
Up to 8th grade	24.6	9.7	5.1	18.4	1.5	2.5
Some high school	19.5	16.7	8.7	13.7	5.5	12.8
High school degree	24.9	27.9	28.0	23.6	25.1	27.7
Some college	13.2	16.3	15.6	15.2	19.2	23.1
College degree and beyond	17.0	28.8	42.4	29.0	48.4	33.4
Unknown	0.8	0.5	0.2	0.9	0.1	0.3
Household Income						
$0-$34,999	50.0	49.3	42.9	48.2	25.8	50.3
$35,000-$49,999	16.6	16.1	12.6	17.6	13.3	14.3
$50,000-$74,999	14.4	14.4	15.6	14.3	18.9	15.1

TABLE 1 CONTINUED

	Mexican American	Puerto Rican	Cuban American	Other Hispanic	Non-Hispanic White	Non-Hispanic Black
$75,000-$99,999	7.2	7.8	8.9	7.5	13.2	7.5
$100,000 and over	7.4	8.7	13.1	8.3	23.3	8.1
Income not reported	4.5	3.7	6.9	4.2	5.6	4.8
Employment Status						
Employed full time	47.5	43.2	53.0	49.9	52.7	46.8
Employed part time	19.2	17.7	14.7	21.3	18.1	17.0
Unemployed	7.4	8.1	10.3	8.0	4.8	9.4
Homemaker, taking care of children	14.4	8.2	7.8	8.9	6.3	3.8
Not-working (school, retired, or disabled)	7.0	17.8	8.3	6.3	13.2	17.7
Unknown	4.6	5.0	6.2	5.8	5.0	5.5
Insurance						
Private	39.5	47.2	50.5	41.6	73.1	52.4
Public	16.1	33.9	14.2	17.6	12.1	25.2
Not Covered	44.4	18.9	35.3	40.8	14.9	22.4

n = 52, 585

* U.S. born and foreign born for Puerto Ricans refers to birth on the mainland and in Puerto Rico

** All Puerto Ricans are U.S. citizens

Source: National Health Interview Survey, Person and Household-Level Data Files, 2008-2009.

at a slower rate in comparison to the other Hispanic subgroups, which is consistent with previous literature (Fix et al. 2003).

The crosstabs also include the demographic variables, sex, marital status, and geographic region, of the respondents. These descriptive results also show that all race/ethnic groups have more women then men. The greatest difference between the two sexes is seen within Puerto Ricans respondents where 62% are female and the other 38% are male. Non-Hispanic blacks have the second biggest divide where 60.5% of their population are female and the other 39.5% are male. Other Hispanics have a lower distribution as 57% are women and 43% are men. Cuban Americans have a slightly smaller gap, 54% female and 46% male. Non-Hispanic whites and Mexican Americans have the lowest distribution, 53% are female and 47% are male.

Additionally, marital status differs among the race/ethnic groups. All groups except non-Hispanic blacks are more likely to be married. Mexican-Americans (64.4%) have the greatest percentage of people who are married. About 17% of Mexican-Americans are divorced/widowed and another 17% have never been married. While only about 45% of Puerto Rican respondents are married, Puerto Rican respondents have one of the highest rates of people who have never been married (28.6%). Cubans and non-Hispanic whites have very similar marital statuses. A majority of Cubans (58%) and non-Hispanic whites (60.8%) are married while only about 16.5% have never been married. Only 34% of non-Hispanic blacks are married, which is significantly lower than all other ethnic groups. They are also the only group that has a greater percentage of people who have never been married (36%) compared to those who are married. Raley et al. (2004)

associate Mexican Americans' higher rate of marriage to certain aspects of Mexican culture that encourage marriage especially among the young immigrant population.

Furthermore, the descriptive statistics show how race/ethnic groups are regionally concentrated. A majority of Mexicans (54.2%) live in the west. About another 30% live in the south and 10% live in the Midwest. These distributions are consistent with previous literature that has found that traditionally a majority of Mexicans reside in the California and Texas, however, the South and Midwest are becoming popular new destinations for this ethnic group as more manufacturing jobs are becoming available. Puerto Ricans also have a highly concentrated population with 55.5% living in the Northeast. This also supports previous research that has found that a majority of Puerto Ricans reside in New York. Moreover, about 85% of Cubans live in the South, which is parallels previous findings that show a majority of Cubans live in Florida. Previous research supports these findings because although new immigrant destinations, the South and Midwest, are arising Mexicans, Puerto Ricans, and Cubans are still regionally concentrated (Leach and Bean 2008; Light and von Scheven 2008; McConnell 2008; Passell et al. 2011)

Socioeconomic variables also display how the different Hispanic subgroups differ from each other as well as non-Hispanic whites. Educational attainment within these race/ethnic groups varies greatly. Mexican American respondents (24.6%) and other Hispanic respondent (18.4%) have a significantly larger percentage of people who have only received education up to the eight grade. About 28% of Puerto Rican, Cuban American, and non-Hispanic black respondents quit school after completing high school.

Additionally, only 17% of Mexican American respondents have received at least a college degree, which is the lowest rate of all the race/ethnic groups. Cuban respondents (42.4%) and non-Hispanic white respondents (48.4%) have the highest rates of college completion. About 29% of both Puerto Rican respondents and other Hispanic respondents have received at least a college degree. These findings are consistent with previous literature that has found Mexican Americans have low levels of educational attainment while Cubans tend to be the most educated Hispanic subgroup (National Research Council 2006).

Moreover, the crosstabs also show patterns between race/ethnicity and household income. About 50% of Mexican American, Puerto Ricans, other Hispanics, and non-Hispanic blacks have annual household incomes between $0 to $34,999. However, only 26% of non-Hispanic whites have annual household incomes of $0 to $34,999. Cuban (13.1%) and non-Hispanic whites (23.3%) have the largest percentage of respondents that make $100,000 or more annually. In contrast, only about 8% of Mexican American, Puerto Rican, other Hispanic, and non-Hispanic black respondents earn $100,000 or more annually. These results are consistent with previous research that has found the average earning for Mexican Americans, Puerto Ricans, and Cuban Americans to be around $20,000 (Motel and Patten 2012a; Motel and Patten 2012b; Motel and Patten 2012c).

Employment status also varies by race/ethnicity. About 47.5% of Mexican American respondents are employed full time. Another 19% are employed part time and 7.4% of Mexican American respondents are not employed. Puerto Ricans have similar employment status, as 43.2% are employed full time and 17.7% are employed part time.

However, Puerto Rican respondents recorded a much higher rate of not-working (17.8%) than any other Hispanic subgroup. Cuban respondents reported the highest percentage of full time employment (53%) and the lowest percentage of part time employment (14.7%) in comparison to the other race/ethnic groups. However, Cuban respondents also have the highest rates of unemployment (10.3%). Moreover, about 50% of other Hispanic respondents have full time employment with an additional 21% working part time. Non-Hispanic white respondents have one of the highest rates of full time employment (52.7%) as well as the lowest rate of unemployment (4.8%). Lastly, a low percentage of non-Hispanic black respondents are employed full time (46.8%) while relatively high percentages are unemployed (9.4%) or not-working (17.7%). Previous literature has found that Hispanics as a group overall have lower employment rates when compared to non-Hispanic whites as immigrants and their offspring are often low-skilled and assimilate to the "underclass" making it harder for them to find employment (Waldinger et al. 2007).

Furthermore, there are large disparities in type of health insurance coverage among these race/ethnic groups. Mexican American respondents have the lowest percentage covered by private health insurance (39.5%) and the highest percentage not covered by any health insurance (44.4%). Furthermore, 19% of Puerto Rican respondents are not covered by health insurance, which is the lowest rate of all Hispanic subgroups as they are citizens resulting in their having access to public health insurance. Additionally, other Hispanics, similar to Mexican Americans, also have low percentage covered by private health insurance (42%) and a high percentage not covered (41%). Non-Hispanic

whites have the highest percentage covered by health insurance with about 73% having private insurance. Hispanics' low rate of insurance coverage has been associated with their low employment status as many Americans receive health insurance through their jobs (Angel and Angel 1996). Over all, Mexican Americans and Puerto Ricans have lower socioeconomic statuses when compared to Cuban Americans. Cuban Americans' socioeconomic profile, of all Hispanic subgroups, is closest to non-Hispanic whites.

Chapter 5
Results for Rates of Obesity and Incidence of Diabetes

Rates of Obesity

Table 2 displays multinomial logistic regression coefficients represented through odds ratios that show the relationship between race/ethnicity and rates of obesity within six different models. Odds ratios less than one indicate the race/ethnicity is less likely to be overweight or obese as compared to non-Hispanic whites, the reference group. Odds ratios greater than one indicate the group is more likely to be overweight or obese than non-Hispanic whites.

Model 1 examines the association between race/ethnicity and rates of obesity. The results show that Mexican Americans (odds ratio = 1.69) as compared to non-Hispanic whites are more likely to be overweight than a normal or healthy weight. Puerto Ricans (odds ratio = 1.54) relative to non-Hispanic whites are also more likely to be overweight as opposed to a healthy weight. Additionally, Mexican Americans and Puerto Ricans are about 80% more likely than non-Hispanic whites to be obese as opposed to a normal weight. Cubans, on the other hand, do not have statistically different rates of being overweight or obese in comparison to non-Hispanic whites. Other Hispanics (odds ratio = 1.23) relative to non-Hispanic whites are more likely to be overweight than a healthy weight. Cubans, on the other hand, do not have statistically different rates of being overweight or obese in comparison to non-Hispanic whites. As suggested in previous literature, Hispanics are more obese than the non-Hispanic white population in the United States (Pan 2009). In this model, it becomes evident that there are initial race/ethnic

TABLE 2
Odds Ratios Depicting the Relationship Between Race/Ethnicity, Obesity, Immigration, and Socioeconomic Factors, U.S. Adults Aged 25-64, 2008-2011

	Model 1		Model 2		Model 3	
	Overweight [Reference = Healthy]	Obese [Reference = Healthy]	Overweight [Reference = Healthy]	Obese [Reference = Healthy]	Overweight [Reference = Healthy]	Obese [Reference = Healthy]
Race/ethnicity [Non-Hispanic White]						
Mexican American	1.69 ***	1.84 ***	1.88 ***	2.14 ***	2.07 ***	2.91 ***
Puerto Rican	1.54 ***	1.80 ***	2.02 ***	2.37 ***	2.01 ***	2.34 ***
Cuban	1.04	1.02	1.35	1.29	1.49	1.89 **
Other Hispanic	1.23 ***	0.95	1.42 ***	1.14	1.59 ***	1.69 ***
Non-Hispanic Black	1.49 ***	2.16 ***	1.80 ***	2.36 ***	1.82 ***	2.46 ***
Nativity [Foreign Born]						
U.S. Born					1.26 ***	1.94 ***
Duration [Foreign Born]						
Less than Five Years						
Five to Nine Years						
Ten or More Years						
Duration and Citizenship [US Born]						
Less than Five Years and Citizen						
Less than Five Years and Noncitizen						
Five to Nine Years and Citizen						
Five to Nine Years and Noncitizen						
Ten or More Years and Citizen						
Sex [Male]						
Female			2.56 ***	1.50 ***	2.56 ***	1.50 ***
Marital Status [Married]						
Widowed			1.45 **	1.85 ***	1.44 **	1.83 ***
Divorced or Separated			1.06	1.18 **	1.06	1.16 *
Never Married			0.81 ***	0.96 **	0.80 ***	0.94 ***
Country Region [Northeast]						
Midwest			1.19 **	1.43 ***	1.18 *	1.38 ***
South			1.05	1.29 ***	1.04	1.25 ***
West			1.02	1.03	1.02	1.01

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

TABLE 2 CONTINUED

	Model 1		Model 2		Model 3	
	Overweight [Reference = Healthy]	Obese	Overweight [Reference = Healthy]	Obese	Overweight [Reference = Healthy]	Obese
Education [College and Beyond]						
Up to 8th Grade						
Some High School						
High School Degree						
Some College						
Unknown						
Household Income [$50,000 to $74,999]						
Less than $35,000						
$35,000 to $49,000						
$75,000 to $99,000						
More than $100,000						
Employment Status [Employed Full Time]						
Employed Part-time						
Unemployed						
Not Working (School, Retired, or Disabled)						
Health Insurance [Private]						
Miscellaneous Government						
Not Covered						
N = 52,585						
-2LL (Intercept Only)	115518.96		115518.96		115518.96	
-2LL (Full Model)	114719.72		112740.54		112533.52	
Chi- Squared	799.24		2778.42		2985.44	
Degrees of Freedom	10		24		26	

*** p < 0.001; ** p , 0.01; * p < 0.05

TABLE 2 CONTINUED

	Model 4		Model 5		Model 6	
	Overweight	Obese	Overweight	Obese	Overweight	Obese
	[Reference = Healthy]		[Reference = Healthy]		[Reference = Healthy]	
Race/ethnicity [Non-Hispanic White]						
Mexican American	1.86 ***	2.62 ***	2.07 ***	2.84 ***	1.99 ***	2.50 ***
Puerto Rican	1.73 ***	2.27 ***	2.08 ***	2.79 ***	2.00 ***	2.40 ***
Cuban	1.14	1.42 *	1.48	1.89 *	1.48	1.87 *
Other Hispanic	1.42 ***	1.49 ***	1.61 ***	1.68 ***	1.57 ***	1.55 ***
Non-Hispanic Black	1.70 ***	2.30 ***	1.82 ***	2.46 ***	1.79 ***	2.24 ***
Nativity [Foreign Born]						
U.S. Born						
Duration [Foreign Born]						
Less than Five Years	0.65 ***	0.36 ***				
Five to Nine Years	0.68 ***	0.40 ***				
Ten or More Years	0.97	0.66 ***				
Duration and Citizenship [US Born]						
Less than Five Years and Citizen			1.65	0.91 *	1.64	0.87 *
Less than Five Years and Noncitizen			0.82 ***	0.46 ***	0.89 **	0.49 ***
Five to Nine Years and Citizen			1.41	0.52 ***	1.46	0.56 ***
Five to Nine Years and Noncitizen			0.77 ***	0.49 ***	0.82 ***	0.51 ***
Ten or More Years and Citizen			1.10	0.80 ***	1.09	0.72 ***
Ten or More Years and Noncitizen			0.97	0.70 ***	1.12	0.77 ***
Sex [Male]						
Female	2.44 ***	1.42 ***	2.57 ***	1.50 ***	2.47 ***	1.44 ***
Marital Status [Married]						
Widowed	1.23 **	1.57 ***	1.43 **	1.82 ***	1.28 *	1.48 **
Divorced or Separated	0.98	1.08 *	1.05	1.16 *	1.03	0.99 *
Never Married	0.75 ***	0.88 ***	0.81 ***	0.95 ***	0.81 ***	0.87 ***
Country Region [Northeast]						
Midwest	1.10 *	1.27 ***	1.19 *	1.38 ***	1.17 *	1.33 ***
South	0.97	1.16 ***	1.05	1.26 ***	1.04	1.23 **
West	0.94	0.92	1.02	1.01	1.03	1.01

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

TABLE 2 CONTINUED

	Model 4		Model 5		Model 6	
	Overweight	Obese	Overweight	Obese	Overweight	Obese
	[Reference = Healthy]		[Reference = Healthy]		[Reference = Healthy]	
Education [College and Beyond]						
Up to 8th Grade					1.64 ***	2.03 ***
Some High School					1.33 ***	1.68 ***
High School Degree					1.35 ***	1.67 ***
Some College					1.31 ***	1.59 ***
Household Income [$50,000 to $74,999]						
Less than $35,000					1.02	1.08
$35,000 to $49,999					1.09	1.11
$75,000 to $99,000					1.12	1.01
More than $100,000					0.96 **	0.77 ***
Employment Status [Employed Full Time]						
Employed Part-time					0.91 ***	0.88 ***
Homemaker					0.90 ***	0.86 ***
Unemployed					1.03	1.01
Not Working (School, Retired, or Disabled)					1.07	1.26 **
Health Insurance [Private]						
Miscellaneous Government					1.09	0.91 ***
Not Covered					1.29 ***	0.90 ***
N= 52,585						
-2LL (Intercept Only)		115518.96		115518.96		115518.96
-2LL (Full Model)		112482.35		112470.57		111532.43
Chi-Square		3036.61		3048.39		3986.53
Degrees of Freedom		30		36		64

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

disparities in rates of obesity.

Model 2 controls for the demographic variables of sex, marital status, and country region in the relationship between race/ethnicity and rates of obesity. There is an incredibly significant relationship between sex and weight. Women as compared to men are two and a half times more likely to be overweight and 50% more likely to be obese than being a normal weight. These sex differences in overweight and obesity have been found in previous research (Wang and Beydoun 2007; Reither 2009). When compared to married respondents, widowed respondents (odds ratio = 1.45) are more likely to be overweight than a normal weight. Respondents who are both widowed (odds ratio = 1.85) and divorced/separated (odds ratio = 1.18) as compared to married respondents are more likely to be obese. These results also support previous literature which documents that marital status can greatly affect health outcomes as the role of a spouse can be connected to positive health outcomes (Sobal et al. 2002). However the results for respondents who were never married go against Sobal et al.'s findings as they were 19% and 4% less likely than married respondents to be overweight and obese respectively than a normal weight. Furthermore, there are differences in reported weight in the region of the country the respondents live. Respondents in the Midwest in comparison to respondents in the Northeast are 19% more likely to be overweight than a normal weight. When compared to respondents in the Northeast, respondents in both the Midwest (odds ratio = 1.43) and South (odds ratio = 1.29) are more likely to be obese than overweight. These regional differences in obesity are similar to previous findings that state the highest obesity rates are in the South and Midwest (Centers for Disease Control and Prevention 2012).

The findings also display that with the addition of these demographic variables, Mexican Americans (odds ratios = 1.88 and 2.14) relative to non-Hispanic whites are more likely to be overweight and obese respectively than a normal weight. When compared to the reference group, Puerto Ricans are 2 times and 2.37 times are also more likely to be overweight and obese respectively as opposed to a healthy weight. Again, Cubans do not have statistically different rates of being overweight and obese when compared to non-Hispanic whites.

Model 3 controls for nativity in the relationship between race/ethnicity and rates of obesity. The epidemiological paradox indicates that when immigrants arrive to the United States, they have lower rates of obesity. These lower rates of obesity have been attributed to the 'selection effect' resulting in migrants being both healthier and younger than the U.S. population (Wen and Maloney 2011; Goel et al. 2004; Barcenas et al. 2007). Similar to existing studies on the epidemiological paradox, these results show that U.S. born respondents are 26% more likely to be overweight and almost 2 times more likely to be obese than a normal weight when compared to foreign-born respondents.

The results show that with the addition of the nativity variable, Mexican Americans when compared to non-Hispanic whites are now two times more likely to be overweight and almost three times more likely to be obese than be a normal weight. Additionally, Puerto Ricans (odds ration = 2.01 and 2.34), relative to non-Hispanic whites, are more likely to be overweight and obese respectively as opposed to be a healthy weight. Interestingly, for the first time, Cubans yielded a statistically significant outcome. Cubans as compared to non-Hispanic whites are about 90% more likely to be

obese than a normal weight. When compared to non-Hispanic whites, Other Hispanics are about 60% more likely to be overweight and about 70% more likely to be obese than a normal weight. Moreover, non-Hispanic blacks (odds ratio = 1.82 and 2.46) are more likely to be overweight and obese respectively.

Model 4 takes the nativity variable and provides more nuance as the duration, or length of time, of the foreign born in United States is considered. Foreign-born respondents in the United States for less than five years (odds ratio = 0.65) and five to nine years (odds ratio = 0.68) are less likely to be overweight than a healthy weight in comparison to native born respondents. However, foreign –born respondents are in the United States for at least 10 years they are no longer statistically difference from native born respondents in regards to both being overweight When compared to the reference group, foreign-born respondents are about 64% and 60% less likely to be overweight and obese respectively than a normal weight. When the foreign born respondents are in the United States for at least ten years, they are only 34% less likely to be obese than a healthy weight. Similar to nativity, the duration results also supports the epidemiological paradox because they explicitly show the longer immigrants reside in the United States, the more likely they are to be obese or overweight (Kaplan et al. 2004; Singh and Siahpush 2011).

When taking duration into consideration, those respondents of Mexican origin (odds ratio = 2.07) relative to non-Hispanic whites are more likely to be overweight as opposed to a normal weight. Additionally, Mexican Americans are 2.8 times more likely than the reference group to be obese than a healthy weight. When compared to non-

Hispanic whites, Puerto Ricans (odds ratio =12.08) are also more likely to be overweight than a normal weight. Moreover, Puerto Ricans and non-Hispanic blacks are 2.7 times more likely to be obese as opposed to a healthy weight. Other Hispanics, in comparison to the reference group, are about 60% more likely to be overweight than a normal weight. Lastly, Cubans (odds ratio = 1.89) and Other Hispanics (odds ratio = 1.68) relative to non-Hispanic whites are also more likely to be obese as opposed to a normal weight.

Model 5 builds off the previous two models by combining nativity and duration with naturalization, or citizenship status, to create an immigrant assimilation variable. Foreign-born noncitizen respondents in the U.S. for less than five years (odds ratio = 0.82) as well as foreign-born noncitizen respondents in the U.S. for five to nine years (odds ratio = 0.49) in comparison to U.S. born respondents are less likely to be obese than a healthy weight. The difference in rates of being overweight between foreign-born respondents who became citizens and U.S. born respondents is statistically insignificant, regardless of duration. When compared to U.S. born respondents, foreign-born respondents who became citizens and have been in the United States for less than five years (odds ratio = 0.91) and five to nine years (odds ratio = 0.52) are less likely to be obese as opposed to a normal weight. However, foreign-born respondents who are citizens are only 20% less likely to be obese than a healthy weight. Foreign-born respondents who have not become citizens and have been in the United States for less than five years and five to nine years, on the other hand, are 54% and 51%, respectively, less likely to be obese than a healthy weight. Foreign-born respondents who are not citizens are 30% less likely to be obese. These are consistent with previous literature that

shows assimilation into the U.S. mainstream society negatively effects immigrants weight as the being to lead progressively unhealthy lives by developing less healthy diets as well as reducing their level of physical activity (Seefeldt et al. 2002; Antecol and Bedard 2006).

The inclusion of the assimilation variable into the model increases the race/ethnic disparities in regards to rates of obesity. Mexicans and Puerto Ricans when compared to non-Hispanic whites are both about 2 times more likely to be overweight and around 2.8 times more likely to be obese than a normal weight. Cubans (odds ratio = 1.89), on the other hand, are only more likely to be obese. Other Hispanics in comparison to the reference group are about 60% more likely to be overweight and about 70% more likely obese. Additionally, non-Hispanic blacks (odds ratio = 1.82 and 2.46) when compared to non-Hispanic whites are more likely to be overweight and obese respectively.

Lastly, model 6 includes the socioeconomic variables of education, household income, employment status, and health insurance and their impact on race ethnic differences in rates of obesity. In regards to the education variable, respondents who received an education up to the eight grade (odds ratio = 1.64 and 2.03) as compared to respondents who received at least a college degree are more likely to be both overweight and obese than a healthy weight. Respondents who received some high school or a high school degree are about 30% more likely to be overweight and about 70% more likely to be obese. Respondents who received only some college in comparison to the reference group are 1.31 times more likely to be overweight and 1.59 times more likely to be obese. These findings are consistent with previous literature that states there is an inverse

relationship between educational attainment and weight. More specifically, the higher the education level, the lower the Body Mass Index (Martin et al. 2008; Wardle et al. 2002). Moreover, respondents who live in households with an income of more than $1000,000 when compared to respondents who live in households with an income of $50,000 to $74,999 are 4% less likely to be overweight and 33% less likely to be obese than a healthy weight. Additionally, in comparison to respondents who are employed full time, respondents who are employed part-time or are a homemaker are about 10% less likely to be both overweight and obese. Respondents who are not working when compared to the reference group are 26% more likely to be obese. These results further prove that income and employment are positively correlated with health outcomes because they allow people to receive benefits and resources to lead a healthier lifestyle (Subramanian and Kawachi 2004). Lastly, respondents who are not covered by health insurance (odds ratio = 1.29) as compared to respondents with private health insurance are more likely to be overweight than a healthy weight. Respondents with miscellaneous government health insurance and no health insurance are 10% less likely to be obese than a healthy weight. These findings differ from previous research that found people with private health insurance or public insurance coverage are positively correlated with better health outcomes as it allows people to gain access to more affordable preventative care and cures (Kasper et al. 2000).

After taking all the controlled variables into consideration, nine of the ten possible outcomes from the primary relationship between race/ethnicity and rates of obesity are significant. Mexicans and Puerto Ricans when compared to non-Hispanic whites are both

about 2 times more likely to be overweight and about two and a half times more likely to be obese than a normal weight. Other Hispanics relative to the reference group are just over 50% more likely to be both overweight and obese as opposed to a healthy weight. On the other hand, Cubans (odds ratio = 1.87) when compared to non-Hispanic whites are only more likely to be obese than a normal weight. Additionally, non-Hispanic blacks (odds ratio = 1.79 and 2.24) when compared to non-Hispanic whites are more likely to be overweight and obese respectively. Overall, these results show that once confounding variables are controlled for, race/ethnic differences in rates of obesity are still significant as nine of the ten relationships are significant.

Incidence of Diabetes

Table 3 shows binomial logistic regression coefficients represented through odds ratios that show the relationship between race/ethnicity and incidence of diabetes within six different models. Odds ratios less than one indicate the race/ethnicity is less likely to be overweight or obese as compared to non-Hispanic whites, the reference group. Odds ratios greater than one indicate the groups I more likely to be overweight or obese than non-Hispanic whites.

Model 1 examines the relationship between race/ethnicity and incidence of diabetes. The results show that Mexican Americans (odds ratio = 1.45) as compared to non-Hispanic whites are more likely to have diabetes. Puerto Ricans (odds ratio = 2.06) relative to non-Hispanic whites are also more likely to have type 2 diabetes. There is no statistically significant difference in incidence of diabetes among non-Hispanic whites,

Cubans, and other Hispanics. Reinforcing previous research, these results found Hispanics, with the exception of Cubans, and non-Hispanic blacks have higher rates of type 2 diabetes than non-Hispanic whites (American Diabetes Association 2011). This model makes it evident that there are initial race/ethnic differences in incidence of diabetes.

Model 2 controls for the demographic variables of sex, marital status, and country of region in the relationship between race/ethnicity and incidence of diabetes. There is an incredibly significant relationship between sex and incidence of type 2 diabetes. Females are about 20% more likely than males to have type 2 diabetes. This result is similar to previous results that type 2 diabetes is more prevalent in women than men (Gale and Gillespie 2001). Moreover, marital status also matters, as when compared to married respondents, those who are widowed are three times more likely to have type 2 diabetes. Respondents who are divorced or separated are 60% more likely to have type 2 diabetes. Previous research has also found marriage brings a decreased likelihood of developing type 2 diabetes due to the decreased amount of stress (Azimi-Nezhard et al. 2008). Additionally, respondents living in the South and Midwest are about 36.5% more likely to have diabetes when compared to respondents living in the Northeast. Reinforcing previous research, these findings show that there are higher incidence of diabetes in the South (Centers for Disease Control and Prevention 2012c). The findings also display that with the addition of these demographic variables, Mexican Americans are 57% more likely than non-Hispanic whites to have diabetes. Puerto Ricans (odds ratio = 2.19) relative to non-Hispanic whites are more likely to have diabetes. When compared to non-

TABLE 3
Odds Ratios Depicting the Relationship Between Race/Ethnicity, Diabetes, Immigration, and Socioeconomic Factors, U.S. Adults Aged 25-64, 2008-2011

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	Diabetes [Ref = No Diabetes]	Diabetes [Ref = No Diabetes]	Diabetes [Ref = No Diabetes]	Diabetes [Ref = No Diabetes]	Diabetes [Ref=No Diabetes]	Diabetes [Ref = No Diabetes]
Race/ethnicity [Non-Hispanic White]						
Mexican American	1.45 ***	1.57 ***	1.57 ***	1.51 ***	1.57 ***	1.21 *
Puerto Rican	2.06 ***	2.19 ***	1.74 ***	1.79 ***	1.72 ***	1.18
Cuban	1.60	1.53	1.24	1.19	1.17	1.13
Other Hispanic	1.05	1.11	1.10	1.07	1.10	1.03
Non-Hispanic Black	1.75 ***	1.72 ***	1.60 ***	1.60 ***	1.59 ***	1.22 ***
Nativity [Foreign Born]						
U.S. Born			1.28 ***			
Duration [U.S. Born]						
Less than Five Years				0.35 ***		
Five to Nine Years				0.46 ***		
Ten or More Years				0.99		
Duration and Citizenship [U.S. Born]						
Less than Five Years and Citizen					0.59	0.73
Less than Five Years and Noncitizen					0.32 ***	0.45 **
Five to Nine Years and Citizen					0.90	1.60
Five to Nine Years and Noncitizen					0.39 ***	0.51 **
Ten or More Years and Citizen					1.08	1.25 **
Ten or More Years and Noncitizen					0.84 *	0.89
Sex [Male]						
Female		1.21 ***	1.12 ***	1.12 **	1.12 **	1.14 **
Marital Status [Married]						
Widowed		3.03 **	2.57 ***	2.54 ***	2.55 ***	1.54 ***
Divorced or Separated		1.60 **	1.45 ***	1.44 ***	1.44 ***	1.13 *
Never Married		0.90	0.80 ***	0.81 ***	0.81 ***	0.72 ***
Country Region [Northeast]						
Midwest		1.37 ***	1.18 **	1.20 **	1.20 **	1.13
South		1.36 ***	1.18 **	1.20 **	1.20 **	1.15 *
West		1.09	0.94	0.94	0.93	0.97

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

TABLE 3 CONTINUED

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	
	Diabetes	Diabetes	Diabetes	Diabetes	Diabetes	Diabetes	
	[Ref = No Diabetes]	[Ref = No Diabetes]	[Ref = No Diabetes]	[Ref = No Diabetes]	[Ref = No Diabetes]	[Ref = No Diabetes]	
Education [College and Beyond]							
Up to 8th Grade						2.08	***
Some High School						1.36	***
High School Degree						1.28	***
Some College						1.13	
Household Income [$50,000 to $74,999]							
Less than $35,000						1.14	*
$35,000 to $49,000						1.06	
$75,000 to $99,999						0.82	**
More than $100,000						0.88	
Employment Status [Employed Full Time]							
Employed Part-time						1.13	*
Homemaker						0.98	
Unemployed						1.16	
Not Working (School, Retired, or Disabled)						3.06	***
Health Insurance [Private]							
Miscellaneous Government						1.15	*
Not Covered						0.70	***
Weight [Healthy]							
Overweight						2.22	***
Obese						5.83	***
N= 52,585							
-2LL (Intercept Only)	28628.55	28628.55	28628.55	28628.55	28628.55	28628.55	
-2LL (Full Model)	288493,50	28182.87	28167.23	28130.51	28120.15	25062.38	
Chi-Squared	135.05	445.69	461.32	498.05	508.40	3566.18	
Degrees of Freedom	5.00	12.00	13.00	15.00	18.00	34.00	

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

Hispanic whites, non-Hispanic blacks are 72% more likely to have diabetes.

Model 3 nativity while also examining the primary relationship between race/ethnicity and incidence of diabetes. The inclusion of this variable is very important as previous research does not support the epidemiological paradox since it has found that incidence of type 2 diabetes is higher (Cunningham et al. 2008). These results find that those born in the United States are 28% more likely to have diabetes then foreign-born respondents. These results support the epidemiological paradox but are contrary to Cunningham et al.'s (2008) previous findings. The results also display that with the addition of the nativity variable, respondents of Mexican origin or who are non-Hispanic blacks are both about 60% more likely than non-Hispanic whites to have type 2 diabetes. When compared to the reference group, Puerto Ricans are 74% more likely to have type 2 diabetes.

Model 4 controls for duration in the relationship between race/ethnicity and incidence of diabetes. Foreign-born respondents living in the U.S. for less than five years (odds ratio = 0.35) and five to nine years (odds ratio = 0.46) when compared to native born respondents are less likely to have type 2 diabetes. Once foreign-born respondents are in the U.S. for at least ten years, they no longer have statistically difference rates of obesity relative to native born respondents. Similar to nativity, these duration results also support the epidemiological paradox because they explicitly show the longer immigrant reside in the U.S., the more likely they are to be diagnosed with type 2 diabetes (Oza-Frank et al. 2011). When taking duration into consideration, Mexican Americans and

non-Hispanic blacks are about 60% more likely than non-Hispanic whites to have type 2 diabetes. Moreover, the type 2 diabetes rates among Puerto Ricans are no longer statistically different from non-Hispanic whites.

Model 5 builds off the previous two models with nativity and duration with the addition of naturalization to create an immigrant assimilation variable. In regards to naturalization, noncitizens living in the United States for less than five years (odds ratio = 0.32), five to nine years (odds ratio = 0.39), and ten or more years (odds ratio = 0.84) when compared to U.S. born respondents are less likely to have type 2 diabetes. On the other hand, foreign-born respondents that have become citizens as compared to U.S. born respondents do not have statistically different incidence of type 2 diabetes regardless of duration. These findings differ from previous findings which found a negative relationship between Hispanics level of acculturation and incidence of type 2 diabetes because with acculturation, immigrants are more likely to receive preventative care (Manious et al. 2006). Mexican Americans and non-Hispanic blacks are again about 60% percent more likely than non-Hispanic whites to have type 2 diabetes. When compared to non-Hispanic whites, Puerto Ricans (odds ratio = 1.72) are also more likely to have type 2 diabetes.

Lastly, model 6 builds off the previous model and also includes the socioeconomic variables of education, household income, employment status, health insurance as well as obesity. Noncitizen foreign-born respondents residing in the United States for less than five years are 55% less likely than U.S. born respondents to have type 2 diabetes. When compared to non-Hispanic whites, noncitizen foreign-born respondents

living in the U.S. for five to nine years (odds ratio = 0.51) are also less likely to have type 2 diabetes. Foreign-born respondents who have lived in the United States for ten or more years, however, are 25% more likely than non-Hispanic whites to have type 2 diabetes. Additionally, respondents who have been educated up to the third grade are two times more likely than those who have been educated through college and beyond to have type 2 diabetes. Also, when compared to the reference group, respondents who have received some high school education (odds ratio = 1.36) and completed a high school degree (odds ratio = 1.28) are more likely to have type 2 diabetes. Previous research has also found an inverse relationship between educational attainment and prevalence of type 2 diabetes (Robbins et al. 2004). Moreover, respondents whose family income is less than $35,000 are 14% more likely to have diabetes when compared to respondents whose family income is $50,000 to $74,999. Respondents whose family income is between $75,000 and $99,999 (odds ratio = 0.82) are less likely to have type 2 diabetes as compared to the reference group. These findings are consistent with previous literature that states family income greatly effects health outcomes, the higher the income the better the health outcomes because it allows people to gain access to resources to lead a healthier lifestyle (Subramanian and Kawachi 2004). When compared to respondents who are employed full time, respondents who are employed part-time are 13% more likely to have type 2 diabetes. Respondents who are not working because they are in school, retired, or disabled are three times more likely to have type 2 diabetes as compared to respondents who are employed full time. Similar to income, previous research has found employment

status greatly affects health outcomes because those who are employed have greater access to resources for preventative care (Kasper et al. 2000).

Additionally, respondents who have public health insurance (odds ratio = 1.15) when compared to respondents with private health insurance are more likely to have type 2 diabetes. Interestingly, when compared to respondents with private health insurance, respondents who do not have health insurance are 30% less likely to have type 2 diabetes. These results do not fully support previous findings that access to private health insurance allows for people to more readily and easily take part in more affordable preventative care and cures (Mathematica Policy Research, Inc. 2010). Lastly, respondents who are overweight (odds ratio = 2.22) and obese (odds ratio = 5.83) when compared to respondents who are a normal weight are more likely to have type 2 diabetes. These findings are consistent with previous literature that states insulin resistance increases with weight gain (Feero and Guttmacher 2010).

The addition of these five variables had a significant impact on the primary relationship between race/ethnicity and incidence of diabetes. When compared to non-Hispanic whites, Mexican Americans (odds ratio = 1.21) and non-Hispanic blacks (odds ratio =1.22) are the only two ethnic groups that are more likely to have type 2 diabetes. Overall, these results show that once confounding variables are controlled for, race/ethnic differences in incidence of type 2 diabetes is not very significant as only two race/ethnicities, Mexican Americans and non-Hispanic blacks, are still more likely to be diagnosed with the disease.

Chapter 6
Discussion

This research on obesity and diabetes among Hispanics contributes to the growing body of literature in three ways. First, it further expands our knowledge on race/ethnic health disparities as it focuses on Hispanics, the fastest growing minority group in the United States (Saenz 2010; U.S. United Stated Census Bureau 2013; National Research Council 2006). Second, this research also considers the role of immigration status in health disparities, allowing for an exploration of the epidemiological paradox. Additionally, by incorporating a complex acculturation variable made up of nativity, duration, and citizenship, this research explores the health assimilation of Hispanic immigrants. Previous research has found that the increased assimilation of immigrants into U.S. society, the more unhealthy they become (Morales et al. 2002; Yang et al. 2009). Also, this research adds to the existing literature by the inclusion of a variety of socioeconomic variables not previously considered.

While there are wide differences in rates of obesity and being overweight among Hispanic subgroups in comparison to non-Hispanic whites, only Mexican-Americans had a difference in incidence of type 2 diabetes in comparison to non-Hispanic whites. Additionally, immigration status greatly impacted the relationship between race/ethnicity and rates of obesity as well as incidence of diabetes. Rates of obesity varied greatly across the Hispanic subgroups. Mexican-Americans, Puerto Ricans, and other Hispanics were *more* likely to be overweight when compared to non-Hispanic whites. Cubans did no differ from non-Hispanic whites in likelihood of being overweight. Additionally,

when compared to non-Hispanic whites, Mexican-Americans and Puerto Ricans were *more* likely to be obese. Cubans and other Hispanics did not differ from non-Hispanic whites in rates of obesity. However, the difference between both Cubans and other Hispanics and non-Hispanic whites was accounted for by immigration status. All of the Hispanic subgroups displayed greater chances of being overweight and obese in the most complicated model.

It is essential to stress the importance of immigration status within these models. When the most complicated immigration variable, which takes into consideration nativity, duration in the United States, and citizenship, was accounted for, all of the Hispanic subgroups became more likely to be both overweight and obese. Moreover, it becomes apparent the more an immigrant has assimilated, the longer they have resided in the United States and if they have gained citizenship, the more their chances of being overweight or obese converge to that of people born in the United States. These results support both the epidemiological paradox and segmented assimilation. Despite Hispanics immigrants having lower socioeconomic statuses and levels of education, they often have better health statuses in comparison to non-Hispanic whites (Markides and Corelil 1986). However, these positive health outcomes fade as the immigrants assimilated into the mainstream society, which supports the theory of segmented assimilation as they are experiencing downward assimilation (Zhou1997).

There are both cultural and environmental explanations for Hispanic immigrants' downward health assimilation. As immigrants are integrating into U.S. culture, both their diets as well as physical activity lead to progressively unhealthier lives (Seefeldt et al.

2002; Antecol and Bedard 2006). Immigrants' diets change as they consume greater quantities of saturated fats and carbohydrates more easily available in the U.S. diet (Lin et al. 2003). Since many Hispanic immigrants tend to have a lower socioeconomic statuses, they feel they need to work more to survive which leaves them with less time for leisure activities such as exercise (Juniu 2000). The combination of unhealthier diets along with reduced physical activity as a result of assimilation has resulted in Hispanic immigrants becoming more likely to be overweight or obese.

Incidence of type 2 diabetes, on the other hand, did not vary greatly among Hispanic subgroups. Mexican-Americans were the only Hispanic subgroup to be *more* likely to have type 2 diabetes in comparison to non-Hispanic whites. All the other Hispanic subgroups, Cuban-Americans, Puerto Ricans, and other Hispanics, had no significant difference in incidence of type 2 diabetes when compared to non-Hispanic whites. This is surprising as previous research found differences between both race/ethnicity and incidence of type 2 diabetes (American Diabetes Association 2011). Additionally, these results show immigration to play a minor role in incidence of type 2 diabetes despite previous literature stating type 2 diabetes is higher among the foreign-born population as well as prevalence increases with duration even when controlling for obesity (Cunningham et al. 2008; Oza-Frank et al. 2011).

However, the lack of difference between Puerto Ricans, Cubans, and other Hispanics and non-Hispanic whites can be attributed to obesity since obese persons are *much* more likely to have type 2 diabetes (Feero and Guttmacher 2010). With the addition of obesity to the models, all the likelihood for type 2 diabetes among all

race/ethnic groups decreased. The relationship between obesity and type 2 diabetes was not wholly unexpected since one of the main causes of type 2 diabetes is reduced insulin resistance, which is often a result of obesity (Feero and Guttmacher 2010).

Overall, these results show that it is important to fully understand immigrants' integration into the United States mainstream society and its consequences. Assimilation into society does not necessarily yield positive outcomes. It has been found that second and third generations do better than their immigrant relatives in regards "educational attainment, occupational status, wealth and home ownership, narrowing the gap with U.S.-born non-Hispanic whites" (Jimenez 2011: 5). However, as these results show, there are also negative outcomes from integration such as health status that get worse as across generations resulting in the gap widening between minorities and non-Hispanic whites. Thus, immigration policy needs to account for the challenges to integration that create downward assimilation since they have grave costs on society as well as individuals (Jimenez 2011:8).

Immigrant assimilation would greatly benefit from their incorporation into the United States health care system. By not including illegal immigrants into their health care system, the U.S. is creating downward assimilation for future generations. The children of illegal immigrants are "often uninsured because their parents work in jobs that do not offer health insurance, or because of fear and confusion about enrolling eligible children in public safety-net programs such as Medicaid and the Children's Health Insurance Program (CHIP)" (Immigration Policy Center 2009). As a result, these

children, who are citizens, are not receiving regular, preventative care which could have negative effects on their lifelong health.

An additional policy recommendation, one more radical as it calls for the reordering of the food industry. Over the past century, the federal government's actions, specifically farm subsidies on corn, have had huge implications on the nation's nutrition and health. Although there have been slight changes to the subsidies overtime, they have persisted to the present day. These subsidies have had three huge negative impacts on Americans' health. First, farmers are more inclined to produce the crops that are subsidized, such as corn and soybeans, instead of other crops, such as vegetables and fruits (Fields 2004). Second, subsidizing has kept corn prices low resulting in farmers needing to plant more of the crop in order to make money (Pollan 2006). Third, increased crop production and low corn prices have resulted in the high fructose corn syrup becoming a cheaper alternative to sugar as a sweetener (Beghin and Jensen 2008). Research has documented a direct link between the availability of high fructose corn syrup, cheaply available beverages and snacks and obesity (Bray et al. 2004). In order to effectively reorder the food industry, the government needs to stop subsidizing certain crops such as corn because it is negatively impacting the health of the country. Additionally, they should reallocate the billions of dollars currently going into corn subsides towards foods that promote a healthier lifestyle such as broccoli, kale, and strawberries.

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