

## ABSTRACT

Title of Document: BIRTH OUTCOMES OF IMMIGRANT AND  
NATIVE-BORN HISPANIC WOMEN:  
ROLE OF PRENATAL CARE UTILIZATION  
AND PARTICIPATION IN THE WOMEN,  
INFANTS AND CHILDREN (WIC)  
PROGRAM

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In recent years, immigration to the U.S. from Central America and Mexico has increased substantially. This trend is evident in Prince George's County, Maryland, which has growing numbers of both Hispanic immigrants and native-born Hispanic Americans. From 2011 to 2012, the infant mortality rate among Hispanics in Prince George's County rose from 3.0 to 5.5 per 1,000 live births. The County lacked information about how birth outcomes were related to immigrant/native-born status and utilization of maternal health services, including receipt of adequate prenatal care and participation in the Women, Infants and Children (WIC) program. Previous studies have found that immigrant Hispanic women have better birth outcomes than native-born women (the "Hispanic Paradox"), but it is not known whether this pattern occurs in Prince George's County.

This study examined the association between immigrant status and two birth outcomes: preterm birth and infant low birth weight (LBW). It focused on how Hispanic women's

immigrant status (immigrant/native-born) was related to their use of prenatal care and WIC participation, as well as the association between these maternal health services and two infant birth outcomes. A major goal of the study was to assess whether or not adequate prenatal care and WIC participation mediated the relationship between women's immigrant status and birth outcomes. Data from the 2011-2012 birth certificates of 4,971 Hispanic women in Prince George's County were used to test study hypotheses.

Findings revealed that native-born Hispanic women were significantly more likely to obtain adequate prenatal care than their immigrant peers, while immigrants were significantly more likely to enroll in WIC. Adequate prenatal care failed to predict either preterm birth or infant LBW, but WIC enrollment was significantly associated with lower likelihood of infant LBW. Consistent with the Hispanic Paradox, immigrant Hispanic women had significantly better birth outcomes than their native-born peers. WIC participation partially mediated the relationship between immigration status and infant LBW. Approximately 7% of the association between being an immigrant and reduced infant LBW was explained by WIC participation. Findings may assist policymakers and practitioners in designing interventions to reduce negative birth outcomes in Prince George's County, Maryland, and the nation.

BIRTH OUTCOMES OF IMMIGRANT AND NATIVE-BORN HISPANIC  
WOMEN: ROLE OF PRENATAL CARE UTILIZATION AND PARTICIPATION  
IN THE WOMEN, INFANTS AND CHILDREN (WIC) PROGRAM

By

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## Dedication

Dedicated to all Afghan women, in particular, my grandmother, Amina Sadat 1933-2014. May the way I live my life pay tribute to yours and the lack of opportunities you faced.

## Acknowledgements

I would like to acknowledge those who have stood beside me and pushed behind me.

Foremost, I would like to express my gratitude to my dissertation committee:

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My dissertation has become a piece of me and vicariously a small piece of all of you.

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## **CHAPTER 1: INTRODUCTION**

### **Immigrant Growth in Prince George's County, Maryland**

The population of immigrants to the U.S. has been steadily growing.<sup>1</sup> In particular, there has been a substantial increase in the number of individuals who have immigrated from Mexico or Central America since 1970.<sup>1</sup> This immigration pattern likely reflects these countries' proximity to the U.S. and to economic pressures that lead residents to search for better job opportunities.<sup>1</sup> Political turmoil, including civil war in some Central American countries, has also been an impetus for immigration. The 2010 U.S. Census Bureau's American Community Survey (ACS) estimated that 13% of the total U.S. population, or 40.8 million people, were born outside of the United States.<sup>2</sup> The percentage of the foreign born population from Mexico and other Central American countries increased from 6% in 1960 to 37% in 2010.<sup>2</sup>

From 2000 to 2009 Maryland experienced the thirteenth largest in-surge of immigrants among all 50 states.<sup>3</sup> Specifically, two counties in Maryland have had substantial immigrant population growth: Montgomery County and Prince George's County.<sup>4</sup> Prince George's County was second among all of Maryland's 23 counties in numbers of international immigrants between 2000 and 2012.<sup>4</sup> The 2012 ACS estimates the immigrant population in Prince George's County to be 20.8%, with almost half of that population being female.<sup>5,6</sup> Immigration among people of Hispanic origin has also been on the rise in Prince George's County.<sup>7</sup> Among immigrants in Prince George's County, 58.7% identified as coming from Latin American countries.<sup>6</sup> This increase in the immigrant population will play an important role in the projected population growth within Maryland because Hispanic

women tend to have more children than non-Hispanic women.<sup>7</sup> Currently, 15% of the population of Prince George's County is Hispanic.<sup>8</sup>

Among the Hispanic women in Prince George's County, infant mortality is on the rise.<sup>9</sup> From 2011 to 2012, the infant mortality rate among Hispanics in Prince George's County rose from 3.0 to 5.5 per 1,000 live births.<sup>9</sup> Preterm birth and low birth weight (LBW) have been found to be contributors to infant mortality both nationally and in Prince George's County specifically.<sup>10</sup> By examining maternal health behaviors that contribute to adverse birth outcomes and infant mortality, it may be possible to mitigate this public health problem.

Immigrants to the United States are generally healthier than non-immigrants of similar race/ethnicity.<sup>11</sup> Infants born to Hispanic immigrant mothers, who often come from economically disadvantaged backgrounds, have been found to have better birth outcomes than infants of Hispanic native-born women.<sup>12</sup> This is often referred to as the Hispanic Paradox.<sup>11</sup> Research has found that immigrants' health status begins to deteriorate the longer they are in the U.S., and this may affect their birth outcomes as well.<sup>11</sup> However, more studies are needed to determine if the Hispanic Paradox exists among the Hispanic immigrant population in Prince George's County, Maryland.

In particular, given the recent rise in the infant mortality rate among Hispanics in Prince George's County,<sup>9</sup> there is a need to identify factors that may contribute to more positive infant health outcomes among this population. Research should explore how birth outcomes are influenced by immigrant and native-born Hispanic mothers' utilization of prenatal care and participation in the Women, Infants, and Children

(WIC) program, a federal program aimed at improving maternal and child health through education, food supplements, and health referrals.<sup>13</sup> The major purpose of this study is to determine if utilization of prenatal care and/or WIC participation mediate the relationship between immigration status and preterm birth and low infant birth weight among Hispanic women and infants in Prince George's County, Maryland.

## **CHAPTER 2: REVIEW OF LITERATURE**

In order to better understand relationships between immigration status and maternal and child health outcomes, it is important to review immigration policy in the U.S. The next section, the historical context for the study, is followed by the theoretical framework, conceptual model, and a review of the literature, which provides the basis for the study's hypotheses. In this review and throughout the dissertation, the term "native-born" refers to individuals born in the 50 U.S. states, the District of Columbia, Puerto Rico or other U.S. territories and "immigrant" refers to those born outside the 50 U.S. states, the District of Columbia, and Puerto Rico or other U.S. territories.<sup>14</sup>

### **Historical Background: Immigrant Growth in the U.S.**

Prior to 1965, the major cultural paradigm for immigration policy focused on the preservation of American culture.<sup>15</sup> During this period, there was a preference for Whites, mainly those emigrating from Europe.<sup>16</sup> As this paradigm shifted to one that was more humanitarian, racial and ethnic preferences within U.S. immigration policy also shifted.<sup>15</sup> The Immigration and Nationality Act (INA) of 1965 was created as a result of this change in ideology.<sup>15</sup> This Act capped immigration for the Eastern Hemisphere, allowing more Hispanics to immigrate.<sup>17</sup> After 1965, the change in policy also made it easier for people of Hispanic origin to settle in the United States legally, unifying families who were previously divided.<sup>16</sup>

With the influx of Hispanic immigrants, the government took steps to control unlawful immigration. The Immigration Reform and Control Act of 1986 (IRCA) required employers to confirm their employees' immigration status and made it

illegal to knowingly recruit or hire illegal immigrants.<sup>17</sup> Concurrently, IRCA established programs to help illegal immigrants become naturalized.<sup>17</sup> This change resulted in many Hispanic immigrants becoming legal citizens of the U.S.<sup>17</sup> The INA and IRCA have added to the diversification of the United States population and have influenced overall U.S. birth outcomes as a result of the large number of Hispanics who have entered the U.S.<sup>18</sup>

In 2010, over half of the immigrant population in the U.S. identified as being from Latin America.<sup>2</sup> Of this immigrant population from Latin America, 55% were born in Mexico.<sup>2</sup> Moreover, of the total immigrant population in the U.S., 29% were born in Mexico.<sup>2</sup> The shift in U.S. racial/ethnic demographics of immigrants from being predominantly of European descent to an influx of people of Hispanic origin has caused another political divide with respect to immigration policy and border control. Similar to the 1965 paradigm shift, there is current tension that will likely influence future immigration policies. As immigrant populations increase, there is often a rise in nativism that creates friction between people who are immigrants and those who are native-born.<sup>19</sup> This tension may result in racial/ethnic discrimination against Hispanics, even though many in this group are native-born.<sup>19</sup> Racial tension is often felt by Hispanic immigrants as well as native-born Hispanics. Additionally, there is acculturative stress, or stress related to acculturating from one's culture of origin to a new culture.<sup>20</sup> Both types of stress may impact Hispanic immigrants.

The INA and IRCA affect families in many ways that are relevant to the disciplines of maternal and child health and family science. This study will investigate the impact of immigration policy on public health through Hispanic



women's utilization of prenatal care, participation in the WIC program, and their birth outcomes. Understanding the influence of immigration policies such as the INA and IRCA is important because it paints a broader picture of the health and well-being of immigrant families in the United States.

### **Historical Background: Salvadoran and Mexican Immigrant Growth**

Following the INA and IRCA, many Salvadorans immigrated to the U.S. Although the majority of Salvadoran immigrants reside in California and Texas, the 2013 census revealed that 11.2% of the total Maryland immigrant population was Salvadoran.<sup>21</sup> Salvadorans experienced a number of push and pull factors that led them to emigrate beginning around the mid-1980s. Push factors, or those that lead individuals away from their homeland, include political turmoil, violence, poverty, and natural disasters. Pull factors, or those that attract individuals to a new country, include the promise of political freedom, economic opportunities, and family reunification.

Ongoing political unrest between an authoritarian government and a left-wing guerilla movement led to the Salvadoran Civil War from 1979-1992.<sup>22</sup> Young men fled El Salvador due to fear of being drafted into the military or because of fears that they or their families would be harmed by guerilla soldiers. Many Salvadorans also faced poverty and a lack of social and economic opportunities due to the war. An influx of Salvadoran refugees emerged as many obtained U.S. work permits (via IRCA) or claimed asylum in the U.S.<sup>22</sup> After the 13-year long war ended, the strong pull factors of political freedom and economic opportunities led Salvadoran immigrants to remain in the U.S. Their decisions to stay instigated a newer wave of

Salvadoran immigrants, specifically family members seeking to be unified with their loved ones, to enter the U.S. in the 1990s and 2000s.<sup>22</sup>

Another factor that contributed to the newer wave of Salvadoran immigrants was natural disasters. The United States Geological Survey reported two earthquakes in El Salvador in January and February of 2001, with magnitudes of 7.7 and 6.6 on the Richter scale. Hundreds were killed and thousands were injured.<sup>23</sup> Aside from the human toll, the earthquakes left San Miguel, San Salvador, and other surrounding major cities in rubble. Rebuilding the infrastructure was costly to the already weakened Salvadoran government, contributing to economic despair and the desire to emigrate.

These push and pull factors led to the overall increase in the Salvadoran immigrant population in the U.S.<sup>22</sup> Maryland, and particularly Prince George's County, has attracted large numbers of immigrants from El Salvador. In the past five years, the County has experienced an influx of approximately 40,000 Salvadoran immigrants.<sup>5</sup> Approximately 6% of the total population in Prince George's County is from El Salvador.<sup>24</sup>

The second largest group of Hispanics in Prince George's County are Mexicans, which comprise 2.8% of the County's population.<sup>24</sup> Major push factors for Mexican immigrants to the U.S. have been poverty, unemployment, and high rates of drug-related crime in Mexico. The most salient pull factors have been economic and educational opportunities, as well as the desire for family reunification in the U.S.<sup>25</sup>

In 1942, the U.S. was faced with a labor shortage due to World War II (WWII) which prompted the U.S. government to allow Mexican migrant workers

across the border through the Bracero Program.<sup>25</sup> This symbiotic program helped Mexican workers earn money while alleviating the U.S. labor shortage. The Bracero Program continued after WWII and expanded from railroad laborers to agriculture.<sup>25</sup> However, Mexican workers suffered from maltreatment and the program ended in 1965.<sup>25</sup> Many of these workers secured a green card or legal residency in the U.S., contributing to a further increase in Mexican immigrants due to family reunifications in the late 1990s and 2000s.<sup>25</sup>

The Pew Research Center estimated that growth in the numbers of illegal Mexican immigrants in the U.S. leveled off from 2009 to 2013, but remained high at 5.9 million illegal Mexican immigrants in 2012.<sup>26</sup> The ongoing poverty in various Mexican cities has led many Mexicans to attempt to cross the U.S. border in the hope of economic opportunities.<sup>25</sup> The Pew Report also found that five East Coast states experienced the greatest increase in undocumented immigrants from 2009 to 2012: Florida, Maryland, New Jersey, Pennsylvania and Virginia.<sup>26</sup>

Knowledge of immigration trends and U.S. immigration policies, as well as the push and pull factors that contribute to immigration of particular groups, sheds light on immigrant dynamics in American society and provides an important context for the use of acculturative stress theory in immigration studies. Currently, there is a need for more research on Central American and Mexican immigrants in our nation, including factors that contribute to their maternal and child health outcomes. The current study utilized acculturative stress theory to explore birth outcomes of immigrant and native-born Hispanic mothers who reside in Prince George's County,

Maryland, focusing on factors that may mediate the relationship between their immigration status and infant outcomes.

### **Theoretical Framework**

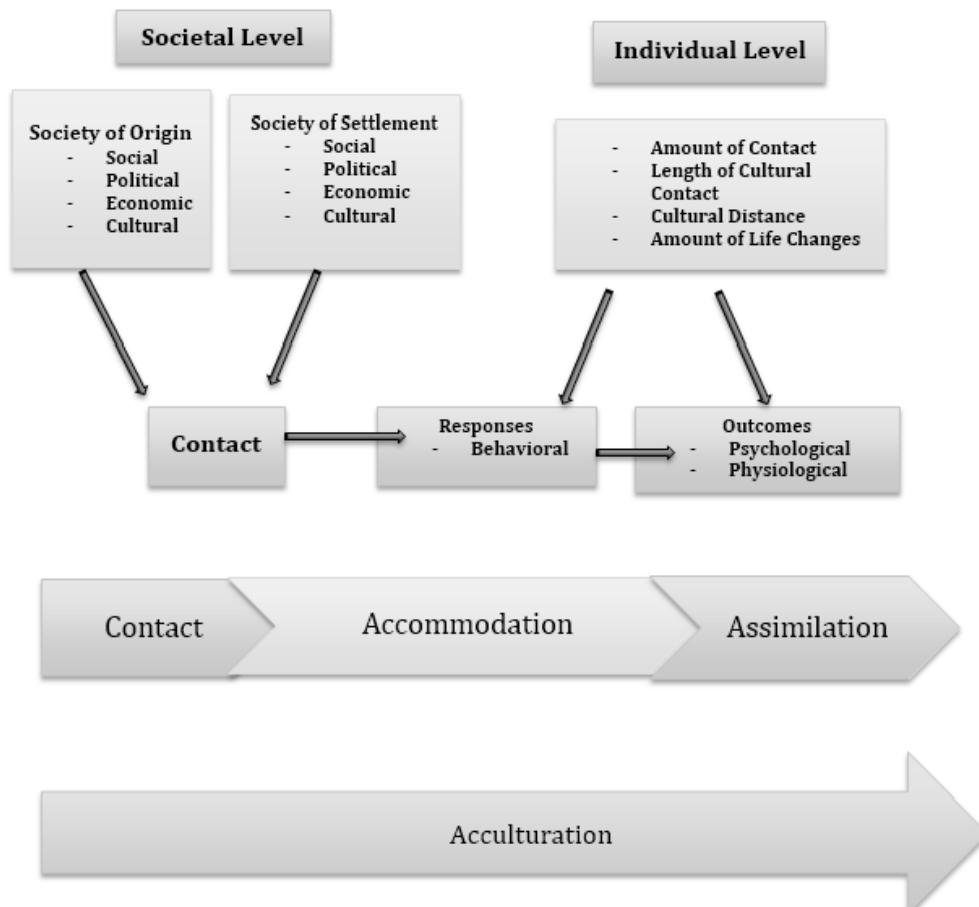
Stress and coping theories address adaptation to change in the environment and its potential to create stress. Stress and coping theories focus on structural, cultural, and interpersonal factors involved in coping with stress.<sup>27</sup> The stress associated with life in a new culture and coping with that stress are part of the process of acculturation. This process includes behavioral changes, such as changes in immigrant Hispanic women's prenatal behaviors in the U.S. as compared to those in their country of origin.

In a public health context, acculturation theory is framed as the process by which an individual or group from a particular culture of origin integrates into a new culture.<sup>28</sup> In particular, the theory highlights how the stress of immigration and coping with a new culture cannot be explained merely by individual experiences, but is also influenced by structural, cultural, and interpersonal factors. All of these factors potentially play a role in utilization of prenatal care and participation in WIC, which may influence birth outcomes. As such, acculturative stress theory can help to shed light on the birth outcomes of immigrant and native-born Hispanic women in Prince George's County.

### **Acculturative Stress Theory**

The Acculturative Stress Theory Framework was guided by the work of Lazarus and Folkman, and also incorporates Ward's work on stress and coping.<sup>29-31</sup> This framework posits that individuals will experience three stages as they go through

the process of acculturation: contact, accommodation, and assimilation.<sup>32-34</sup> The framework (Figure 1) shows the three stages and their societal and individual level impacts.<sup>32-34</sup> Also important to acculturation is the family level impact. However, because there is no information about family level factors, except women's marital status within the data available for this study, a review of the acculturative stress theory will focus on the societal and individual impacts.



**Figure 1. Acculturative Stress Theory Framework<sup>32-34</sup>**

According to the Acculturative Stress Theory, when immigrant Hispanic women first come into contact with a new American culture, it disrupts their experience at both societal and individual levels.<sup>32</sup> This disruption is necessary to the acculturation process: contact instigates the individual's experience of a new culture.

Immigrant Hispanic women encounter U.S. culture, which has different social and political structures and different cultural norms compared to their countries of origin. Likewise, they may experience diminished economic conditions in the United States. All of these factors may be difficult to cope with unless there is a certain amount of accommodation.

Accommodation can occur at a societal and individual level. The amount of societal and individual-level accommodation will vary for each group or person.<sup>35</sup> At the societal level, accommodation might mean U.S. states recognizing the need for better access to health care for immigrant Hispanic women and therefore implementing policies to promote health equity and access to prenatal care. This policy change can influence the social climate toward immigrants and contribute to improvements in immigrant health. However, accommodation can also be negative if policies change to strengthen border control and restrict immigrants' access to health care.

At the individual level, accommodation may involve learning new languages and making changes in cultural foods, clothing, and family rituals and routines.<sup>35</sup> Accommodation can also include more complex maternal behaviors such as obtaining prenatal care or participating in WIC. Adjusting to the dominant group's culture can be protective if individuals adopt positive behaviors.<sup>18</sup> If the cultural norm in the United States is to seek preventative services such as health screenings, an immigrant who accommodates to this norm may benefit from early identification and treatment of a pregnancy complication and/or obtain healthcare to facilitate a healthy pregnancy.

As a result of these accommodations, some long-term adaptations or outcomes may be achieved, contributing to assimilation. These outcomes can be cultural, psychological, or physiological. Longer-term adaptations can result in adoption of a new culture that is neither fully Hispanic nor fully American.<sup>35</sup> Using the preceding examples, a psychological outcome would be a change in immigrants' attitudes toward health screenings or prenatal care. If their native culture stigmatized health screenings or prenatal care in a medical facility or government-funded programs for pregnant women, there could be a change in their original perceptions as assimilation occurs. These psychological changes can potentially contribute to positive physiological outcomes that decrease the risk of preterm birth or a LBW infant.

#### **Other Types of Stress Experienced by Hispanics in the U.S.**

Existing literature on acculturation theory addresses acculturative stress in immigrants.<sup>36</sup> According to the theory, acculturation is a process during which individuals not only experience changes in their social norms, but also psychological and physiological changes.<sup>36</sup> Intercultural contact may lead both immigrant and native-born Hispanic women to experience stressors. Immigrants may deal with stressors such as having to learn a new language, eat new foods, or overcome economic challenges in finding a new job. In contrast, native-born Hispanics may deal with racial and ethnic prejudice and discrimination. Sanchez and Fernandez found that a general "lack of mainstream acceptance was associated with acculturative stress."<sup>20</sup> Native-born Hispanics who are not of European descent may feel as though they are not fully accepted or respected in American society.<sup>37</sup> Specifically, because they may not look or speak similar to individuals of European

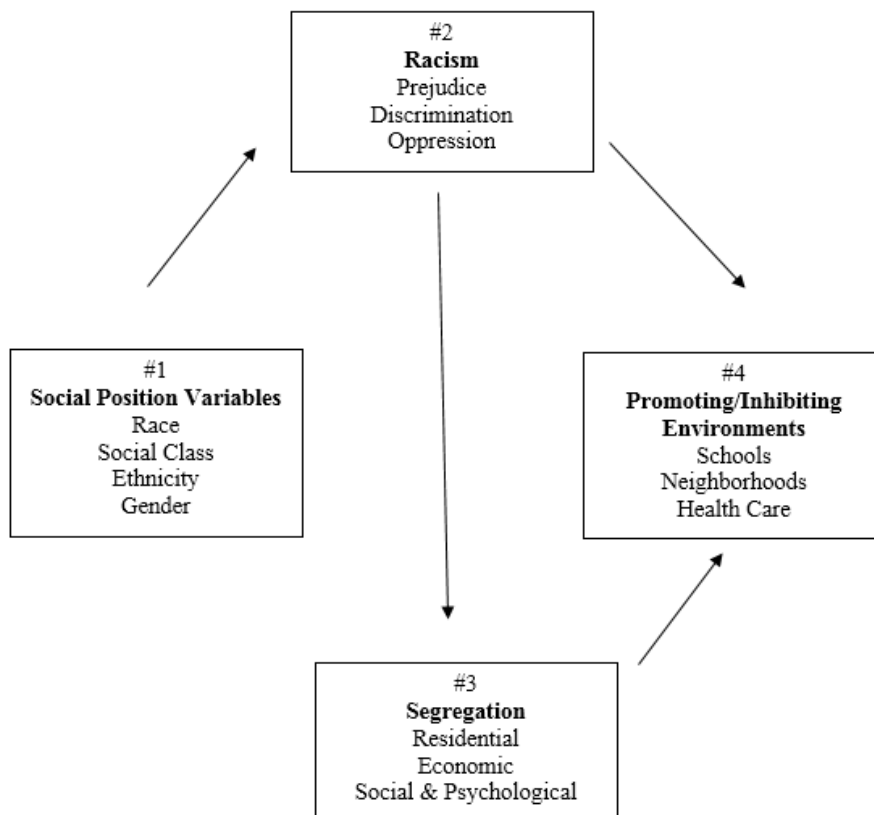
descent, they may experience racial/ethnic discrimination and feel undervalued by the dominant culture. These factors may heighten stress and lead to adverse health outcomes.<sup>18,38,39</sup> Thus, both immigrant and native-born Hispanics may experience stress.

Constructs from Garcia Coll et al.'s Integrative Model for Developmental Competencies in Minorities can shed additional light on native-born Hispanic disadvantage in the use of health services.<sup>40</sup> Four of the eight constructs identified in the model are of relevance to this study: social position variables, discrimination, segregation, and promoting/inhibiting environments (see Figure 2).<sup>40</sup> Native-born Hispanic women may experience lower social position in American society as a result of social hierarchies based on race, ethnicity, and social class. Discrimination towards Hispanics due to their lower social position can lead to segregation.<sup>40</sup> For example, limited job opportunities due to institutional discrimination may lead Hispanic women to become segregated economically. Poor employment prospects and lower socioeconomic status may restrict housing opportunities and result in residential segregation. Residential and geographic segregation may further limit access to health facilities that provide prenatal and other health care. The integrative model assumes that segregation of a population of color is the driving factor that leads to differences between populations of color and those that are White.<sup>40</sup> Thus, native-born Hispanics may experience stress as a result of their lower social position, discrimination, and social, economic, and geographic segregation.

The interplay of constructs identified in Garcia Coll's model may lead native-born Hispanics to experience poorer health care environments than non-Hispanic



Whites, as well as contribute to their lower utilization of prenatal care services or participation in WIC. It should also be noted that health outcomes reflect health care resources within a community. If healthcare systems are set up in a way that deter native-born Hispanics from using services, such as refusing to accept patients on Medicaid, or offering no evening or weekend hours, native-born Hispanic women may be unable to access adequate health care and suffer negative birth outcomes.



**Figure 2. Integrative Model for Developmental Competencies in Minorities<sup>40</sup>**

## **Duration of Residence in U.S. and Health Outcomes**

One indicator of whether stress is acculturative or not is the length of time the immigrant has lived in the United States. Some studies have found that Hispanic immigrants initially have more favorable health outcomes, but as the duration of residence increases, their health outcomes become comparable to those of native-born Hispanics.<sup>41</sup> Kaestner et al. analyzed data from the National Health and Nutrition Examination Survey (NHANES) to study 700 immigrant and native-born Mexicans and their stress levels. This study used biomarkers to create a score for allostatic load.<sup>42</sup> Allostatic load measures the body's cumulative wear due to stress.<sup>43</sup> The researchers focused on 45-60 year old participants to account for the possibility that time spent in the U.S. would affect stress levels.<sup>42</sup> They found that recently arrived Mexican immigrants in the target age range had lower levels of stress compared to native-born Mexican Americans.<sup>42</sup> A strength of this study was that multiple chronic stressors (as measured by allostatic load) were able to be studied as a group.

Also using NHANES data, the Texas City Stress and Health Study employed biomeasures to compute a score for allostatic load for a total of 2,604 native-born and immigrant Hispanics in Texas.<sup>44</sup> Consistent with the results of Kaestner et al.,<sup>44</sup> the researchers found that immigrant Mexican Americans who had lived in the U.S. for 10 years or less were 62% less likely to have a high allostatic load compared to native-born Mexican Americans.<sup>44</sup> The greater likelihood of a high allostatic load among native-born Mexican Americans may result in more adverse health outcomes for this group.<sup>42</sup> A leading explanation for the Hispanic Paradox has been that

immigrant Hispanics are less exposed to stressors such as discrimination in the U.S. and are therefore healthier than native-born Hispanic Americans.<sup>42</sup>

The Hispanic Paradox has also been observed in Hispanic women's birth outcomes.<sup>45</sup> Teitler et al. examined the relationship between maternal duration in the U.S. and the birth weight of children of immigrants.<sup>45</sup> The researchers used three datasets: the Early Childhood Longitudinal Study-Kindergarten, consisting of 21,000 kindergarteners in 1998-1999; the Early Childhood Longitudinal Study-Birth Cohorts, consisting of 10,000 children born in 2001 and followed until the end of first grade; and the Fragile Families and Child Wellbeing birth cohort study, consisting of 4,898 children born between 1998 and 2000 in U.S. cities with a population of over 200,000 people.<sup>45</sup> They found that rates of infant LBW were lower in the first few years of immigrant mothers' residence in the U.S. and then began to increase.<sup>45</sup>

### **Explaining the Hispanic Paradox**

Acculturative Stress Theory is often used in the literature to explore health outcomes in populations of Hispanic origin. However, it is important to note that there are two other hypotheses that also aim to explain the Hispanic Paradox: selective migration and cultural buffering.

#### **Selective Migration**

The selective migration hypothesis states that immigrants to the U.S. are generally healthier than individuals in their country of origin.<sup>46</sup> This is because those who choose to migrate are more likely than non-immigrants to be in better health and willing to endure the tribulations that come with the immigration process.<sup>46</sup>

According to the hypothesis, this selection process makes immigrant Hispanics to the U.S. healthier than native-born Hispanics.<sup>46</sup>

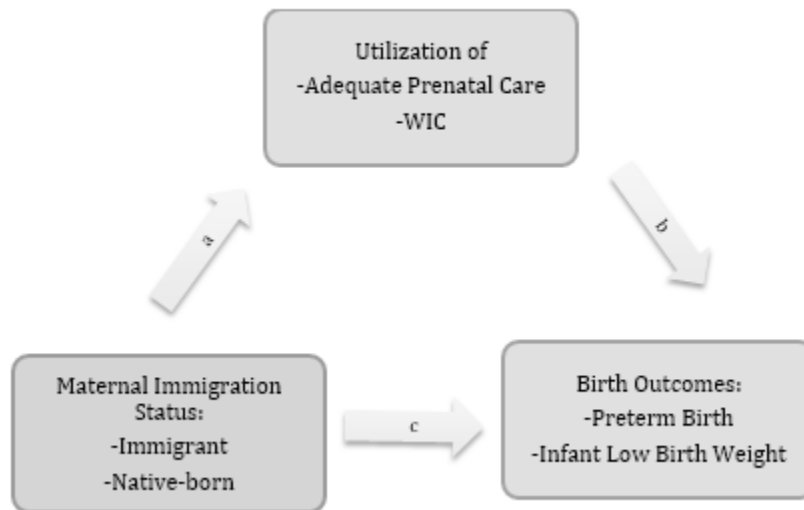
A similar form of selective migration can occur if immigrants who are less healthy choose to return to their country of origin.<sup>46-48</sup> As a result, the immigrants who remain in the U.S. appear healthier than the average individual.

### **Cultural Buffering**

Still another hypothesis used to explain the Hispanic Paradox is cultural buffering. This hypothesis attributes better immigrant health to protective health factors in an individual's culture of origin prior to migration. For example, within Mexican society, cultural norms include a healthy diet, active lifestyle, and strong familial/social support systems.<sup>18,49</sup> Having a healthy diet, living an active lifestyle, and having social support have all been shown to improve birth outcomes.<sup>50,51</sup> The cultural norms of immigrants prior to immigration promote protective factors that may influence aspects of their health status, including women's pregnancies and their birth outcomes.<sup>18</sup>

### **Conceptual Model**

This study aims to elucidate factors related to the Hispanic Paradox. Specifically, the study examined whether or not two health care behaviors, utilization of adequate prenatal care and participation in WIC, mediate the relationship between Hispanic women's immigration status and two separate birth outcomes: preterm birth and infant LBW. Figure 3 presents the conceptual model for this study.



**Figure 3. Conceptual Model**

### **Birth Outcomes**

This study will focus on two birth outcomes: preterm birth and infant LBW. Preterm birth affects approximately 500,000 babies in the U.S. every year and has contributed greatly to child morbidity and mortality.<sup>10,52</sup> The Centers for Disease Control and Prevention (CDC) define preterm birth as a birth that occurs at less than 37 weeks of gestation.<sup>52</sup> The fetus goes through major biological development during the final stages of pregnancy; the more preterm a child is born, the less time it has to fully develop in utero.<sup>52</sup> Preterm birth may contribute to breathing, feeding, vision, and hearing difficulties, which may result in emotional or economic burdens for families of preterm children.<sup>52</sup> The severity of developmental problems in preterm infants varies and can lead to infant death.<sup>52</sup>

Preterm birth is associated with LBW of the infant, defined as less than 2500 grams (5.5 pounds).<sup>52,53</sup> In 2012, the CDC estimated that 8% of babies in the U.S.

were born LBW.<sup>54</sup> LBW infants are at higher risk of adverse birth outcomes such as decreased autonomic regulation, motor system functioning, and self-regulatory abilities.<sup>55</sup> These decreased biological capabilities inhibit an infant's survival during the first year of life.<sup>53</sup> Both preterm birth and LBW are important to consider in the field of maternal and child health.

### **Immigrant Status and Birth Outcomes**

A number of studies have explored the relationship between women's immigrant status and birth outcomes. Two cross sectional studies of immigrant women in Chicago and New York found that regardless of race, immigrant women tended to have better birth outcomes than nonimmigrant women.<sup>56,57</sup> The study in Chicago used linked birth and death records for 57,324 singleton births to Mexican women.<sup>57</sup> Researchers found that Mexican immigrant women in Chicago had lower rates of preterm birth and LBW infants compared to native-born women of all other races.<sup>57</sup> A second study in New York by Almeida et al. linked data on 4,813 women from the Pregnancy Risk Assessment Monitoring System (PRAMS) survey to birth certificates.<sup>56</sup> Immigrant Hispanics had comparable rates of preterm birth to Whites, while native-born Hispanics had an increased rate of preterm births compared to Whites and immigrant Hispanics.<sup>56</sup> This association is well documented as part of the "Hispanic Paradox" and both studies support this paradox.<sup>11</sup>

McDonald et al. expanded the previous study using data from PRAMS from New York and 26 other states to compare reproductive health outcomes between Hispanic (N=5,104) and non-Hispanic White mothers (N=22,608).<sup>58</sup> In comparisons of preterm birth frequencies, Hispanic women in the U.S. experienced lower rates of

preterm birth compared to non-Hispanic Whites.<sup>58</sup> However, perhaps due to limitations of the data set, McDonald et al. did not investigate the role of maternal duration of residence in the U.S. in their study.

Another study of the relationship between immigration status and preterm birth among Hispanic women considered the length of the woman's residence in the U.S. Hospital records were used to compare 83,233 infants of immigrant mothers to 314,237 infants of native-born mothers. Findings revealed that recent Hispanic immigrants had a lower rate of preterm births compared to their nonimmigrant counterparts.<sup>59</sup> However, these findings were only significant for women who were in the U.S. for less than five years.<sup>59</sup> For immigrant women who resided in the U.S. for 5-15 years, there was a linear increase in the preterm birth rate as their duration of residence in the U.S. increased.<sup>59</sup> When immigrant women had spent fifteen or more years in the U.S., they had similar birth outcomes as nonimmigrants.<sup>45,59</sup> This study is consistent with the broader literature in its use of acculturation theory, which suggests that the longer immigrants have been in the U.S., the more likely they are to have adverse birth outcomes.<sup>45,60</sup> However, duration of mother's residence in the U.S. is a relatively new topic within the field of immigrant Hispanic health. There is current debate about the duration of time in the U.S. after which protective health behaviors begin to deteriorate among immigrant women, resulting in immigrant health outcomes that are comparable to those of their native-born peers.

Still another recent study explored racial/ethnic and nativity differences in birth outcomes of women in New York City. Almeida et al. found that immigrant Hispanic women had higher odds of having a LBW infant compared to native-born

Hispanic women.<sup>56</sup> This finding is contrary to the Hispanic Paradox, and may have been influenced by several methodological factors. First, due to the method of data collection, the researchers were unable to disaggregate Puerto Rican from other Hispanic mothers. Also, the researchers may have been unable to account for acculturation.<sup>56</sup> Approximately twenty-five percent of the immigrant Hispanic group in their study came to the U.S. when they were younger than 15 years old.<sup>56</sup>

In another study, researchers used the 2002 Natality Detail Data on 634,797 Hispanic women in the U.S. to determine if there was an association between immigrant status and infant LBW. They found that immigrant Hispanic American mothers were less likely to have LBW babies compared to native-born Hispanic American mothers.<sup>61</sup> More specifically, immigrant Hispanic women had 23% lower odds of having a LBW baby compared to native-born Hispanics.<sup>61</sup> These results concur with the majority of literature about maternal immigration status and women's birth outcomes.

Another large investigation used birth certificates from the U.S. and Belgium and survey data from France (because birth weight is not registered on French birth certificates) to determine if there was an association between maternal immigration status and birth outcomes in the three countries.<sup>18</sup> The immigrant population from the U.S. was Mexican and the immigrant populations from Belgium and France were North African. The researchers used North African immigrants because they had low socioeconomic status and high fertility, comparable to the Mexican population in the U.S.<sup>18</sup> The sample consisted of 285,371 Mexico-born and 3,131,632 U.S.-born mothers in the United States; 4,623 North African and 103,345 Belgian mothers; and



632 North African and 11,185 French mothers.<sup>18</sup> Immigrants in the U.S., Belgium, and France all had infants with higher birth weights compared to infants of native-born mothers.<sup>18</sup> Thus, the Hispanic Paradox or a pattern similar to this paradox was found among immigrant populations in both the U.S. and other countries.

### **Prenatal Care and WIC Program**

Prenatal care has been identified as an important contributor to positive birth outcomes.<sup>62</sup> Standard prenatal care consists of routine checkups, prenatal vitamins, and guidance on optimal prenatal health behaviors.<sup>63</sup> During prenatal visits, positive prenatal behaviors are reinforced and mothers are reminded of the deleterious effects of smoking, drinking alcohol, and using drugs during pregnancy. Prenatal care allows for monitoring of pregnancy complications that can sometimes be resolved before they harm the mother or child. Obtaining adequate prenatal care also reduces the risk of having a LBW baby.<sup>64</sup> Early prenatal care and retention in prenatal care visits are associated with higher infant birth weights and lower infant mortality rates.<sup>65</sup>

A second health behavior posited to have a beneficial influence on infant birth outcomes is pregnant women's participation in the WIC program. WIC is administered by the Food and Nutrition Services (FNS) of the U.S. Department of Agriculture (USDA).<sup>13</sup> The program provides education and counseling for pregnant, breastfeeding, and postpartum women, as well as referrals to health care providers or social services.<sup>13</sup> Participants also receive supplemental nutritious foods to prevent potential health problems during prenatal and child development.<sup>13</sup> Maryland's WIC-approved food list for pregnant mothers includes milk, cheese, and peanut butter,

providing sources of calcium and protein.<sup>66</sup> For infants, the food list includes: formula, cereal, and specific fruits, vegetables, and meats.<sup>66</sup> WIC serves 9.1 million women, infants, and children nationwide, including approximately 143,000 women, infants, and children per month in Maryland.<sup>13</sup>

### **Immigrant Status and Use of Maternal Health Services**

This study will focus on relationships between Hispanic women's immigrant status and two separate prenatal health behaviors: adequate utilization of prenatal care and participation in the WIC program.

Research has examined use of prenatal care among immigrant and native-born Hispanic women in the U.S. One major study revealed that women who received no prenatal care were two to four times more likely to have negative birth outcomes (LBW, very LBW, preterm birth, small for gestation age, neonatal mortality, and infant mortality) compared to women who received any prenatal care.<sup>67</sup> In this study, National Center for Health Statistics (NCHS) U.S. Linked Live Birth-Infant Death files of 126,220 women were used in a cluster analysis to determine whether or not women who did not receive prenatal care had distinctive characteristics.<sup>67</sup> The researchers found that women without prenatal care were more likely than women who obtained such care to have low education, increased parity, and immigrant status. While the study looked at all races/ethnicities, the two clusters with the highest concentrations of women receiving no prenatal care had the highest numbers of immigrant Hispanic women. One of the clusters consisted of young (20-30 year old), immigrant Hispanic women with no education and low behavioral risks (no drinking or smoking) while the other consisted of very young (20 years old or less), immigrant

Hispanic women with less than a high school education and low behavioral risks.

Despite the lack of prenatal care, these clusters had comparable birth outcomes to the clusters of non-Hispanic White women.

Although the previous study found poorer use of prenatal care among immigrants compared to native-born women, at least one U.S. study had a different outcome.<sup>12</sup> Zambrana et al. conducted interviews with 399 Mexican Americans and 545 Mexican immigrants in Los Angeles County.<sup>12</sup> To account for acculturation, the researchers categorized women who were born in Mexico but resided in the U.S. since at least the age of 10 as native-born Mexican Americans.<sup>12</sup> Women who were born in Mexico, but resided in the U.S. for seven or fewer years, were categorized as immigrants. Findings revealed no significant differences between immigrant and native-born Mexican American women in their initiation of prenatal care. However, it should be noted that this study was limited to one geographic area in 2007 of the U.S., Los Angeles County, which has effective prenatal education and outreach programs readily available in English and Spanish.

The existing literature examining immigrant women's use of prenatal care has revealed mixed results. Conflicting findings may stem, in part, from the failure to disaggregate the large group of immigrant Hispanic women to better understand their health care utilization. In particular, studies have found that the legal status of immigrant mothers influences their use of health services, with undocumented women least likely to obtain adequate levels of prenatal care than their documented peers.<sup>68</sup>

Several states, including Maryland, have taken the initiative to provide prenatal care for lower income mothers through the Children's Health Insurance Program (CHIP) and Medicaid.<sup>69</sup> In 2009, President Obama signed the *Children's Health Insurance Reauthorization Act of 2009*, expanding the healthcare program to four million children and pregnant women.<sup>70</sup> This Act was the first to include legal immigrants without a waiting period.<sup>70</sup> The Maryland Children's Health Insurance Program (MCHIP) uses federal and state funds to ensure health benefits for children up to age 19 and pregnant women of any age who meet the program's income guidelines.<sup>70</sup> However, the program only provides prenatal care services to legal immigrants. Some undocumented immigrant mothers may fail to receive adequate prenatal care because of their limited financial resources and fear of adverse immigration consequences, such as deportation.<sup>69</sup>

In an effort to improve county birth outcomes, Prince George's County established the Health Action Coalition's Infant Mortality Workgroup (IMWG) in 2012.<sup>71</sup> IMWG's mission is to reduce infant LBW and infant mortality, as well as increase the proportion of pregnant women who receive prenatal care in their first trimester.<sup>71</sup> The program targeted Hispanic women by adding Spanish to existing pregnancy education referral cards and pamphlets distributed at county clinics and health fairs. The group also hosted a pilot symposium addressing prenatal care in December 2014, attended by over 70 pregnant county women, the majority of whom were Hispanic. These women are being followed by The Pregnancy Aid Center's referral program. The program's success in reaching Hispanic women resulted in

plans for three more similar events to connect women with pregnancy information and prenatal care.

Another maternal care service, used by women in Maryland and across the nation, is the WIC program. Research indicates that relatively large numbers of Hispanics participate in the WIC.<sup>67</sup> In WIC's 2012 national annual report, 47% of participants identified as being Hispanic.<sup>72</sup> This participation rate is believed to be the result of several factors, including the program's positive approach to providing guidance, the presence of Hispanic staff members, and the provision of nutritious supplemental foods to women who have limited financial resources.<sup>72</sup> Immigrants appear more likely to participate in WIC than non-immigrants because enrollment is not based on their legal status.<sup>13</sup> Some native-born Hispanic women may decline to enroll in WIC due to the stigma associated with receiving government food assistance. In one study that interviewed 70 women who had never enrolled, were currently enrolled, or formerly enrolled in WIC, many women reported reluctance to receive help from a government agency.<sup>73</sup>

### **Prenatal Care Utilization and Infant Birth Outcomes**

Adequate prenatal care can improve birth outcomes through diagnosis and treatment of maternal complications that reduce maternal risk factors.<sup>74</sup> Existing literature summarizes the benefits of prenatal care for the infant, including extension of gestation, heavier birth weight, and lower risk of infant mortality.<sup>75,76</sup> Dott and Fort linked 69,556 birth and 1,541 death certificates in Louisiana and found that infant mortality varied inversely with number of prenatal visits (defined by Kessner as nine or more visits for 36 or more weeks of gestation).<sup>77,78</sup> In the U.S. women

receive prenatal care through insurance, government assistance, access to free prenatal care through qualification for certain programs, and self-pay.<sup>79</sup>

Researchers have studied women's utilization of prenatal services in Portugal, where prenatal care is free to all women, in order to diminish the effects of difficulty in obtaining such care.<sup>80</sup> Similar to Dott and Fort, they used the Kessner Index to evaluate associations between adequacy of prenatal care and preterm birth or infant LBW.<sup>80</sup> A sample of 3,734 infants linked with their mother's questionnaire data revealed that adequate and intermediate prenatal care were significantly associated with lower risk of preterm birth or infant LBW as compared to inadequate prenatal care.<sup>80</sup>

These studies laid the groundwork for other researchers interested in identifying the components of prenatal care visits that influence birth outcomes. Kogan et al. studied the content of prenatal care, focusing particularly on maternal reports of the health behavior advice they received.<sup>63</sup> Using a sample of 9,394 U.S. women from the National Maternal and Infant Health Survey, they found that women who reported failing to receive health behavior advice during prenatal visits were at higher risk of having a LBW infant compared to women who received such advice during their prenatal visits.<sup>63</sup> However, more research is needed to identify the specific aspects of prenatal care visits that influence birth outcomes.

### **WIC Participation and Infant Birth Outcomes**

Research has also examined the relationship between women's participation in WIC and infant birth outcomes. In one study, researchers linked birth and death records from the Washington State Department of Health to birth outcomes. This

study compared WIC participants (N=42,495) to women who were WIC eligible but did not use WIC (N=30,751).<sup>81</sup> Logistic regression revealed that use of WIC was protective for both preterm birth and infant LBW, especially for high risk mothers.<sup>81</sup> Since WIC provides guidance, social support, prenatal care referrals, and healthy supplemental foods,<sup>18,49</sup> it was not surprising that WIC participation was associated with positive birth outcomes.

The adoption of some U.S. cultural norms, such as unhealthy diets and isolation of the nuclear family from extended family members, may decrease protective factors from women's culture of origin that influence prenatal behavior and birth outcomes.<sup>51</sup> For example, as immigrants become more acculturated, they often adopt more of the popular American diet. Researchers used data from 5,982 participants in the New Immigrant Survey (NIS; 2003-2004) and found that as duration of residence in the U.S. increased, there was an increase in self-reported dietary changes that were associated with poorer health status.<sup>82</sup> More acculturated women's increasing consumption of over-processed foods and high-fructose drinks, for example, are likely to contribute to poor health outcomes.<sup>83</sup> Similarly, immigrating to the U.S. may involve leaving family and friends. Immigrants may lose their social support system and become physically and emotionally isolated, leading to depression and other adverse health problems.<sup>56</sup> Programs such as WIC may help to combat these negative outcomes by providing supportive guidance as well as healthy foods.

## **Other Potential Factors Influencing Birth Outcomes**

Social and economic disadvantages among minorities in the U.S. may also exacerbate inequalities in adequate prenatal care or access to WIC. Such inequalities may influence birth outcomes.<sup>84</sup> Some of these disadvantages include low educational attainment, low socioeconomic status, and marriage at a younger age. Hispanics and African Americans tend to have lower educational attainment compared to all other races in the U.S.<sup>85</sup> Immigrant Hispanics have some of the lowest rates of educational attainment.<sup>85</sup> Ward et al. studied race/ethnicity and socioeconomic status using the National Health Interview Survey (NHIS) and found that Hispanics in the U.S. had higher rates of poverty compared to non-Hispanic Whites.<sup>86</sup> This finding was confirmed by McDonald et al. using state-based pregnancy risk assessment monitoring system data.<sup>58</sup> Hispanics were also more likely to marry younger than individuals from other racial/ethnic backgrounds.<sup>87</sup> All of these factors among Hispanics may contribute to adverse birth outcomes.

## **Control Variables**

Several other factors may influence the relationship between maternal immigration status and birth outcomes. Such factors include maternal age, maternal education, marital status, parity, and smoking status during pregnancy. Statistical models have traditionally adjusted for these factors because of their influence on birth outcomes and their association with immigration status.

### **Maternal Age**

Childbirth at an increased maternal age leads to a higher risk of negative birth outcomes.<sup>88</sup> Older mothers are more likely than their younger peers to have a preterm



birth and infant LBW.<sup>88</sup> Risks are especially high among mothers older than forty years of age.<sup>88</sup>

Adolescent pregnancy has also been associated with some negative birth outcomes. In a study of 23,654,785 live births in a linked 1995–2000 infant birth and death data set from the U.S., researchers found that teenage mothers were more likely to have infants born preterm and LBW compared to infants of the reference group, 20-34 year old mothers.<sup>89</sup> The researchers compared mothers aged <16, 16-17, and 18-19 years to the reference group and found that as maternal age decreased, the likelihood of negative birth outcomes increased.<sup>89</sup>

### **Maternal Education**

Lower levels of education have been associated with higher preterm birth risks, neonatal and postnatal death, and stillbirth.<sup>90</sup> Maternal education is often split into three categories in research: less than high school, high school, and more than a high school education.<sup>61,90,91</sup> Immigrant Hispanics are more likely to be less educated (<12 years) than native-born Hispanics.<sup>61</sup> Moreover, women with lower levels of education are often found in poorer neighborhoods where access to prenatal care may be more difficult.<sup>90</sup>

### **Marital Status**

The link between marital status and health outcomes has also been well established within the literature. Researchers have conducted a systematic review of marital status and birth outcomes.<sup>92</sup> In one meta-analysis of 21 studies, unmarried mothers were at increased risk for both preterm birth and infant LBW compared to married mothers.<sup>92</sup> Marital status can also affect stress levels, and maternal stress has

been linked to negative birth outcomes.<sup>93</sup> Marriage can decrease stress through social support or it can increase stress if there are marital problems. Immigrant Hispanic women in the U.S. are more likely to be married compared to their native-born counterparts.<sup>94</sup>

### **Parity**

Immigrant Hispanic women generally have more children than native-born-Hispanic women.<sup>7</sup> Prevailing categories of parity in the U.S. include: nulliparity (no children), low multiparity (1-3 children), and grand multiparity (4-8 children).<sup>95</sup> In a cross-sectional study, researchers found that compared with low multiparity women, mothers who are grand multipara were at greater risk for obstetric complications, neonatal morbidity, and perinatal mortality.<sup>95</sup>

### **Smoking Status During Pregnancy**

In the U.S., the most widely studied behavioral risk factor associated with negative health effects is smoking.<sup>96</sup> Extensive literature covers the deleterious effects of smoking during pregnancy, and smoking has been directly associated with adverse birth outcomes.<sup>97-100</sup> A meta-analysis of 124 articles revealed a strong association between smoking during pregnancy and placenta previa, placental abruption, ectopic pregnancy, and other maternal complications.<sup>97</sup> Studies have found that women who smoke have a significantly higher rate of preterm birth and LBW infants than nonsmoking women.<sup>96,101</sup> According to the CDC, Hispanics are less likely to smoke than non-Hispanics, with a prevalence of 12.5% smokers, compared to the White, non-Hispanic prevalence of 19.7%.<sup>102</sup> However, native-born Hispanic American women are more likely to smoke than immigrant Hispanic

American women.<sup>12,103</sup> This may be the result of their longer exposure to the behavioral risk factor of smoking in the U.S.

### **Significance of Study**

This study attempted to improve understanding of factors that may contribute to positive birth outcomes for immigrant and native-born Hispanic mothers in Prince George's County, Maryland. Among mothers of all races and ethnicities, utilization of prenatal care has been found to impact gestational age and infant birth weight.<sup>50,62</sup> Adequate prenatal care has been associated with several positive outcomes, including full-term birth, adequate gestational age, and healthy weight infants.<sup>50,62</sup> Women's participation in WIC has also been found to be protective against negative birth outcomes, especially among high risk mothers.<sup>81</sup> Although birth outcomes among Hispanic immigrants have been studied, few researchers have considered receipt of adequate prenatal care and participation in WIC as mediating factors. Adopting the framework of Acculturative Stress Theory and concepts from the Integrative Model for Developmental Competencies in Minorities, this study extended current literature by attempting to identify factors that mediate the relationship between immigration status of Hispanic mothers and their birth outcomes. Identification of such mediators may suggest ways in which the healthcare system facilitates or hinders the likelihood of positive birth outcomes for Hispanic women.

It should be noted that although the current study sought to determine if the Hispanic Paradox exists in Prince George's County, there are some limitations stemming from the County's available dataset. Because duration of residence in the U.S. is not available on Maryland birth certificates, it was not examined in this study.

There was also limited information on mothers' country of origin because Maryland birth certificates break down this variable into Mexican, Puerto Rican, Cuban, not stated, and other/unknown Hispanic categories. However, based on the summary of the Prince George's County immigrant population presented in the Introduction, it is likely that the majority of other/unknown Hispanic women in the sample are Salvadoran and relatively new immigrants, with less than 15 years of residence in the U.S.

Based on the Acculturative Stress Theory, constructs from the Integrative Model for Developmental Competencies in Minorities, and existing literature, the following research questions and hypotheses are proposed:

**Research Question**

(1) Is there an association between immigrant status and birth outcomes for Hispanic mothers?

**Hypotheses**

(1a) Immigrant Hispanic mothers have a lower likelihood than native-born Hispanic mothers of delivering a preterm infant.

(1b) Immigrant Hispanic mothers have a lower likelihood than native-born Hispanic mothers of having a LBW infant.

**Research Question**

(2) Is there a relationship between immigrant status and adequate prenatal care?

**Hypothesis**

(2a) Immigrant Hispanic mothers have a greater likelihood of reporting adequate prenatal care compared to native-born Hispanic mothers.

**Research Question**

(3) Is there a relationship between immigrant status and participation in WIC?

**Hypothesis**

(3a) Immigrant Hispanic mothers have a greater likelihood of reporting participation in WIC compared to native-born Hispanic mothers.

**Research Question**

(4) Is adequate prenatal care associated with birth outcomes?

**Hypotheses**

(4a) Adequate prenatal care is associated with a lower likelihood of preterm birth.

(4b) Adequate prenatal care is associated with a lower likelihood of infant LBW.

**Research Question**

(5) Is participation in WIC associated with birth outcomes?

**Hypotheses**

(4a) Participation in WIC is associated with a lower likelihood of preterm birth.

(4b) Participation in WIC is associated with a lower likelihood of infant LBW.

**Research Question**

(6) Is the relationship between the immigration status of Hispanic mothers and birth outcomes mediated by adequate prenatal care?

**Hypothesis**

(6a) The relationship between the immigration status of Hispanic mothers and birth outcomes is mediated by adequate prenatal care.

**Research Question**

(7) Is the relationship between the immigration status of Hispanic mothers and birth outcomes mediated by participation in WIC?

**Hypothesis**

(7a) The relationship between the immigration status of Hispanic mothers and birth outcomes is mediated by participation in WIC.

## **CHAPTER 3: METHODOLOGY**

### **Dataset**

This study used 2011-2012 residential birth certificates from Prince George's County, Maryland for singleton births to 5,720 Hispanic women 15-42 years of age. These records include information such as the mother's country of origin, use of prenatal health services, participation in WIC, and birth outcomes, which were utilized to test the study's hypotheses. Information on maternal age, maternal education, parity, marital status, and smoking were collected from the birth certificate.

### **Sample**

The sample comprised of Hispanic women who gave birth in Prince George's County, Maryland. The U.S. Census Bureau defines Hispanic as:

People who have classified themselves as 'Mexican,' 'Puerto Rican,' or 'Cuban,' as well as those who indicate that they are of 'another Hispanic, Latino, or Spanish origin.' People who do not identify with one of the specific origins listed on the questionnaire but indicate that they are of 'another Hispanic, Latino, or Spanish origin' are those who were born in Spain, the Spanish-speaking countries of Central or South America, or the Dominican Republic.<sup>104</sup>

In the current study, mother's race/ethnicity is defined as how she identifies herself on the race/ethnicity question on the birth certificate.

## **Measures**

### **Independent Variable**

#### *Maternal Immigration Status*

Mother's birthplace, obtained from the birth certificate, was used to determine whether the mother is an immigrant or native-born. This variable was coded as yes (1) if she is an immigrant, meaning that she was born outside the 50 U.S. states, the District of Columbia, Puerto Rico or other U.S. territories or no (0) if she was native-born, meaning that she was born in the 50 U.S. states, the District of Columbia, Puerto Rico or other U.S. territories.

### **Dependent Variables**

The dependent variables in this study consist of preterm birth and infant LBW.

#### *Preterm Birth*

Time of birth, in weeks, was obtained from the birth certificate. If gestation was 36 weeks or less, it was considered preterm birth and coded as (1) and if gestation was 37 weeks or more, it was not be considered preterm birth and coded as (0).

#### *Infant LBW*

Birth weight, in grams, was obtained from birth certificate data as a categorical variable. Less than 2500 grams was considered LBW and coded as (1), and 2500 grams or more was considered not LBW and coded as (0).



## **Mediators**

This study included two separate mediating variables: obtaining adequate prenatal care and participation in the WIC program.

### *Adequacy of Prenatal Care measured by Kessner Index*

Adequacy of prenatal care was measured using the Kessner Index, which takes into account when the mother began prenatal care and the number of prenatal visits while considering gestational age.<sup>78</sup> A score was calculated based on the previous three factors, with care split into three categories: adequate, coded as (1), intermediate, coded as (2), and inadequate, coded as (3).<sup>78</sup> A binary variable was created for having had adequate prenatal care, coded (1) if women were classified as having adequate care, and coded (0) if women were classified as having either intermediate or inadequate care. For further explanation of the Kessner Index, see Figure 4 which was created using the Institute of Medicine recommendations.<sup>78</sup>

### *Participation in the WIC Program*

A categorical variable was created by the Maryland Vital Statistics staff to assess participation in WIC. It was measured based on how the mother answered the question, “Are you enrolled in WIC?” The answer to this question was coded as yes (1) or no (0).

<b>ADEQUATE*</b>	
<b>Gestation (weeks)****</b>	<b>Number of Prenatal Visits</b>
13 or less AND	1 or more or not stated
14-17 AND	2 or more
18-21 AND	3 or more
22-25 AND	4 or more
26-29 AND	5 or more
30-31 AND	6 or more
32-33 AND	7 or more
34-35 AND	8 or more
36 or more AND	9 or more
<b>INADEQUATE**</b>	
<b>Gestation (weeks)****</b>	<b>Number of Prenatal Visits</b>
14-21*** AND	0 or not stated
22-29 AND	1 or less or not stated
30-31 AND	2 or less or not stated
32-33 AND	3 or less or not stated
34 or more AND	4 or less or not stated
<b>INTERMEDIATE</b>	All combinations other than specified above

\* In addition to the specified number of visits indicated for adequate care, the first prenatal visit must occur at 13 weeks or less (first trimester).

\*\* In addition to the specified number of visits indicated for adequate care, all women who started their prenatal care during the third trimester (28 weeks or later) are considered inadequate.

\*\*\* For this gestation group, care is considered inadequate if the time of the first visit is not stated.

\*\*\*\* When month and year are specified but day is missing, input 15 for day. Adequacy categories are in accord with recommendations of American College of Obstetrics and Gynecology and the World Health Organization.

#### **Figure 4: Kessner Index**

##### **Control Variables**

##### *Maternal Age*

A categorical variable assessing years of maternal age was created by the Maryland Vital Statistics staff. Dummy variables were coded for two categories: less than 20 years of age was coded as yes (1) or no (0) and 35 years or older was coded as yes (1) or no (0). Twenty to 34 years of age was used as the reference group. Due to the small number of participants who were younger than 15 years or older than 42

years, data were only analyzed for participants between the ages of 15 and 42 to ensure confidentiality.

#### *Maternal Education*

A categorical variable assessing years of education was created by the Maryland Vital Statistics staff. Dummy variables were coded for two categories: 12 years of education was coded as yes (1) or no (0) and greater than 12 years of education which was coded as yes (1) or no (0). Having completed fewer than 12 years of education was used as the reference group.

#### *Marital Status*

A dichotomous variable assessing marital status was created by the Maryland Vital Statistics staff. Married was coded as (1) and unmarried was coded as (0).

#### *Parity*

A categorical variable assessing parity was created by the Maryland Vital Statistics staff using information from the question, “live births that are now living?” Low multiparity included women who had 1-3 children and was coded as (0) and high multiparity included those who had 4 or more children and was coded as (1).

#### *Maternal Smoking*

Maternal smoking during pregnancy was dichotomous and coded in a yes (1) or no (0) format. It was based on the mother’s response on the birth certificate to the question, “How many cigarettes OR packs of cigarettes did you smoke on an average day during each of the following time periods: during the first three months of pregnancy, during the second three months, during the third trimester?” The yes response identified mothers who had smoked at least one cigarette during pregnancy

and was coded as (1) and no indicated mothers who had not smoked any cigarettes during pregnancy and was coded as (0).

### **Procedure and Statistical Analyses**

This study was approved by the Prince George's County Health Department Institutional Review Board (IRB) and the University of Maryland IRB. All procedures were in accord with the ethical standards set forth by the IRBs.

Statistical Analysis System (SAS) version 9.3 software was used to examine associations between the independent, dependent, and mediating variables. First, frequencies were run on all previously mentioned variables. Then bivariate analyses were conducted using logistic regression. Baron and Kenny's 4-step procedure using multiple regression analysis was used to test for mediation.<sup>105</sup> Analysis followed the conceptual model from Figure 3 in c, a, b format and significance of the coefficients was examined at each step. Each pathway tested on the conceptual model (Figure 3) must be significant to fulfill Baron and Kenny's mediation criteria.<sup>105</sup>

The first step was to answer Research Question 1 by examining the relationship, shown by arrow c in Figure 3 (page 28), between Hispanic mothers' immigration status and each of the two birth outcomes. Hypothesis 1a was that immigrant Hispanic mothers are less likely than nonimmigrant Hispanic mothers to have a preterm infant. Hypothesis 1b was that immigrant Hispanic mothers are less likely than nonimmigrant Hispanic mothers to have a LBW infant. These hypotheses were tested with logistic regression analysis, regressing each of the birth outcomes on Hispanic mothers' immigration status without the control variables. Then all control variables were added to the model and odds ratios (ORs) and 95% confidence

intervals (CIs) were reported. P-values were considered statistically significant at the  $p < .05$  level or lower.

The second step was to answer Research Questions 2 and 3 by examining the association between Hispanic mothers' immigration status and their prenatal behaviors (Figure 3, arrow a) using logistic regression. The mediating variables, adequate prenatal care and participation in WIC, were examined independently. Logistic regression was used to answer hypotheses 3a and 4a which are: immigrant Hispanic mothers have a greater likelihood of reporting adequate prenatal care compared to native-born Hispanic mothers, and immigrant Hispanic mothers have a greater likelihood of reporting participation in WIC compared to native-born Hispanic mothers. These hypotheses were tested by separately regressing adequate prenatal care on Hispanic mothers' immigration status, and participation in WIC on Hispanic mothers' immigration status, both without the control variables. Then all control variables were added to the models and odds ratios (ORs) and 95% confidence intervals (CIs) were reported.

The third step was to answer Research Questions 4 and 5 by examining the association between adequate prenatal care and birth outcomes (Figure 3, arrow b) using logistic regression. Hypotheses 4a and 4b in this step were: adequate prenatal care is associated with a lower likelihood of preterm birth, and adequate prenatal care is associated with a lower likelihood of infant LBW. Testing was done by regressing each of the two birth outcomes separately (preterm birth and LBW) on adequate prenatal care without control variables. Then all control variables were added to the models and odds ratios (ORs) and 95% confidence intervals (CIs) were reported. In

this step, participation in WIC and birth outcomes were also examined (Figure 3, arrow b) using logistic regression. Hypotheses 5a and 5b were: participation in WIC is associated with a lower likelihood of preterm birth, and participation in WIC is associated with a lower likelihood of infant LBW. Each of the two birth outcomes was separately regressed on participation in WIC. Then all control variables were added to the models and odds ratios (ORs) and 95% confidence intervals (CIs) were reported.

The Final Research Questions addressed whether or not the relationships between Hispanic mothers' immigration status and infant birth outcomes are mediated by adequate prenatal care and participation in WIC. If there were significant associations in all of the previous steps, hypotheses 6a and 7a would be tested. These hypotheses were: the relationship between immigration status and birth outcomes is mediated by adequate prenatal care, and the relationship between immigration status and birth outcomes is mediated by participation in WIC. These hypotheses were tested through logistic regression analysis with Hispanic mothers' immigration status and the mediators predicting preterm birth and infant LBW. If Hispanic mothers' immigration status is no longer significant when adequate prenatal care or participation in WIC is controlled, the finding supports full mediation. If Hispanic mother's immigration status is still significant when adequate prenatal care or participation in WIC is controlled, but has a smaller coefficient, the findings support partial mediation.

## **CHAPTER 4: RESULTS**

### **Descriptive Statistics**

Descriptive statistics (percentages) were used to summarize characteristics of the sample of 4,971 Hispanic women between the ages of 15 and 42 who gave birth in Prince George's County, Maryland in 2011 and 2012. Chi-square statistics were used to examine differences between immigrant and native-born Hispanic mothers on all variables. Results revealed significant differences between the two groups of mothers for all variables except maternal education of 12 years. These data are presented in Table 1. Approximately 17% of mothers were native-born and 83% were immigrant mothers. The majority of the Hispanic women were between 20-34 years of age (77%) and over half (56%) had less than 12 years of education. Specifically, when examining maternal education of less than 12 years, 62% of immigrant Hispanic women and 28% of native-born Hispanic women were in this lowest education category. Thirty-nine percent of Hispanic mothers reported being married and 15% had four or more children. Less than 1% of the total analytic sample reported smoking during their pregnancy.

Table 1 further reveals that Hispanic mothers were more likely to be enrolled in the WIC program (75%) than to receive adequate prenatal care (39%). Immigrant mothers (78%) were more likely than native-born mothers (63%) to participate in WIC. In contrast, native-born mothers (46%) were more likely than immigrant mothers (38%) to receive adequate prenatal care. Approximately 7% of pregnancies to mothers in the study resulted in a preterm infant and 6% resulted in a LBW infant.

Immigrant mothers were less likely than native-born mothers to have a baby born pre-term or LBW.

**Table 1. Frequencies of All Variables in Analytic Sample by Immigration Status**

	Hispanic mothers (N=4,971)			
<b>Mothers Birth Place</b>	<b>Total N (%)</b>	<b>Native-born</b>	<b>Immigrant</b>	<b>P-value</b>
	<b>4,971 (100)</b>	<b>864 (17.4)</b>	<b>4107 (82.6)</b>	
Maternal Age				
20-34 years ( <i>reference</i> )	3822 (76.9)	594 (68.8)	3228 (78.6)	0.001
<20 years	498 (10.0)	231 (26.7)	267 (6.5)	0.001
35-42 years	651 (13.1)	39 (4.5)	612 (14.9)	0.001
Maternal Education				
<12 years ( <i>reference</i> )	2793 (56.2)	238 (27.6)	2555 (62.2)	0.001
12 years	1225 (24.6)	227 (26.3)	998 (24.3)	0.220
>12 years	953 (19.2)	399 (46.2)	554 (13.5)	0.001
Marital Status, currently married	1939 (39.0)	310 (35.9)	1629 (39.7)	0.041
Parity, four or more children	771 (15.5)	57 (6.6)	714 (17.4)	0.001
Smoking, smoked during pregnancy	36 (0.7)	23 (2.7)	13 (0.3)	0.001
Adequate Prenatal Care	1955 (39.3)	394 (45.6)	1561 (38.0)	0.001
WIC Enrollment	3724 (74.9)	543 (62.9)	3181 (77.5)	0.001
Preterm Birth	370 (7.4)	80 (9.3)	290 (7.1)	0.032
Low Birth Weight	271 (5.5)	62 (7.2)	209 (5.1)	0.012

## Logistic Regression

The following section describes results of the regression analyses, which are presented for each of the seven research questions.

### **Research Question 1: Is there an association between immigrant status and birth outcomes for Hispanic mothers?**

The analyses for this research question were conducted separately for the birth outcomes of preterm birth and LBW. The analyses aimed to determine: 1) if an association exists between immigrant status and having a preterm infant, and 2) if an association exists between immigrant status and having a LBW infant. Tables 2 and 3 show the results of the regression analyses.



*Preterm Birth*

In model I (Table 2), the odds of having a preterm birth were 26% lower (OR 0.74, 95% CI 0.57, 0.97, P<.05) for immigrant Hispanic mothers compared to native-born Hispanic mothers. This relationship remained significant after adjusting for the control variables in model II; the odds of preterm birth were 30% lower (AOR 0.70, 95% CI 0.52, 0.94, P<.05) for immigrant mothers compared to their native-born peers. The only control variable that was significant was older (35-42) maternal age (AOR 1.52, 95% CI 1.13, 2.03, P<0.05). The odds of having a preterm birth were 52% higher among Hispanic mothers who were 35-42 years of age compared to Hispanic mothers who were 20-34 years of age.

**Table 2. Regression of Preterm Birth on Maternal Immigration Status and Controls**

	Hispanic mothers (N=4,971)			
	Model I		Model II	
	OR	95%CI	AOR	95%CI
Immigrant	0.74	(0.57,0.97)*	0.70	(0.52, 0.94)*
Maternal Age				
20-34 years ( <i>reference</i> )			<i>reference</i>	
<20 years			1.03	(0.70, 1.53)
35-42 years			1.52	(1.13, 2.03)*
Maternal Education				
<12 years ( <i>reference</i> )			<i>reference</i>	
12 years			1.10	(0.84, 1.43)
>12 years			1.06	(0.78, 1.45)
Marital Status, currently married			1.25	(1.00, 1.57)
Parity, four or more children			1.18	(0.88, 1.59)
Smoking, smoked during pregnancy			0.62	(0.15, 2.60)
*P<.05				

*Infant LBW*

As shown in the unadjusted analysis in Table 3, maternal immigrant status was significantly associated with LBW (OR 0.69, 95% CI 0.52, 0.93, P<.05). After adjusting for control variables, this association remained significant (AOR 0.70, 95% CI 0.50, 0.98, P<.05). The odds of having a LBW infant were 30% lower for immigrant Hispanic mothers compared to native-born Hispanic mothers. There were no control variables significantly associated with LBW.

**Table 3. Regression of Infant LBW on Maternal Immigration Status and Controls**

	Hispanic mothers (N=4,971)			
	Model I		Model II	
	OR	95%CI	AOR	95%CI
Immigrant	0.69	(0.52, 0.93)*	0.70	(0.50, 0.98)*
Maternal Age				
20-34 years ( <i>reference</i> )			<i>reference</i>	
<20 years			1.10	(0.72, 1.69)
35-42 years			1.32	(0.92, 1.89)
Maternal Education				
<12 years ( <i>reference</i> )			<i>reference</i>	
12 years			1.02	(0.75, 1.39)
>12 years			1.05	(0.73, 1.50)
Marital Status, currently married			1.06	(0.81, 1.38)
Parity, four or more children			0.94	(0.65, 1.36)
Smoking, smoked during pregnancy			0.87	(0.21, 3.68)
*P<.05				

Overall, there was a significant association between maternal immigration status and the birth outcomes of LBW and preterm birth. The next step was to examine if there were associations between the independent variable and two potential mediators, adequate prenatal care and WIC.

**Research Question 2: Is there a relationship between immigrant status and adequate prenatal care?**

As shown in Table 4, maternal immigrant status was found to be significantly associated with adequate prenatal care in both the unadjusted (OR 0.73, 95% CI 0.63, 0.85,  $P < .01$ ) and adjusted (AOR 0.83 95% CI 0.70, 0.98,  $P < .05$ ) models. The odds of obtaining adequate prenatal care were 17% lower for immigrant Hispanic mothers compared to native-born Hispanic mothers. There were also several significant associations between control variables and adequate prenatal care. With regard to maternal education, the odds of obtaining adequate prenatal care were 46% higher (AOR 1.46, 95% CI 1.26, 1.68,  $P < .01$ ) for mothers with 12 years of education and 78% higher (AOR 1.78, 95% CI 1.50, 2.10,  $P < .01$ ) for mothers with more than 12 years of education compared to Hispanic mothers who had less than 12 years of education. With respect to maternal age, the odds of receiving adequate prenatal care were 28% lower (AOR 0.72 95% CI 0.58, 0.90,  $P < .05$ ) for Hispanic mothers younger than 20 years old compared to those who were 20-34 years of age. Additionally, the odds of obtaining adequate prenatal care were 51% higher (AOR 1.51 95% CI 1.33, 1.71,  $P < .01$ ) among married Hispanic mothers compared to their single peers. Lastly, the odds of obtaining adequate prenatal care were 29% lower (AOR 0.71 95% CI 0.59, 0.84,  $P < .01$ ) for Hispanic mothers who had four or more children compared to those with fewer children.

**Table 4. Regression of Adequate Prenatal Care on Maternal Immigration Status and Controls**

	Model I		Model II	
	OR	95%CI	AOR	95%CI
Immigrant	0.73	(0.63, 0.85)**	0.83	(0.70, 0.98)*
Maternal Age				
20-34 years ( <i>reference</i> )			<i>reference</i>	
<20 years			0.72	(0.58, 0.90)*
35-42 years			1.12	(0.94, 1.34)
Maternal Education				
<12 years ( <i>reference</i> )			<i>reference</i>	
12 years			1.46	(1.26, 1.68)***
>12 years			1.78	(1.50, 2.10)***
Marital Status, currently married			1.51	(1.33, 1.71)***
Parity, four or more children			0.71	(0.59, 0.84)***
Smoking, smoked during pregnancy			0.60	(0.29, 1.25)
*P<.05, **P<.01, ***P<.001				

**Research Question 3: Is there a relationship between immigrant status and participation in WIC?**

Table 5 reveals that maternal immigrant status was significantly associated with enrollment in the WIC program in both the unadjusted (OR 2.03, 95% CI 1.74, 2.37, P<.01) and adjusted (AOR 1.64, 95% CI 1.36, 1.98, P<.01) models. The odds of participating in WIC were 64% higher among immigrant Hispanic mothers compared to native-born Hispanic mothers. Several control variables were also associated with enrollment in the WIC program; the odds of participating were 70% less (AOR 0.30, 95% CI 0.25, 0.36, P<.01) for Hispanic mothers who had more than 12 years of education compared to those with less than 12 years. The odds of WIC participation were 38% less (AOR 0.62, 95% CI 0.54, 0.71, P<.01) for married Hispanic mothers compared to their single peers. Lastly, the odds of participating in WIC were more than twice as high (AOR 2.08, 95% CI 1.59, 2.81, P<.01) for women

who were less than 20 years of age and 31% less (AOR 0.69, 95% CI 0.56, 0.83, P<.01) for those 35 years or older compared to women in the 20-34 year age range.

In summary, significant relationships were found between the independent variable, maternal immigration status, and the potential mediators of adequate prenatal care and enrollment in WIC. The next step was to examine potential associations between the mediators and the birth outcomes.

**Table 5. Regression of WIC Enrollment on Maternal Immigration Status and Controls**

	Model I		Model II	
	OR	95%CI	AOR	95%CI
Immigrant	2.03	(1.74, 2.37)**	1.64	(1.36, 1.98)***
Maternal Age				
20-34 years ( <i>reference</i> )			<i>reference</i>	
<20 years			2.08	(1.54, 2.81)***
35-42 years			0.69	(0.56, 0.83)***
Maternal Education				
<12 years ( <i>reference</i> )			<i>reference</i>	
12 years			0.87	(0.73, 1.03)
>12 years			0.30	(0.25, 0.36)***
Marital Status, currently married			0.62	(0.54, 0.71)***
Parity, four or more children			0.95	(0.78, 1.16)
Smoking, smoked during pregnancy			0.75	(0.36, 1.56)
***P<.001				

**Research Question 4: Are adequate prenatal care or WIC enrollment associated with preterm birth?**

As shown in Table 6, adequate prenatal care was not significantly associated with preterm birth in either the unadjusted or adjusted models. WIC enrollment was significantly associated with preterm birth in the unadjusted model III. The odds of preterm birth were 23% less (OR 0.77, 95% CI 0.61, 0.97, P<.05) for Hispanic

**Table 6. Regression of Preterm Birth on Adequate Prenatal Care, WIC enrollment, and Controls**

	Model I		Model II		Model III		Model IV	
	OR	95% CI	AOR	95%CI	OR	95%CI	AOR	95%CI
Adequate Prenatal care	0.97	(0.78, 1.21)	0.92	(0.74, 1.15)				
WIC					0.77	(0.61, 0.97)*	0.82	(0.64, 1.05)
Maternal Age								
20-34 years ( <i>reference</i> )			<i>reference</i>				<i>reference</i>	
<20 years			1.18	(0.81, 1.71)			1.20	(0.82, 1.74)
35-42 years			1.47	(1.10, 1.96)*			1.45	(1.08, 1.94)*
Maternal Education								
<12 years ( <i>reference</i> )			<i>reference</i>				<i>reference</i>	
12 years			1.16	(0.89, 1.50)			1.14	(0.88, 1.48)
>12 years			1.24	(0.93, 1.64)			1.15	(0.86, 1.54)
Marital Status, currently married			1.25	(0.99, 1.56)			1.22	(0.97, 1.53)
Parity, four or more children			1.17	(0.87, 1.58)			1.18	(0.88, 1.59)
Smoking, smoked during pregnancy			0.70	(0.17, 2.95)			0.70	(0.17, 2.93)
*P<.05								

mothers participating in WIC compared to nonparticipants. However, after adjusting for the control variables in model IV, WIC participation was no longer significant. In model II, the odds of preterm birth were 47% higher (AOR 1.47, 95% CI 1.10, 1.96,  $P < .05$ ) for Hispanic mothers who were 35-42 years of age compared to those in the 20-34 year old age range. In model IV, again, the odds of having a preterm birth were 45% higher (AOR 1.45, 95% CI 1.08, 1.94,  $P < .05$ ) for mothers of advanced maternal age (35-42) compared to those 20-34 years of age.

**Research Question 5: Are adequate prenatal care or WIC enrollment associated with infant LBW infant?**

As shown in Table 7, adequate prenatal care was not significantly associated with a LBW infant; however there was a significant association between WIC enrollment and infant LBW. In the unadjusted model III, the odds of having a LBW infant were 28% lower (OR 0.72, 95% CI 0.55, 0.94,  $P < .05$ ) for Hispanic mothers participating in WIC compared to nonparticipants. After adjusting for control variables in model IV, the odds of delivering a LBW infant were 27% lower (AOR 0.73, 95% CI 0.55, 0.97,  $P < .05$ ) for WIC participants than nonparticipants.

In model II, the odds of having a LBW infant were 28% higher (AOR 1.28, 95% CI 0.90, 1.83,  $P < .05$ ) among Hispanic mothers who were 35 years of age or older compared to those in the 20-34 year age range.

**Table 7. Regression of LBW on Adequate Prenatal care, WIC Enrollment and Controls**

	Model I		Model II		Model III		Model IV	
	OR	95%CI	AOR	95%CI	OR	95%CI	AOR	95%CI
Adequate Prenatal care	0.87	(0.67, 1.12)	0.84	(0.65, 1.09)				
WIC					0.72	(0.56, 0.94)*	0.73	(0.55, 0.97)*
Maternal Age								
20-34 years ( <i>reference</i> )			<i>reference</i>				<i>reference</i>	
<20 years			1.25	(0.88, 1.87)			1.29	(0.86, 1.94)
35-42 years			1.28	(0.90, 1.83)*			1.25	(0.87, 1.78)
Maternal Education								
<12 years ( <i>reference</i> )			<i>reference</i>				<i>reference</i>	
12 years			1.09	(0.80, 1.47)			1.06	(0.78, 1.44)
>12 years			1.24	(0.89, 1.73)			1.10	(0.78, 1.55)
Marital Status, currently married			1.06	(0.82, 1.38)			1.02	(0.78, 1.33)
Parity, four or more children			0.93	(0.65, 1.34)			0.94	(0.65, 1.36)
Smoking, smoked during pregnancy			0.98	(0.23, 4.13)			0.97	(0.23, 4.07)
*P<.05								



In the final test for mediation, adequate prenatal care and participation in WIC were added to the models to determine the extent to which each of the mediators may explain the association between maternal immigration status and birth outcomes.

Tables 8 and 9 present results for these analyses.

**Research Question 6: Is the relationship between the immigration status of Hispanic mothers and birth outcomes mediated by adequate prenatal care?**

Table 8 reveals that immigrant status was significantly related to preterm birth in both the unadjusted and adjusted models. The odds ratio for immigrant status in the unadjusted model (OR 0.74, 95% CI 0.57, 0.97,  $P < .05$ ) was closer to 1 and therefore, smaller, than the odds ratio in the adjusted model (AOR 0.71, 95% CI 0.53, 0.96,  $P < .05$ ). These results indicate that the relationship between immigration status of Hispanic mothers and their birth outcomes was not mediated by adequate prenatal care. Only the control variable of older maternal age (35-42) was significantly associated with preterm birth; the odds of preterm birth were 50% higher (OR 1.50 95% CI 1.12, 2.01,  $P < .05$ ) for mothers 35-42 years of age compared to those 20-34 years of age.

**Table 8. Regression of Preterm Birth on Maternal Immigration Status, Adequate Prenatal Care, WIC, and Controls**

	Model I		Model II	
	OR	95%CI	AOR	95%CI
Immigrant	0.74	(0.57, 0.97)*	0.71	(0.53, 0.96)*
Adequate Prenatal Care			0.91	(0.73, 1.14)
Enrolled in WIC			0.84	(0.66, 1.08)
Maternal Age				
20-34 years (reference)			reference	
<20 years			1.05	(0.71, 1.55)
35-42 years			1.50	(1.12, 2.01)*
Maternal Education				
<12 years (reference)			reference	
12 years			1.10	(0.85, 1.44)
>12 years			1.03	(0.75, 1.41)
Marital Status, currently married			1.24	(0.99, 1.56)
Parity, four or more children			1.17	(0.87, 1.58)
Smoking, smoked during pregnancy			0.61	(0.14, 2.56)
*P<.05				

**Research Question 7: Is the relationship between the immigration status of Hispanic mothers and birth outcomes mediated by participation in WIC?**

As shown in Table 9, immigrant status was significantly related to infant LBW in both the unadjusted and adjusted models. The odds ratio for infant LBW in the unadjusted model (OR 0.69, 95% CI 0.52, 0.93, P<.05) was farther from 1 and, therefore, larger, than the odds ratio for the adjusted model (AOR 0.71, 95% CI 0.51, 1.00, P<.05) (Table 9). There was a 7% reduction in the association between mother’s immigrant status and infant LBW when WIC enrollment was added. These results suggest that participation in WIC partially mediates the relationship between maternal immigration status and infant LBW.

Participation in the WIC program was significantly associated with infant LBW after adjusting for control variables (AOR 0.75, 95% CI 0.56, 0.99, P<.05). No control variables were significant after adding the mediating variables to the model.

**Table 9. Regression of Infant LBW on Maternal Immigration Status, Adequate Prenatal Care, WIC, and Controls**

	Model I		Model II	
	OR	95%CI	AOR	95%CI
Immigrant	0.69	(0.52, 0.93)*	0.71	(0.51, 1.00)*
Adequate Prenatal Care			0.83	(0.64, 1.07)
Enrolled in WIC			0.75	(0.56, 0.99)*
Maternal Age				
20-34 years ( <i>reference</i> )			<i>reference</i>	
<20 years			1.12	(0.73, 1.73)
35-42 years			1.30	(0.91, 1.86)
Maternal Education				
<12 years ( <i>reference</i> )			<i>reference</i>	
12 years			1.03	(0.76, 1.41)
>12 years			0.99	(0.69, 1.44)
Marital Status, currently married			1.05	(0.80, 1.37)
Parity, four or more children			0.93	(0.64, 1.34)
Smoking, smoked during pregnancy			0.83	(0.20, 3.54)
*P<.05				

## **CHAPTER 5: DISCUSSION**

Previous research has studied the relationship between maternal immigration status and birth outcomes. The current study extended past research by examining two potential mediators of this relationship: adequate prenatal care and participation in WIC. The study adopted the Acculturative Stress Theory to provide context in understanding factors that might influence the relationship between the immigrant experience and infant outcomes. The Integrative Model for Developmental Competencies in Minorities also provided social stratification processes that were used to interpret findings related to native-born Hispanic mothers' experiences with maternal health services and their birth outcomes. Prince George's County birth certificate data from 2011-2012 were used to examine the relationships between Hispanic women's immigrant status, use of prenatal care services, and birth outcomes. A major goal of the study was to determine if adequate prenatal care and participation in WIC were mediators in the relationship between Hispanic mothers' immigration status and preterm birth and infant LBW.

This chapter discusses results of the data analyses, as well as describes limitations of the study, implications for policy and programming, and ideas for future research. Table 10 summarizes the study's research questions, hypotheses, and findings.

**Table 10. Summary of research questions, hypotheses, and findings**

Research Question	Hypothesis	Findings
1. Is there an association between immigrant status and birth outcomes for Hispanic mothers?	1a. Immigrant Hispanic mothers have a lower likelihood than native-born Hispanic mothers of delivering a preterm infant.	This hypothesis is supported.
	1b. Immigrant Hispanic mothers have a lower likelihood than native-born Hispanic mothers of having a LBW infant.	This hypothesis is supported.
2. Is there a relationship between immigrant status and adequate prenatal care?	2a. Immigrant Hispanic mothers have a greater likelihood of reporting adequate prenatal care compared to native-born Hispanic mothers.	This hypothesis is not supported; immigrant mothers had a significantly lower likelihood of reporting adequate prenatal care compared to native-born mothers.
3. Is there a relationship between immigrant status and participation in WIC?	3a. Immigrant Hispanic mothers have a greater likelihood of reporting participation in WIC compared to native-born Hispanic mothers.	This hypothesis is supported.
4. Is adequate prenatal care associated with birth outcomes?	4a. Adequate prenatal care is associated with a lower likelihood of preterm birth.	This hypothesis is not supported.
	4b. Adequate prenatal care is associated with a lower likelihood of infant LBW.	This hypothesis is not supported.
5. Is participation in WIC associated with birth outcomes?	5a. Participation in WIC is associated with a lower likelihood of preterm birth.	This hypothesis is not supported.
	5b. Participation in WIC is associated with a lower likelihood of infant LBW.	This hypothesis is supported.
6. Is the relationship between the immigration status of Hispanic mothers and birth outcomes mediated by adequate prenatal care?	6a. The relationship between the immigration status of Hispanic mothers and birth outcomes is mediated by adequate prenatal care.	This hypothesis is not supported.
7. Is the relationship between the immigration status of Hispanic mothers and birth outcomes mediated by participation in WIC?	7a. The relationship between the immigration status of Hispanic mothers and birth outcomes is mediated by participation in WIC.	This hypothesis is partially supported. Approximately 7% of the association between being an immigrant and reduced infant LBW was explained by WIC participation.

## **Characteristics of the Study Sample**

It is important to consider characteristics of the study's sample of immigrant and native-born Hispanic mothers, as well as their use of prenatal services and birth outcomes. Birth certificate data revealed that 83% of the Hispanic mothers who gave birth in Prince George's County in 2011 and 2012 were immigrants and 17% were native-born. These data are consistent with the rising number of recent immigrants from Central America and Mexico in both the County and state of Maryland.<sup>3,7</sup> Interestingly, native-born mothers were younger than their immigrant counterparts; more than a quarter of native-born mothers were under 20 years of age, compared to approximately 7% of immigrant mothers. Additionally, approximately 15% of immigrant mothers were 35-42 years of age, a rate three times higher than for native-born mothers (5%). It is possible that some immigrant mothers delayed childbearing before moving to the U.S., or took time to adjust to American culture (e.g., finding housing, employment) prior to having children. The latter finding may also reflect higher parity among immigrant mothers. Notably, immigrant mothers (17%) were more than two and a half times as likely as native-born women (7%) to have four or more children.

Findings also revealed that immigrant mothers were less educated than their native-born peers; approximately 62% of immigrant mothers had less than 12 years of education, compared to only 28% of native-born mothers. Previous studies have also found that immigrant Hispanics had lower educational levels (<12 years) than native-born Hispanics, likely reflecting the lack of educational opportunities and the need for early workforce involvement in their countries of origin.<sup>61</sup>

Unfortunately, birth certificate data were not available for the number of years immigrant Hispanic women had resided in the U.S., a factor that has previously been linked to immigrant birth outcomes. Specifically, research has found that Hispanic immigrants with less than 15 years of U.S. residence had lower rates of pre-term birth than their native-born peers.<sup>59</sup> Maryland population studies indicate that immigrant mothers in the Prince George's County sample are likely to be relatively recent immigrants. There has been a significant increase in Hispanic immigrants within the county and state since 2000.<sup>3,4</sup> As noted earlier, various push factors (political turmoil, violence, poverty, natural disasters) and pull factors (political freedom, economic opportunities, family reunification) have likely contributed to the waves of immigrants from El Salvador and Mexico within Prince George's County in recent years.<sup>22,25</sup>

Findings also revealed some additional significant differences between Hispanic immigrant and native-born mothers in the study sample. Immigrant mothers were significantly more likely to be married (40%) than their native-born counterparts (36%), but approximately 60% of all women in the sample were single at the time their child was born. Interestingly, the percentage of immigrant mothers who were married in the Prince George's County sample was almost identical to the percentage of foreign-born Hispanic mothers who gave birth nationally in 2011 (37%). However, the percentage of married native-born mothers in the sample (40%) was substantially lower than native-born Hispanic mothers in the U.S. (56%) who delivered a child in 2011.<sup>106</sup> Interviews with Prince George's County health workers and state immigration attorneys indicate that Hispanic marriage rates have been

dropping within the County during the last decade, just as they have been in the state and nation.<sup>54</sup> They note that reasons for this drop include tax advantages of being a low-income head of household and growing social acceptance of unmarried Hispanic relationships. (Maryland immigration lawyer at Allan J. Kruger Law Offices, phone call, April 2015). Cohabiting Hispanics describe their relationship as a “union abierta” or open partnership, and refer to each other as “esposo/a,” translated as husband or wife. Additionally, it was noted that some Hispanics remain unmarried in the U.S. because they are legally married in their countries of origin and have not obtained a divorce. (County health worker at Prince George’s County Health Department, phone call, April 2015).

Current health behavior findings were consistent with past studies showing low rates of smoking among pregnant Hispanic mothers. Less than 3% of native-born mothers and less than 1% of immigrant mothers reported smoking during their pregnancy. According to the CDC, Hispanics are less likely to smoke than non-Hispanics, with an overall prevalence of 12.5% smokers compared to the White, non-Hispanic prevalence of 19.7%.<sup>102</sup> Moreover, cigarette smoking is more prevalent among Hispanic men (17.3%) than among Hispanic women (7.0%).<sup>102</sup>

With respect to use of prenatal health care services, findings revealed that native-born mothers (46%) were significantly more likely to obtain adequate prenatal care than immigrant mothers (38%). This outcome may be influenced by the fact that some of the Hispanic women in the county’s immigrant sample were undocumented. Although CHIP and Medicaid cover the costs of labor and delivery for women who are not legal U.S. residents, they do not provide funding to support these women’s



prenatal care.<sup>69,70</sup> County health workers must refer undocumented women to a small number of nonprofit clinics that will provide them with free or low-cost care. (County health worker at Prince George's County Health Department, phone call, April 2015). It is not known what percentage of the current sample was undocumented, but this factor may play a role in immigrant Hispanic women's lower receipt of adequate prenatal care.

In contrast to the prenatal care findings, the County's Hispanic immigrant women (78%) were more likely to be enrolled in WIC compared to their native-born peers (63%). The WIC program does not restrict eligibility to legal immigrants; both documented and undocumented pregnant women are entitled to receive the program's services.<sup>13</sup> Current findings on use of maternal health services are consistent with those provided in WIC's 2012 annual report, which indicate that Hispanic immigrant women were more likely to enroll in WIC, but less likely to use prenatal care, than their native-born peers.<sup>72</sup>

### **Maternal Immigration Status and Use of Maternal Health Services**

One objective of the study was to determine whether or not there was a relationship between Hispanic women's immigrant status and their use of two maternal health care services after controlling for relevant demographic and health behavior (smoking) factors. First, it was hypothesized that immigrant women would obtain adequate prenatal care more than their native-born peers. However, this hypothesis was not supported. Instead, findings revealed that immigrant Hispanic mothers were significantly less likely than their native-born peers to obtain adequate prenatal care. Specifically, immigrant Hispanic mothers were 17% less likely to

obtain adequate prenatal care compared to mothers born in the U.S. This outcome was at first surprising given that more immigrant than native-born Hispanic women participated in the WIC program, which provides referrals to prenatal care clinics.<sup>72</sup> Maryland provides legal immigrants with CHIP and Medicaid coverage for prenatal care and the County has launched a number of initiatives to increase immigrant women's utilization of prenatal health services.<sup>69,71</sup> However, as noted earlier, CHIP and Medicaid do not cover prenatal care for immigrants who are not legal U.S. residents.

The current findings are consistent with some previous research examining the relationship between immigration status and use of prenatal care. For example, in a study of over 100,000 mothers using NCHS data, cluster analyses revealed that immigrant Hispanic women were in the group of women who had the lowest rates of adequate prenatal care.<sup>67</sup> In addition to illegal status, language and literacy barriers have been identified as contributing to immigrant women's lower use of prenatal services provided through CHIP and/or Medicaid.<sup>107,108</sup> Immigrant women may have difficulty identifying nearby prenatal care clinics with Spanish-speaking staff, and may find it challenging to set up appointments by phone when they speak limited or no English. Similarly, they may have trouble finding or arranging transportation to a health clinic with Spanish interpreters or staff. Previous research has also identified other barriers to immigrant women's receipt of prenatal care, including lack of knowledge about the programs, confusion about eligibility requirements, and fear of negative immigration consequences (e.g., deportation of the undocumented woman or family members).<sup>109</sup>

In contrast to the results for prenatal care, findings supported the hypothesis that Hispanic immigrants would be more likely to participate in WIC than Hispanic native-born mothers. After controlling for relevant demographic and health behavior factors, immigrant Hispanic women had a 64% greater likelihood of participating in the WIC program compared to their native-born peers. This finding may be largely due to WIC's enrollment process, which does not consider the legal status of women who apply to the program.<sup>13</sup> Previous national reviews of WIC enrollment have reported a high level of program participation among Hispanic women.<sup>72</sup> WIC staff widely and actively promote their program to mothers of all races and ethnicities, and consistently maintain a presence of Hispanic staff.<sup>72</sup> These factors may decrease the aforementioned language barriers of enrolling in WIC among Hispanic immigrant mothers. Moreover, immigrant mothers may experience a comfortable environment in a setting that welcomes them and provides their families with nutritious foods.

The Acculturative Stress Theory also provides a framework for considering why immigrant Hispanic women's use of prenatal care and participation in WIC may be different from that of native-born Hispanic women. As noted earlier, it is likely that the immigrant women in this study came to the U.S. relatively recently (within the last 15 years) and have not fully assimilated to American culture. These women, who are likely to have emigrated from El Salvador or Mexico, have come from cultures where midwives ("parteras") play an important role in women's prenatal healthcare.<sup>110</sup> During the 12 years of war in El Salvador, many women feared traveling to clinics or hospitals and chose to deliver their babies in their homes.<sup>111</sup> Moreover, the earthquakes resulted in damage to medical and social service facilities,

and there were shortages of basic medical supplies (e.g., prenatal vitamins, contraceptives) and equipment.<sup>111</sup> El Salvador also has maternal and child health workers (“materno infantiles”) who are trained to provide basic health care to low-risk pregnant women, but are not allowed to participate in deliveries.<sup>112</sup>

In Mexico, large numbers of women in rural areas have also relied on midwives for prenatal care and delivery. Prenatal laboratory tests and medical visits are often too expensive for the poorest Mexicans. Travel to a hospital requires a car, a driver, gas, and someone to take care of a mother’s children during her delivery.<sup>113</sup> Some women are also afraid of visiting male gynecologists/obstetricians, which is discouraged in areas of the country with a macho, conservative culture. Thus, it appears that many immigrant women in Prince George’s County have come from countries that have not stressed the importance of obtaining early prenatal care in a medical facility, and instead relied on midwives or community health workers for prenatal care. These immigrant women are in different stages of accommodating to American culture, and it may require some time for them to begin seeking early prenatal care in a clinical setting.

The Acculturative Stress Theory may also help to explain immigrant women’s greater participation in WIC compared to native-born Hispanics. Their countries of origin emphasize healthy, traditional dietary practices and nutritious foods, and discourage smoking and drinking during pregnancy.<sup>110</sup> Moreover, Hispanic culture emphasizes social and community support for healthy pregnancies. Immigrant women may eat healthier cultural foods than native-born women, and live in immigrant-concentrated neighborhoods that provide social support.<sup>114</sup> WIC’s

provision of supportive counseling and provision of healthy foods, with no questions asked about legal status, appears likely to attract immigrant mothers who are accommodating to a new culture.

In contrast, native-born women's use of maternal health services may reflect processes identified in the Integrative Model for Developmental Competencies in Minorities. Having grown up in the U.S., native-born women are more likely to have adopted social norms concerning the importance of early prenatal care. However, the lower social position in American society of economically-disadvantaged Hispanics, together with their likely experiences of prejudice and discrimination, may have contributed to feelings of stigma, embarrassment, or shame related to relying on government programs, such as WIC. Thus, both the Acculturative Stress Theory and the Integrative Model for Developmental Competencies may help to explain findings related to immigrant and native-born Hispanic women's receipt of adequate prenatal care and participation in WIC.

Current findings also revealed that women's age, education, and marital status were significant predictors of Hispanic women's participation in WIC. Mothers who were 35 years or older, had more than 12 years of education, and were married were significantly less likely to enroll in WIC than their younger, less educated, and single peers. It can be speculated that some of these women did not meet WIC income guidelines and/or had the ability to purchase nutritious foods during their pregnancies. Hispanic adolescents were twice as likely to participate in WIC as older Hispanic mothers, which may reflect county health workers' targeted outreach to this younger age group.

## **Use of Prenatal Care Services and Infant Birth Outcomes**

Another objective of the study was to examine the relationship between use of prenatal health care and infant birth outcomes among immigrant and native-born Hispanic women. First, it was hypothesized that adequate prenatal care would be associated with a lower likelihood of preterm birth and infant LBW. Contrary to expectations, these hypotheses were not supported. Findings were initially surprising given the extensive literature revealing that adequate prenatal care contributes to a decreased risk of preterm birth and infant LBW.<sup>80,115</sup> Numerous studies have found that negative birth outcomes are more likely in infants of mothers who have received limited or no prenatal care.<sup>115-118</sup>

Current findings may be influenced, in part, by the criteria for adequate prenatal care in the Kessner Index. This index categorizes women who did not initiate prenatal care within the first trimester as not receiving adequate prenatal care.<sup>78</sup> In the total sample of Hispanic women, only 38% of immigrant women and 46% of native-born women were categorized as receiving adequate prenatal care. Approximately 42% of immigrant mothers and 52% of native-born mothers completed a prenatal care visit during their first trimester. Thus, using the Kessner Index, 58% of immigrant mothers and 48% of native-born mothers were excluded from the category of receiving adequate prenatal care without considering any prenatal visits in the second and third trimesters. However, it should be noted that an additional 34% of immigrant mothers and 42% of native-born mothers had initiated prenatal care in the second trimester of pregnancy. Only 24% of immigrant mothers and 6% of native-born mothers began prenatal care in the third trimester or did not

receive any prenatal care. Overall, only 44% of the Prince George's County sample of Hispanic women initiated prenatal care in the first trimester of their pregnancies. Notably, of the 33 states, including Maryland, that use the standard birth certificate (2003 revision), 68% of Hispanic mothers reported receiving prenatal care in the first trimester.<sup>119</sup> These findings illustrate the need for Prince George's County to take active steps to increase early prenatal care initiation among Hispanic women.

The lower rate of early prenatal care initiation in the current study may stem from the fact that many of the County's Hispanic women failed to understand the benefits of obtaining first trimester prenatal care. However, as women's pregnancies began to be visible, or they began to share the news of their pregnancies with others, they may have received encouragement to visit prenatal clinics. Friends and relatives may have provided information about their eligibility for prenatal services and the locations of area clinics with Spanish speakers, and helped them to get to their prenatal appointments. From this point on, Hispanic women may have received monitoring of their pregnancies, helping to make up for their lack of a prenatal care visit in the first trimester. The overall level of prenatal care obtained by Hispanic women in Prince George's County may have been better than women who received little or no prenatal care in previous research,<sup>115-118</sup> which contributed to the lack of a significant relationship between adequate prenatal care and infant birth outcomes. Future research might consider adopting alternative measures of adequate prenatal care, including measures considered to be more "culturally appropriate" with respect to the prenatal care behaviors of the immigrant and native-born Hispanic women.

One study using the National Maternal and Infant Health Survey examined the content of prenatal care, focusing on the health behavior advice given to pregnant women.<sup>80</sup> The researchers found that women who failed to receive health behavior advice (i.e., advice about smoking, drinking alcohol, and nutrition) during prenatal visits were at a higher risk of infant LBW than those who received such advice.<sup>80</sup> In the current study, Hispanic women exhibited a very low rate of smoking, and thus may not have benefited from cautions about smoking compared to populations of women who smoked more frequently. Moreover, three quarters of the current sample received nutrition advice and nutritious foods from participation in the WIC program. These factors may have affected the lack of relationship between adequate prenatal care and infant LBW in the current study. Unfortunately, there are no data available on women's alcohol consumption on the Maryland birth certificate. Future research examining the relationship between prenatal care and birth outcomes, including preterm birth, should continue to examine the role of prenatal care messaging/content and infant outcomes.

### **WIC Participation and Infant Birth Outcomes**

It was also hypothesized that Hispanic women's participation in WIC would be associated with a lower likelihood of having a preterm birth or LBW infant. Findings revealed no significant association between WIC participation and the incidence of preterm birth. This finding may be influenced by the timing of WIC enrollment.<sup>120</sup> Birth certificate data did not reveal any information about the trimester women enrolled in WIC, or the duration of time for which they were enrolled. Women enrolled in WIC early in their pregnancies and women enrolled in WIC for



only a month before their births were both treated both as “enrolled in WIC.” Since WIC makes prenatal care referrals, women who enrolled early may have received benefits that were not experienced by women who enrolled late. Without knowing the duration of WIC enrollment, it is impossible to examine whether there was a relationship between WIC participation and preterm birth associated with differing levels of program exposure.<sup>120</sup>

The lack of a significant relationship between WIC participation and preterm birth may also be due to the nature of services provided by the WIC program. WIC provides prenatal counseling and health referrals, but focuses primarily on nutrition. Medical clinics provide prenatal screening to identify risk factors for preterm birth, such as high blood pressure, preeclampsia, diabetes, blood clotting disorders, and infections.<sup>121</sup> Still other risk factors include a family or personal history of premature labor, or having another pregnancy too soon after having a baby.<sup>121</sup> Medical clinics address the latter factors, which are less likely to be identified in WIC visits. Thus, the differing nature of services provided in medical clinics and WIC may help to explain why WIC participation was not significantly related to a lower likelihood of preterm birth among Hispanic mothers.

As hypothesized, WIC participation was associated with a lower likelihood of infant LBW. Hispanic mothers who enrolled in WIC were 27% less likely to have a LBW infant than non-participants in the WIC program. This finding was congruent with previous literature which found that WIC participation is a protective factor against infant LBW.<sup>81</sup> Provision of nutritious foods is a key component of WIC, and adequate nutrition has been found to be important in reducing LBW.<sup>81</sup> The WIC

program provides a group of nutrient-rich foods for pregnant mothers. Thus, it was not surprising that WIC participation was associated with a lower likelihood of infant LBW among the Hispanic mothers in this study.

### **Maternal Immigration Status and Infant Birth Outcomes**

A third set of hypotheses in this study focused on the relationship between Hispanic mothers' immigration status and infant birth outcomes. It was hypothesized that immigrant mothers would be less likely than native-born mothers to have a preterm birth and a LBW infant. As predicted, after controlling for relevant demographic and health behavior factors, immigrant Hispanic mothers had a 30% lower likelihood of having a preterm birth and a LBW infant compared to native-born Hispanic mothers. This finding is consistent with previous research, including mostly cross-sectional studies, which found immigrant Hispanic mothers to have lower rates of preterm birth than their native-born peers.<sup>56-58</sup>

Current results are also congruent with findings of a major study involving more than 600,000 Hispanic women, which found that immigrant Hispanic women had a 23% lower odds of having a LBW infant than native-born Hispanic women.<sup>61</sup> The latter study also used birth certificate data. Both the infant LBW and preterm birth results in the present study support the Hispanic Paradox<sup>11</sup>, finding that immigrant Hispanic women have better birth outcomes than their native-born Hispanic peers. As noted earlier, when considered within the framework of the Acculturative Stress Theory, these findings may reflect immigrant women's continued adoption of healthy pregnancy behaviors from their home culture during the process of accommodation to a new culture.

Existing literature suggests that native-born Hispanic mothers may have higher rates of preterm birth and LBW infants than immigrant mothers due to factors addressed in the Integrative Model for Developmental Competencies.<sup>40</sup> This model posits that processes such as prejudice, discrimination, lower social position, segregation, and inhibiting environments may contribute to adverse birth outcomes. Pregnant, native-born Hispanic women may be particularly sensitive to such negative experiences associated with their ethnicity, age, marital status, and accent or English language proficiency. Notably, the native-born Hispanic women in this study were significantly younger and less likely to be married than their immigrant peers. Approximately 27% of native-born women in the study were teens and 64% were unmarried. Pregnancy can be especially stigmatizing for younger women because dominant social norms discourage teen pregnancy, especially among those who are unwed.<sup>114</sup>

The lower social position of Hispanic women in American culture, especially those who are economically disadvantaged, has been found to contribute to both acute stressors (e.g., denied housing, being fired) and minor, day-to-day experiences of discrimination.<sup>114</sup> Such daily irritations include being treated rudely, receiving poor service, and being the object of demeaning remarks related to one's pregnancy. Research suggests that prolonged exposure to discrimination may increase allostatic load, activating stress processes that lead to negative health outcomes.<sup>114</sup>

One recent study examined the association between daily discrimination and infant LBW among young, urban women of color in New York City.<sup>114</sup> Approximately 62% of the sample was Hispanic, but the study did not identify

immigration status. Findings revealed that mothers' experience of everyday discrimination during the second trimester of pregnancy was related to infant LBW, and that depressive symptoms mediated the relationship between discrimination and infant LBW. Specifically, mothers who experienced greater discrimination experienced more depressive symptoms, and these symptoms predicted infant LBW. Such findings suggest that chronic experiences of minor discrimination events may have a significant effect on health outcomes for both mother and child.<sup>114</sup>

The lower likelihood of delivering a LBW infant among immigrant versus native-born Hispanic mothers may also be influenced by immigrant women's greater likelihood of living in immigrant enclaves.<sup>68</sup> Majority ethnic communities often provide social capital that offers protective effects, such as surrounding pregnant mothers with social support, nutritious cultural foods, and health-related information.<sup>68</sup> Hispanic immigrant neighborhoods may also have affordable community health clinics with Spanish-speaking staff that serve low income or uninsured populations. Native-born mothers are more likely to be residentially integrated within the majority population, where they may have less access to many beneficial forms of social capital that can influence birth outcomes.<sup>68</sup> Thus, residence in an immigrant enclave may reduce immigrant women's risk of having a preterm birth or LBW infant.

### **Maternal Health Services as Mediators of Infant Birth Outcomes**

A final set of hypotheses predicted that adequate prenatal care and participation in WIC would mediate the relationship between maternal immigrant status and birth outcomes. Contrary to expectations, adequate prenatal care failed to

mediate the relationship between either preterm birth or infant LBW. As noted earlier, these findings may be influenced, in part, by use of the Kessner Index which applies strict criteria in the assessment for adequate prenatal care.<sup>78</sup> Only 44% of the total sample of Hispanic women in the current study initiated prenatal care during their first trimester. Some researchers have opted for a less restrictive measure, such as whether or not mothers begin care in the second trimester, as opposed to the first.<sup>68</sup> It has also been noted that Hispanic women have a very low rate of smoking, which is a significant predictor of both preterm birth and LBW.<sup>122,123</sup> Thus, early entry into prenatal care may not have had as positive an impact on this study's Hispanic sample relative to the larger non-Hispanic population of mothers.

Consistent with the adequate prenatal care findings, participation in WIC did not mediate the relationship between Hispanic mothers' immigration status and preterm birth. As previously discussed, this finding may stem from the fact that WIC is primarily a nutrition program. WIC does not provide medical screening for many of the risk factors associated with preterm birth such as high blood pressure, preeclampsia, and diabetes and thus, may have a limited influence on preterm birth.<sup>121</sup> Some previous studies in developing countries have found that nutritional interventions offer promise in improving pregnancy outcomes, but it remains unclear as to their impact on the reduction of preterm births.<sup>124</sup>

As hypothesized, participation in WIC was found to partially mediate the relationship between immigration status and LBW. As noted, immigrant women were more likely than native-born women to enroll in WIC. Approximately 7% of the association between being an immigrant and reduced infant LBW was explained

by WIC participation. Given that research has linked maternal nutrition to infant birth weight<sup>125</sup>, and that WIC provides pregnant women with nutritious foods, this outcome was not surprising. Nutritious food assistance may especially benefit Hispanic women who are economically disadvantaged.<sup>126</sup> The social support and counseling about healthy pregnancy provided by WIC's staff may also help to protect program participants from having a LBW infant.

### **Limitations**

Although this study had multiple strengths, including birth certificate data to examine immigration status, maternal health care, and birth outcomes in a large sample of Hispanic women, certain limitations must be acknowledged. First, although Maryland birth certificates provided data on immigrant status, they did not collect detailed information about national origin, differentiate between documented and undocumented women, or ask about immigrants' duration of residence in the U.S. Information about smoking was collected, but unlike birth certificates in many other states, women were not questioned about their alcohol consumption during pregnancy.<sup>68</sup> Previous research has found that each of these factors contributes to diverse health outcomes among native-born and immigrant Hispanic women.<sup>127</sup>

A second shortcoming of the current research was its cross-sectional design. Because the study represents a "snapshot" in time, causal inference cannot be made from observed relationships. Research by Levin, for example, found that results of cross-sectional studies may differ with the year/years of data used and failure to consider larger societal trends.<sup>128</sup>

A third limitation of the study was the possibility of recall bias. Mothers may not have remembered how many prenatal care visits they attended or whether their first visit occurred within the first 13 weeks of their pregnancy. A related potential shortcoming was the social desirability bias, or the tendency for study participants to answer questions in a manner considered desirable to others. This bias may have resulted in over-reporting of ‘good behaviors,’ such as early prenatal care visits, or under-reporting of ‘bad behaviors,’ such as smoking. It may have been intimidating for some Hispanic mothers to provide nurses with information about behaviors they knew to be less desirable, affecting the accuracy of participant responses.

Finally, because the study was conducted in just one Maryland county, current findings cannot be generalized to counties throughout Maryland or to other states. However, the study may provide important insights about the relationships between immigrant status, maternal health care utilization, and birth outcomes that can be examined in other Hispanic populations and geographic areas.

### **Implications for Policy and Programming**

Despite some limitations, this study has implications for policy and programming related to maternal health services for immigrant and native-born Hispanic women, particularly in Prince George’s County and the state of Maryland. With respect to policy, current findings suggest that the state would benefit from collecting more comprehensive information from mothers on their children’s birth certificates. Specifically, it is recommended that data be collected on maternal country of origin and duration of residence in the U.S. It is also recommended that the birth certificate record information about the mother’s alcohol consumption

during pregnancy, as is collected in other states.<sup>68</sup> Such data would enable policymakers and researchers to identify the links between health behaviors and birth outcomes among Hispanics and other racial/ethnic groups. Knowledge of immigrant characteristics, including country of origin and length of residency in the U.S., would also enable practitioners to target prenatal care interventions to specific subgroups of the immigrant Hispanic population.

With respect to programming, the study highlights the need for county practitioners to recruit Hispanic immigrant and native-born women to prenatal care earlier in their pregnancies. The Health Department should support and expand the Health Action Coalition's Infant Mortality Workgroup,<sup>71</sup> which aims to increase the number of pregnant women in the county who obtain prenatal care in their first trimester. The Workgroup should target both documented and undocumented Hispanic women who may not understand the importance of early prenatal care visits. New media campaigns, offered in Spanish and English, should be aimed at increasing Hispanic women's initiation of prenatal care within their first trimester of pregnancy. Such campaigns can share the value of providing expectant parents with prenatal health care advice and identifying risk factors that can be effectively managed if identified early.

Current findings further suggest that Spanish-speaking community health workers, known as "promotoras," may play a key role in educating Latino immigrants about the importance of early prenatal care. Promotoras may support traditional Hispanic values and traditions, such as social support, healthy cooking, and healthy diets, while also encouraging first trimester health care visits. Promotoras may also



encourage positive health behaviors for pregnant mothers, including refraining from smoking and drinking alcohol. Prenatal care interventions delivered by these familiar and respected community health workers have had previous success in helping immigrants to adopt beneficial health behaviors.<sup>129</sup> Thus, promotoras may serve as a bridge between positive elements of immigrant women's culture of origin and positive aspects of American culture (early and adequate prenatal care).

One strategy that may be effective in promoting positive prenatal care for this population is hiring and training Hispanic mothers to become promotoras, just as the Head Start program hires parents to be Parent Involvement Coordinators. Such women would likely have knowledge of local pregnancies and the trust of their peers. Experienced promotoras might also receive additional training to lead Centering Pregnancy programs, a group-focused prenatal care intervention, within the County. The Centering approach appears consistent with Hispanic cultural values in its focus on social support. Expansion of a promotora program within the County, including ongoing training of these health workers, could play an important role in creating a sustainable program that links Hispanic women with maternal health services. Involvement of Hispanic mothers in prenatal care programming would also be likely to establish a sense of Hispanic ownership and pride among both immigrant and native-born women.

Outreach to Hispanic immigrants also requires that community health workers have knowledge of clinics that provide prenatal care for the County's undocumented pregnant women since these services are unavailable to this group through CHIP or Medicaid. Currently, there are only a few nonprofits providing prenatal services to

undocumented women in Prince George's County, and one is scheduled to close at the end of June, 2015. (County health worker at Prince George's County Health Department, phone call, April 2015). The small number of clinics serving illegal residents also provides challenges related to access, such as scheduling appointments, arranging transportation, and being able to receive health services from Spanish-speaking staff. These challenges must be addressed in order to increase immigrant women's early and adequate use of prenatal care.

This study's major finding of the role of WIC in reducing Hispanic women's incidence of infant LBW has important implications for maternal and child health practice. Results highlight the potential benefits of enrolling more Hispanic women in the program. Efforts to attract more immigrant women to WIC should focus on the program's availability to all women, regardless of their legal status. Outreach to native-born Hispanic women should attempt to overcome potential stigmas that result from reliance on government assistance programs for the economically disadvantaged.<sup>73</sup>

Proposed initiatives to extend WIC participation in Prince George's County will require increasing funding for this program. Currently, the County's five WIC offices must periodically set up waitlists because program capacity has been reached. This situation may discourage pregnant women from returning to the program and experiencing its benefits, including its role as a gateway to other maternal healthcare services. An additional allocation of Title V funds to the County's WIC program should also include support for more Spanish-speaking staff to accommodate the growing Hispanic population.

Study findings revealing that a quarter of native-born Hispanic women were teen parents point to the importance of continuing adolescent pregnancy prevention programs for this subgroup. A considerable body of research documents the adverse effects of teen pregnancy.<sup>89</sup> Pregnant adolescents in this study were significantly less likely than their older peers to obtain adequate prenatal care but more likely to be enrolled in WIC. Thus, special efforts should be made to help pregnant adolescents receive early and adequate prenatal care. Health workers should also encourage teen mothers' continued participation in WIC after their babies are born.

In summary, current findings suggest a number of action items and potential partnerships that could improve Hispanic immigrant and native-born women's use of prenatal care services. A list of strategies for enhancing prenatal care and WIC participation among this population, as well as potential partnerships for these initiatives, is presented in Table 11.

**Table 11. Strategies for Enhancing Prenatal Care and WIC Participation in Prince George’s County, MD**

<b>Strategy</b>	<b>Potential Partnership(s)</b>
Include maternal country of origin, duration of U.S. residence, and maternal alcohol consumption on Maryland birth certificates.	Maryland Vital Statistics
Increase allocation of Title V funds to the Prince George’s County WIC program to eliminate the problem of periodic waitlists, and ensure that Spanish-speaking WIC staff members are available to accommodate the growing Hispanic population.	Maryland Department of Health and Mental Hygiene in Baltimore, MD
Promote local farmers’ markets in Hispanic neighborhoods. Provide on-site cooking demonstrations that feature traditional Hispanic recipes using healthy, available, and reasonably-priced Hispanic foods.	University of Maryland Extension, County farmers’ markets
Support the Health Action Coalition’s Infant Mortality Workgroup initiative to increase the number of documented and undocumented Hispanic women who receive prenatal care in their first trimester. Develop and implement media campaigns, offered in Spanish and English, aimed at increasing early prenatal care.	Prince George’s County Health Department, Healthy Start, Head Start, Medicaid, Maryland Children’s Health Insurance Program, local media
Identify nonprofit clinics that provide prenatal care to undocumented Hispanic women and educate County families about the availability and locations of these clinics.	Prince George’s County Health Department, Prince George’s County Public Schools
Hire more promotoras to provide outreach to pregnant Hispanic women in Prince George’s County. Promotoras can support positive Hispanic values, such as healthy eating, social support, and refraining from smoking and drinking, as well as encourage adoption of American values such as first trimester prenatal care.	CASA de Maryland, Prince George’s County Health Department
Educate the Hispanic community about the benefits of Centering Pregnancy programs. Increase the number of Hispanic women leading and participating in Centering care groups.	Centering Healthcare Institute in Greenbelt, MD.
Collaborate with Prince George’s County School-based Wellness Centers to prevent teen pregnancies in the Hispanic immigrant and native-born populations.	Bladensburg High School, Fairmont Heights High School, Northwestern High School, Oxon Hill High School

### **Future Research**

Although the current study adds to the literature examining the role of Hispanic women’s immigrant status in their use of maternal healthcare services, more research is needed. Future studies should address the diversity of the Hispanic population, investigating differences in the utilization of maternal healthcare services

among mothers who differ in immigrant status, country of origin, duration of residence in the U.S., and legal status. Currently, few studies have disaggregated documented and undocumented immigrants in exploring the Hispanic Paradox.<sup>68</sup> Including these variables in future research may help to explain discrepancies in findings among studies investigating maternal immigrant status and infant birth outcomes.

The current study based its hypotheses on the Acculturative Stress Theory and the Integrative Model for Developmental Competencies in Minorities. Another theoretical model which focuses on cultural identity, Berry's Model of Acculturation, may also shed light on the relationship between immigrant women's acculturation orientation and their use of health services.<sup>130</sup> This model includes four categories of acculturation: assimilation (immigrant accepts the host culture and rejects culture of origin), separation (immigrant rejects the host culture and accepts culture of origin), integration (immigrant accepts both the host culture and culture of origin), and marginalization (immigrant rejects both the host culture and culture of origin).<sup>130</sup> Future research may determine if Hispanic immigrant women's acculturation orientation influences whether or not they participate in health programs designed to promote healthy pregnancies in the host country, such as prenatal health clinics and the WIC program. Testing hypotheses based on additional theories that consider assimilation and accommodation may help to clarify how specific stressors experienced by immigrant and native-born Hispanic women influence their birth outcomes.

In examining native-born Hispanic women's use of maternal health care services, existing theory and literature highlight the need to consider factors such as discrimination, racism, sexism, and marginalization.<sup>40,114</sup> These stressors may also affect immigrant women to varying degrees. Future research should directly assess women's experiences of discrimination, including exclusion, social ostracism, and everyday irritations, such as experiencing degrading comments and being treated rudely.<sup>114</sup> Studies should attempt to identify the nature and extent of discrimination and daily irritations (e.g. poor treatment related to ethnicity, age, socioeconomic or immigrant status) experienced by pregnant Hispanic women. Research can then explore how such negative experiences are linked to women's utilization of maternal health care services and birth outcomes, such as preterm birth and infant LBW. Future studies might also collect biological measures of stress to examine physiological factors that may link maternal discrimination experiences to birth outcomes.

As noted, there were some limitations resulting from this study's sole reliance on Maryland birth certificate data. The future ability to link birth certificates with other health record information may add to current knowledge of the association between Hispanic women's use of maternal health services and their birth outcomes. For example, it would be valuable to have data on women's consumption of alcohol, legal/illegal drug use, and intake of folic acid and prenatal vitamins, as well as their preexisting health conditions such as diabetes, hypertension, and intrauterine infections. Each of these factors has been found to contribute to diverse birth outcomes among both Hispanic and other women.<sup>127</sup>

In the future, qualitative research is needed to explore reasons why immigrant and native-born Hispanic women obtain or fail to obtain adequate prenatal care. Interviews or focus groups with pregnant Hispanic women may provide valuable information about the perceived quality of available prenatal care services and the barriers to accessing such care. Given this study's findings, special efforts should be made to determine why significant proportions of immigrant and native-born women are not obtaining prenatal care visits in their first trimester. Likewise, mothers should be asked about what motivates their participation in WIC or prevents them from enrolling in the program. Interviewers should also probe reports that some native-born women experience stigma related to obtaining government assistance.

Other potential barriers that should be explored through qualitative research include financial difficulties, absence of documentation, lack of insurance coverage, transportation problems, and difficulties locating providers and scheduling appointments. Researchers might also investigate psychosocial barriers that discourage women from trusting or relying on healthcare professionals, such as the absence of Hispanic staff and Spanish-speaking interpreters, or their experience of rude or disrespectful service in a healthcare facility. Finally, future research should examine potential buffering effects of social support and/or residence in predominantly Hispanic communities on the relationship between Hispanic immigrant status and women's birth outcomes.

## **Conclusion**

In recent years, there has been a significant increase in Hispanic immigration to Prince George's County, the state of Maryland, and the U.S. Nationally, a quarter

of U.S. births were to Hispanic women in 2012, with sizable numbers of infants born to immigrant mothers.<sup>131</sup> These trends point to the need for maternal and child health professionals to focus on the maternal health care behaviors of Hispanic immigrant and native-born women.

The current study emphasizes the benefits of Hispanic women's participation in WIC as a protective factor in reducing the likelihood of infant LBW. The study highlights the need for Prince George's County community health workers to recruit an even larger cohort of pregnant Hispanic women to the WIC program. Moreover, new initiatives should be designed to ensure that pregnant Hispanic women obtain first trimester prenatal care, given its benefits in detecting and treating maternal health problems. Outreach programs should engage both documented and non-documented Hispanic women. Expanding the numbers of Hispanic women who receive adequate prenatal care may also integrate them into the health care system, increasing the likelihood that they will utilize future preventive health services for themselves and their children (e.g., postnatal care, immunizations, physical exams).

Continued research on immigrant and native-born Hispanic women, including studies that consider the diversity of this population, will be critical in developing interventions to increase the access, quality, and use of maternal health care programs. Investments in both research and community-based health programs should reduce the long-term costs of failing to address preventable health problems, and improve the well-being of Hispanic mothers and their children.



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