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# Low Birth Weight, Prenatal Smoking, Pest Exposure And Breastfeeding Modify The Effect Of Acculturation On Hispanic Children's Asthma

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LOW BIRTH WEIGHT, PRENATAL SMOKING, PEST EXPOSURE AND  
BREASTFEEDING MODIFY THE EFFECT OF ACCULTURATION ON  
HISPANIC CHILDREN'S ASTHMA

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by

Paola Chavez Payan

2013

## Dedication

Para mi madre.

Y para él.

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BREASTFEEDING MODIFY THE EFFECT OF ACCULTURATION ON  
HISPANIC CHILDREN'S ASTHMA

by

PAOLA CHAVEZ PAYAN, BA.

THESIS

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## Abstract

Prior research suggests that Hispanic migrants in the U.S. experience better respiratory health than their U.S.-born counterparts; this is reflective of a Hispanic health paradox (HHP). I address the following research questions with a focus on the HHP among children in the urban US border setting of El Paso, Texas: 1) Does acculturation relate to current asthma symptoms and diagnosed asthma? 2) Does the relationship between acculturation and current asthma symptoms and diagnosed asthma persist when controlling for relevant risk factors? 3) How does acculturation modify the relationships between the risk factors and current asthma symptoms and diagnosed asthma? Data were collected through a cross-sectional, observational mail survey of all primary caretakers of 4<sup>th</sup> and 5<sup>th</sup> graders in the El Paso Independent School District (N=1,513 Hispanic families). Generalized linear models (GLM) and interaction effects were used. Acculturation was a positive and significant predictor of asthma symptoms and diagnosed asthma. Low birth weight, prenatal smoking, pest exposure, and breastfeeding modified the effect of acculturation on asthma symptoms and diagnosed asthma. Overall the results of the research suggest that acculturation matters yet it is not equally risky for all Hispanic children. These findings foster an understanding of how the effect of acculturation on Hispanic children's respiratory health is intensified or attenuated by distinct individual-level risk factors.

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## **Chapter 1: Introduction and Literature Review**

According to national estimates, Hispanics have the lowest prevalence of asthma in the United States when compared to other racial and ethnic groups (Svendsen et. al 2009). Mexican-American children experience relatively low rates of chronic respiratory health conditions compared to non-Hispanic whites, a pattern consistently evident in cross-sectional surveys of this population (Padilla et al 2009). In fact, Mexican American children have lower asthma prevalence rates than do non-Hispanic Whites and Blacks, despite disproportionate numbers of Mexican Americans living in poverty, having low education levels, and lacking health insurance (Martin et al. 2007).

This is reflective of a broader trend whereby Hispanic migrants in the United States experience better health outcomes than their U.S.-born counterparts in spite of multiple disadvantages. This population's health outcomes are equal to, or even better than, those of non-Hispanic Anglos. Factors explaining the relative health advantages of Hispanics may include cultural practices, family support systems, selective migration, diet, and genetic heritage (Markides et al. 1986), but a definitive explanation has yet to be determined. Even though recent research has begun to question whether all Hispanic groups enjoy a mortality or health advantage (Morales et al. 2002), the majority of the evidence continues to support an advantage, at a minimum for Mexican Americans, by far the largest component of the Hispanic American population (Markides et al. 2005). Referred to as the Hispanic health paradox (HHP), this epidemiological finding first emerged from the phenomenon of relatively healthy birth outcomes among Mexican Americans.

Multiple studies have examined the extent to which the HHP exists for asthma and other respiratory conditions. With the rapid increase of Hispanic immigrant groups entering the United States interacting with mainstream culture, research associated with the relation of acculturation to the HHP is relevant. In order to further understandings of acculturation, the HHP, and children's health, I examine the effect of acculturation on Hispanic children's asthma symptoms and asthma diagnosis and if that relationship is modified by certain risk factors. This exploration on the effect of acculturation and possible modifying risk factors on Hispanic children's asthma will contribute to emerging literature pertaining to the topic. This study addresses the following research questions: 1) Does acculturation

relate to current asthma symptoms and diagnosed asthma? 2) Does the relationship between acculturation and current asthma symptoms and diagnosed asthma persist when controlling for relevant risk factors? 3) How does acculturation modify the relationships between the risk factors and current asthma symptoms and diagnosed asthma?

### **1.1 Literature: Acculturation and Asthma**

Acculturation may be simply defined as the process by which immigrant groups adopt the cultural values and practices of the host country (Lara et al. 2005). More specifically, the classical conception of acculturation asserts that it is a phenomenon that results when groups of individuals from different cultural background come into continuous first-hand contact with subsequent changes in the original culture patterns of either or both groups (Berry 1997; Redfield et al. 1936). The low acculturation levels to dominant White Anglo norms among U.S. Hispanics with low socioeconomic status have been shown to result in a number of health-related advantages. However, some have challenged these outcomes, suggesting that culture serves mainly as a proxy for access to care and that attributing health outcomes to acculturation risks cultural stereotyping and inaccuracy (Martin et al. 2007). For the purpose of this study acculturation is defined as a process of cultural adaptation that occurs when immigrant groups from distinct cultures come into contact, leading to changes in the cultural patterns of either one or both groups.

Much of the literature on the HHP has focused on documenting how acculturation erodes the initial health advantage that immigrants have. Commonly, these studies measure acculturation by nativity or length of stay in the United States (e.g., Subramanian et al. 2009), conflating possible important distinctions. However, some scholars feel that definitions of acculturation need to be more inclusive, to move beyond behavioral indicators, such as language use, and include values and attitudes (Thomson et al. 2009). Studies examining acculturation and children's asthma have tended to conceptualize acculturation in four ways: language proficiency, nativity, length of residence, and composite measures that combine several variables.

Epidemiologic studies looking specifically at language proficiency and/or preference as measures of acculturation have found that Spanish-speaking is protective for children's respiratory

health. The decision to complete a survey in Spanish, for example, might map to an individual with less acculturation to the United States. Mosnaim et al. (2007) found a relationship between parental language preference and asthma diagnosis in a large group of Hispanic schoolchildren: rates of diagnosed asthma were greater among children whose surveys were completed in English when compared to those whose surveys were completed in Spanish (55.2% vs. 36.3%). Similarly, Martin et al. (2007) reported less diagnosed asthma among Hispanic children whose caregivers' preferred language was Spanish as opposed to English. In El Paso (the location of this study), Svendsen et al. (2009) found that asthma and allergy prevalence were slightly lower in Hispanic/Spanish-language preferred children compared to Hispanic/English-language preferred children. Another study of Hispanic persons living in the southwestern United States found a higher prevalence of asthma and wheezing among children with more acculturated mothers, as measured by the mothers' English versus Spanish language preferences (Gonzales et al. 2007).

Nativity is yet another proxy for acculturation used in studies of respiratory health and the HHP. The assumption is that US born Hispanics have higher levels of acculturation than do foreign-born Hispanics. Results by Cagney et al. (2007) showed that Hispanic immigrants in Chicago (where 70% of Hispanics are Mexican) had the lowest rate of asthma of any groups studied: 7.8% of foreign-born Hispanics, 14.8% of US-born Hispanics, 19% of Whites, and 22.2% of Blacks reported asthma or other breathing problems. These lower rates of asthma are mirrored in lower rates of chronic health problems overall. Furthermore, Subramanian et al. (2009) observed that those children (Mexicans, among other Hispanics, non-Hispanic Blacks, and non-Hispanic Whites) whose mothers were not born in the United States had a lifetime asthma prevalence of 11% compared to children of U.S.-born mothers who had a prevalence of 22%; nativity also accounted for much of the Hispanic heterogeneity in lifetime reported asthma (Subramanian et al. 2009). Multiple studies have reported asthma being substantially lower among immigrant mothers and children born to immigrant mothers when compared to American mothers and their children (Lara et al. 2012; Subramanian et al. 2009).

Moreover, acculturation has also been measured in relation to an immigrant's length of residence in the United States with the assumption that longer length of residence maps to higher levels of

acculturation. Eldeirawi et al. (2009), for example, found that the prevalence of asthma and asthma-related respiratory conditions increased upon migration from developing to industrialized countries and that prevalence of these conditions was positively associated with longer residence in the host countries. According to Svendsen et al. (2009), adverse allergic and asthmatic health outcomes among children, many of whom were foreign-born, increased with duration of residence in El Paso, Texas, which is also my area of study.

Lastly, studies have utilized composite measures of acculturation as linked to asthma among Hispanics instead of isolating one specific variable like nativity or language preference. Martin et al. (2007), for example, define acculturation as inclusive of caregivers' preferred language (for the interview), country of birth, and the number of years they had lived in the United States (Martin et al. 2007); they found an association between caregivers' level of acculturation and children's asthma burden, with less diagnosed asthma and total potential asthma burden seen among children whose caregivers were less acculturated. Acculturation, as measured by summing four language preference items, had a stronger effect on the risk of asthma and wheezing than country of birth, among Mexican Americans (Eldeirawi et al. 2006).

Although these studies are important, they are limited in their consideration of acculturation as usually relating to nativity or overly general preferred language items. Though language and nativity have been shown to have some validity as behavioral measures of acculturation, these measures alone may not be appropriate for all acculturating groups and should be combined with other behaviors (Lerman et al. 2009). Furthermore, most of these studies of acculturation (measured in any of the four ways) assume that the effects of acculturation are the same for all children. One exception is Eldeirawi et al. (2009), but they found no statistically significant interaction terms for country of birth (i.e., US vs. Mexico) with age, gender, having a regular source of care, parental history of asthma or allergies, history of ear infection in infancy, or maternal exposure to animals/pets during pregnancy.

This study makes two key contributions to the literature. First, I use a composite measure of children's acculturation derived from the Cultural Lifestyle Inventory (Lerman et al. 2009), which captures a broad range of cultural preferences. It allows for more complete and thorough considerations

of acculturation than just nativity or language preferences alone; while I address language preferences through the use of this inventory, I am able to capture its different dimensions in a more nuanced way than just using which language the survey was completed in, for example. My measure is also assessed for the child as opposed to using the parent's acculturation as a proxy for the child. Second, I test for how acculturation interacts with other risk factors to shape children's odds of experiencing asthma symptoms or being diagnosed with the asthma. This approach allows for examination of how acculturation may impact different types of children differently as opposed to assuming the effect on asthma is the same for all children. It is important to note that this study was conducted in a US-Mexico border community in which mainstream culture represents an amalgamation of Mexican and Anglo cultural characteristics (Abraido-Lanza et al. 2006). The acculturation process may be different for individuals residing in border communities compared with those settling into communities more distant from Mexico; in addition to the characteristics of sending communities, the social context of settlement regions should also be considered when interpreting the health implications of acculturation (Espinosa de los Monteros et al. 2008).

## Chapter 2: Data and Methods

### 2.1 Data Collection

Data were collected through a cross-sectional mail survey that was approved by my university's Institutional Review Board. The closed-ended questionnaire was sent to all primary caretakers (parents and guardians) of 4<sup>th</sup> and 5<sup>th</sup> graders attending school in the El Paso Independent School District (EPISD), without prior knowledge of the children's health conditions. Surveys were conducted using the tailored design method (TDM) to obtain the highest achievable response rates by personalizing communication, following-up with non-respondents, and offering incentives (Dillman et al. 2009). Mailings were sent in three waves during May of 2012 and all survey materials were provided to households in English and Spanish. Ultimately, 6,295 primary caretakers received surveys at their home address and 1904 surveys were returned for a 30% response rate. Research indicates that similar and even substantially lower survey response rates can yield representative samples (Curtin et al. 2000; Holbrook et al. 2008; Keeter et al. 2006; Visser et al. 1996). The first mailing consisted of the survey packet, which included a consent letter and the survey (in both English and Spanish), a \$2 incentive and a postage-paid return envelope. A week later, a bilingual reminder postcard was mailed. One week after that, survey packets were resent to all non-respondents (again with \$2 and a postage-paid return envelope).

Because Hispanics comprise the largest and fastest growing minority group in the United States, there is a need for further research to advance the understanding of Hispanic health disparities (Collins et al 2012). For the purpose of this study, 1,513 Hispanic families (defined as having a Hispanic child and/or Hispanic primary caretaker) were included in the analysis. Of this total, 43% responded to the survey in Spanish, and 57% in English. The primary caretaker answered questions about her/himself, the child, and the secondary caretaker. For 83% of children (n=1253) in this study's sample, the primary caretaker was the mother. Nearly 86% of participating Hispanics reported being of Mexican, Mexican American, or Chicano origin; all Hispanics were included in this study to allow for a larger study population.

### 2.1.1 Survey Population

All surveyed caretakers resided in El Paso County, Texas, which had an estimated population of 827,398 in 2012. El Paso is comprised of a highly heterogeneous Hispanic population. According to the U.S. Bureau of the Census, in 2011, 81% of its residents were Hispanic (compared with 17% for the US and 38% for TX), while smaller percentages were non-Hispanic white (14%) and non-Hispanic black (4%). El Paso County had a lower median household income (2011 US \$36,333) than the State of Texas (2011 US \$49,391) and the U.S. (2011 US \$50,502) with a poverty rate of 24 %, which is higher than the national rate (16%). In 2011, just 26% of El Paso County residents spoke only English, while 72% spoke Spanish. Furthermore, 27% of the county's Spanish speaking households did not speak English very well, 26% of county residents were foreign-born, and 15% were not US citizens.

The EPISD is the largest school district in Region 19 (El Paso and Hudspeth Counties) of the Texas Education Agency's Educational Service Center. With more than 64,000 students across 94 campuses, the EPISD also is the 10<sup>th</sup> largest district in Texas and the 61<sup>st</sup> largest district in the United States. Within the EPISD, 83% of students are of Hispanic origin and 37% are enrolled in 58 elementary schools (EPISD 2013). Children in the 4<sup>th</sup> and 5<sup>th</sup> grade from all 58 schools are represented in the dataset. More detailed descriptive statistics are presented in Table 1, but it is notable that the mean income of the surveyed households was \$20,000-\$29,000 in 2012, which is below the county, state and national averages. The vast majority of children (90%) were born in the United States, and 16% were not continuously covered by health insurance over the past 12 months. This approximates the high rate of un-insurance for children in Texas, which leads the nation at 19%; the U.S. average is 9% (US-Mexico Border Health Commission 2010).

Descriptive statistics for the percentages of surveyed children who are male, Hispanic, and economically disadvantaged indicate that the sample is generally representative of the EPISD student population (EPISD 2013). The percent male and percent Hispanic are nearly identical between my sample and EPISD (49.9% vs. 51.4% and 82.2% vs. 82.6%, respectively); the sample pertaining to this study has a lower percentage of economically disadvantaged children than the EPISD as a whole (60.4% vs. 71.1%). Additionally, El Paso has a relatively high children's lifetime prevalence rate (15% based on



the survey administered as part of this study) when compared to the 2010 Texas children's lifetime prevalence rate of 12% (American Lung Association 2012).

## **2.2 Variables**

### **2.2.1 Respiratory Health Outcomes**

Asthma is the most commonly diagnosed chronic disease in childhood (Svendsen et. al 2009) currently affecting nearly 7 million youngsters under the age of 18 (Bloom et al. 2012). Defined as a chronic, inflammatory disorder of the airways, asthma contributes to airway hyperresponsiveness, respiratory symptoms (e.g., coughing, wheezing, chest tightness) and pathologic damage, all episodic symptoms resulting from airflow obstruction (AAAAI 1999). Factors associated with onset of asthma symptoms in children include allergies, family history, prenatal exposure to tobacco smoke, male gender, low birth weight, and viral respiratory infections (AAAAI 1999). To this date, there is no cure for asthma, but once it is properly diagnosed and a treatment plan is in place, the condition is reasonably manageable.

Two dependent variables were used in this analysis to represent respiratory health problems: current asthma symptoms and lifetime doctor-diagnosed asthma, which have received focus in many studies. I considered asthma symptoms, in addition to doctor-diagnosed asthma, for the purpose of eliminating possible underreporting of actual asthma diagnoses. This is especially important in a sample of Hispanic children, since they are the least likely to be insured of all racial/ethnic groups in the United States, limiting their opportunities of receiving a diagnosis of asthma (Mosnaim et al. 2007). Nearly 15% of my sample reported an asthma diagnosis while 18% reported asthma symptoms in the last year. There is some overlap between the two variables with 10% of children reporting both symptoms and a diagnosis. Both variables were created using ISAAC (The International Study of Asthma and Allergies in Childhood) questionnaire items.

*Current asthma symptoms.* Respondents were asked to respond to the following two questions which were used to construct the current asthma symptoms variable: 1) Has your child had wheezing or whistling in the chest in the last 12 months (1= Yes, 0= No)? And, 2) How long has it been since the child last had any symptoms of asthma (recoded as 1= Less than one day ago to less than 1 year ago,

0=1 year to more than 5 years ago or never)? Symptoms of asthma included coughing, wheezing, shortness of breath, chest tightness or phlegm production when someone does not have a cold or respiratory infection. Children were considered to have current asthma symptoms if their caretaker answered yes to the wheezing item and/or indicated that the child had experienced asthma symptoms within the last year.

*Diagnosed asthma.* The following question was used to determine if the child had ever been diagnosed with asthma: Has your child ever been told by a doctor or other health professional that he or she has asthma (1= Yes, 0= No)? Descriptive statistics for both dependent variables are presented in Table 1.

Table 1. Dependent and Independent Variable Descriptives (Original Data)

Variable	N	Min.	Max.	Mean	Std. Deviation	% Missing
Current Asthma Symptoms	1461	0	1	.18	.387	3.4
Doctor-Diagnosed Asthma	1452	0	1	.15	.359	4.0
Mother is US-born	1267	0	1	.47	.499	16.3
Mother's respiratory health problems	1513	0	1	.32	.466	0.0
Child's acculturation	1385	-2.310	1.655	.000	.971	8.5
Sex	1466	0	1	.49	.500	3.1
Free and Reduced Price Meals (FRPM)	1336	0	1	.67	.472	11.7
Body Mass Index (BMI)	1069	6.67	69.20	19.990	5.529	29.3
Health insurance	1486	0	1	.84	.366	1.8
Prenatal smoking exposure	1487	0	1	.03	.175	1.7
Low birth weight	1243	0	1	.09	.293	17.8
Pest	1513	0	1	.46	.499	0.9
Breastfeeding	1487	0	1	.69	.463	1.7

### 2.2.2 Independent Variables: Risk Factors

*Child's acculturation.* I created an acculturation factor through factor analysis using maximum likelihood extraction and direct oblim rotation methods. Though varimax rotation is most commonly used, oblique methods allow factors to correlate, theoretically rendering more accurate results than orthogonal methods (e.g., varimax), which can result in a loss of valuable information if the factors are in fact correlated. (Costello et al. 2005). The aim of factor analysis is to reveal any latent variables that cause the manifest variables to covary (Costello et al. 2005). In this analysis, all items loaded onto one factor with an Eigen value of 5.913 that explained 53.76% of the variance. It is worth noting here that the variables with the highest loadings were primarily those related to language spoken in different

contexts and media language preferences. The items related to social relationships loaded more weakly on the acculturation factor; this may be an artifact of our study location in which over 80% of residents are Hispanics and it may be rather difficult for children to meet non-Hispanic peers. A second factor with only one item loading was generated but it was not used because a factor like this, with fewer than three items, is generally weak and unstable; 5 or more strongly loading items (.50 or better) are desirable and indicate a solid factor (Costello & Osborne. 2005). I used the shortened Cultural Life Style Inventory Scale (CLSI) (Lerman et al. 2009), which I modified to include caretaker-reported questions on the child. See Table 2 below for further details.

Table 2. Acculturation Descriptives: Factor Analysis Loadings and CLSI Questions & Responses

Question	Response	Item Mean	Item Std. Deviation	Factor 1 Loading	Factor 2 Loading
What language does the child use when she or he speaks with her or his brothers and sisters?	1) Only in Spanish 2) More Spanish than English 3) Both in English and Spanish about equally 4) More in English than Spanish 5) Only in English	3.32	1.566	.804	-.102
What language does the child use when he or she speaks with his or her parents or primary caretakers?	1) Only in Spanish 2) More Spanish than English 3) Both in English and Spanish about equally 4) More in English than Spanish 5) Only in English	3.03	1.628	.867	-.113
What language does the child use when he or she speaks with his or her closest friends?	1) Only in Spanish 2) More Spanish than English 3) Both in English and Spanish about equally	4.00	1.205	.841	.025

	4) More in English than Spanish 5) Only in English				
What kind of radio stations does the child listen to?	1) Only Spanish-speaking radio stations 2) Mostly Spanish-speaking radio stations 3) Both English- and Spanish-speaking radio stations about equally 4) Mostly English-speaking radio stations 5) Only English-speaking radio stations	3.76	1.402	.497	-.080
What kind of TV programs does the child watch?	1) Only Spanish-speaking TV programs 2) Mostly Spanish-speaking TV programs 3) Both English- and Spanish-speaking TV programs about equally 4) Mostly English-speaking TV programs 5) Only English-speaking TV programs	4.01	1.071	.780	-.033
What kind of magazines, websites, books or newspapers does the child read?	1) Only in Spanish 2) More Spanish than English 3) Both in English and Spanish about equally 4) More in English than Spanish 5) Only in English	4.28	.966	.779	-.032
In what language does the child pray?	1) Only in Spanish 2) More Spanish than English 3) Both in English and	2.89	1.886	.747	-.070

	Spanish about equally 4) More in English than Spanish 5) Only in English				
In what language are the jokes with which the child is familiar?	1) All are in Spanish 2) More are Spanish than in English 3) Some are in English and some are in Spanish about equally 4) More are in English than in Spanish 5) All are in English	3.65	1.465	.893	-.048
What is the ethnic background of the child's closest friends?	1) All are Hispanic (Mexican, Mexican American, Latino, etc.) 2) Most are Hispanic 3) Both non-Hispanic and Hispanic about equally 4) Most are non-Hispanic (white Anglo, African American, Asian American, etc.) 5) All are non-Hispanic (white Anglo, African American, Asian American, etc.)	2.26	.928	.453	.494
When the child goes to social functions such as parties, dances, picnics or sports events, what is the ethnic background of the people that the child tends to go with?	1) Always Hispanics 2) Mostly with Hispanics 3) Both with non-Hispanics and Hispanics about equally 4) Mostly with non-Hispanics 5) Always with non-Hispanics	2.46	.712	.396	.678

What types of national or cultural holidays (such as Fourth of July and Dieciséis de Septiembre) does the child typically celebrate?	1) Only Mexican holidays 2) Mostly Mexican holidays 3) Both American (US) and Mexican holidays about equally 4) More American (US) holidays 5) Only American (US) holidays)	3.65	1.071	.498	-.009
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### 2.2.3 Socio-demographic Risk Factors

*Mother is US-born.* This study's estimates of nativity effects on asthma were based on the mother's nativity, rather than the child's, since the vast majority of children (91%) were born in the US. Previous studies finding higher rates of asthma in Hispanic children born to US-born mothers make accounting for nativity necessary (Subramanian et al. 2009). Multiple studies have used nativity as an acculturation-related measure. Rather, this study uses the above mentioned acculturation factor and simply adjusts for the effect of mother's nativity as a control variable. Nativity information for primary and secondary caretakers who reported being mothers was used. The variable is coded 1= U.S. born, 0= Foreign born.

*Sex (Male).* Children with diagnosed asthma are more likely to be boys (Mosnaim et al. 2007) and boys are more likely to develop lower respiratory symptoms than girls during the first years of life (Stein et al. 1999), including wheezing making this an important control variable. Children's sex was categorized into 1= Male or 0= Female.

*Health insurance.* Having access to care means that one is more likely to have an asthma diagnosis if she/he has symptoms, but receiving care, which is more common amongst the insured population, can also help a child minimize his/her symptoms. For these reasons, there was a need to account for health insurance. In this particular study, access to care was operationalized as health insurance status and was defined by asking respondents the following question: Has the child had health insurance coverage continuously for the past 12 months (1= Yes, 0= No)?

*Socioeconomic Disadvantage (Free & Reduced Price Meals, [FRPM]).* Poor children have higher asthma prevalence (Carlson et al. 2001). Socioeconomic disadvantage is represented by a free and reduced price meals (FRPM) variable, which indicates whether the child qualifies for less expensive school lunches or not. Guidelines for constructing this were obtained from The Food and Nutrition Service (FNS) of U.S. Department of Agriculture (USDA) and I used the two following survey questions in my calculations: 1) How many people are living or staying at this (reported) address? 2) What is your yearly total household income for 2011 before taxes (1=Less than 1,999 – 15=\$150,000 or more)? I used FRPM instead of poverty because it is a less conservative measure of socioeconomic disadvantage than is poverty. FRPM is 185 % percent of the poverty line.

#### **2.2.4 Prenatal and Medical History Risk Factors**

*Maternal Respiratory Disease History.* Maternal asthma is strongly associated with childhood asthma (Litonjua et al. 1998). Respondents were asked if the child's biological mother ever had any of the following diseases: A) Asthma, B) Hay fever or allergies, C) Eczema, and/or D) Chronic bronchitis, emphysema, or chronic obstructive lung disease. The variable was coded 1 if the mother has had 1 or more of the formerly mentioned four diseases and 0 if she had none of the four.

*Prenatal smoking exposure.* Mothers' smoking while pregnant may be an especially strong risk factor for children's asthma (Stein et al. 1999; Gilliland et al. 2001). Prenatal smoking exposure was determined by the following question: Did the child's mother smoke while she was pregnant (1= Yes, 0= No)?

*Low birth weight.* Low birth weight is a well-documented predictor of asthma symptoms and diagnosed asthma (Brooks et al. 2001; Gold et al. 1999). The survey asked the caretaker about how much the child weighed at birth in grams or pounds and ounces. This value was recoded so that 1= the birth weight of a child is equal to or less than 2,499 grams and 0= the birth weight of the child is equal to or more than 2,500 grams. 2,500 grams is a widely used cut-off for low birth weight (ICD-10 2010).

*Breastfeeding.* While breastfeeding has been linked to asthma, whether it is a risk or protective factor is not definitively known. While the immunological properties of breast milk are significant contributing factors of vital importance for infant health (Björkstén et al. 2011), studies have indicated



that breastfeeding in infancy might be related to the higher prevalence of asthma (Takemura et al. 2001). To construct the breastfeeding variable, respondents were asked if the child was ever breastfed (1= Yes, 0= No).

*Body Mass Index (BMI).* BMI is commonly used as a medical history variable (Morales et al. 2002) and it is important to account for because there is a strong association between asthma and both being overweight and obese (Gennuso et al. 1998). BMI was calculated from two survey items whereby caretakers were asked to report the child's current (at the time of the survey) height and weight. The reported height was divided by the square of the reported weight to derive BMI. Studies have demonstrated that using parent-reported height and weight values may be sufficient to provide reasonably accurate estimates of obesity prevalence (Skinner et al. 2012). For the purpose of this study, the continuous variable was standardized before being entered in the regression models.

### **2.2.5 Environmental Risk Factor**

*Pest.* Exposure to pests, mold or recent water damage in the home has been associated with asthma diagnosis and asthma-related symptoms, according to a study by Salo et al. (2004); Woodin et al. (2011) found a modest association between pest exposure and asthma diagnosis in a meta-analysis of five studies. To determine pest exposure, respondents were asked if: At any time during the past 12 months, have you been troubled by any of the following pests inside your home? A) Rats, B) Ants, C) Mice, D) Spiders, E) Cockroaches, F) Termites, G) Other. The dichotomous pest variable was re-coded as 1 if the respondent chose one or more of the options in A-G and 0 if not.

### **2.2.7 Multiple Imputation of Missing Values**

To address non-response bias, the missing values of all analysis variables were multiply imputed. MI involves creating multiple sets of values for missing observations using a regression-based approach. Multiple imputation (MI) is currently a best practice for addressing missing data in statistical analysis. It is used to avoid the bias that can occur when missing values are not missing completely at random (MCAR) (Enders 2010) and is appropriate for self-reported survey data (Enders 2010). In SPSS, 20 imputed datasets were specified to increase power and 200 between-imputation iterations were used to ensure that the resulting imputations were independent of each other (Enders 2010).

Using 20 datasets is the current “rule of thumb” in multiple imputation as it maximizes power (as opposed to using 3-5 datasets, which used to be the convention) and improves the validity of multi-parameter significance tests (Enders 2010). Analyzing a single imputed dataset would effectively treat the filled-in values as real data, so even the best imputation technique, when used with just one imputed dataset may underestimate sampling error. Multiple imputation techniques appropriately adjust the standard errors for missing data (Enders 2010). I ran multiple imputation once and included all respondents who fit the chosen criteria. I reported pooled mean values for each variable. The percent missing for the variables ranged from a low of 2 % (insurance var.) to a high of 28 % (BMI variable); see Table 1 for specific percentages for each variable.

### **2.2.8 Analysis Methods**

The analysis examines the relationships between child’s acculturation, risk factors (socio-demographic, prenatal/medical, and environmental), and children’s current asthma symptoms and children’s diagnosed asthma, with the goal being the disentanglement of the relative importance of each variable. First, correlation coefficients were calculated to measure of the strength and direction of the linear relationships between my independent and dependent variables. Many studies involve responses that might be considered to have a normal distribution, yet this is not invariably the case and models based on this distribution are often indiscriminately applied to data that may be better handled otherwise (Lindsey et al. 1998). My data were not normally distributed, which is why a three- step process using generalized linear models (GLM) was used for the examination of main and interaction effects. Initially, I ran bi-variate models using only acculturation to predict the two asthma variables. In a second step, I added in the risk factors as control variables. In a third step, I interacted each risk factor with child’s acculturation with the hypothesis that acculturation would exacerbate the risk factor variable’s negative effect on asthma. In sum, there are three models for each dependent variable for a total of six models. Before finalizing my models, I tested the independent variables included in the present analysis for multicollinearity. Though SPSS does not pool variance inflation factor (VIF) scores for imputed data, values are for the original dataset and for the 20 multiply imputed datasets; VIF values were under 2 for each independent variable, indicating the absence of multicollinearity issues in my models.

## Chapter 3: Results

*Correlations.* The mother being U.S. born, the mother having respiratory problems, the child being male, the child having health insurance, and higher levels of child's acculturation were positively and significantly related to current asthma symptoms, while qualifying for free or reduced price meals (being near poor or poor) had a negative and significant relationship with current asthma symptoms. In relation to doctor-diagnosed asthma, the mother being U.S. born, the mother having respiratory problems, the child being male, the child having health insurance, and higher levels of child's acculturation were positively and significantly related, while the child having been breastfed was negatively and significantly related to diagnosed asthma. See Table 3 for further details.

Table 3. Pearson's Correlations

Variable	Current Asthma Symptoms Corr.(p)	Doctor-Diagnosed Asthma Corr.(p)
Mother is U.S. born	.134 (.000)	.056 (.041)
Breastfeeding	-.030 (.246)	-.057 (.028)
Mother's Respiratory Problems	.233 (.000)	.143 (.000)
Maternal Smoking	-.006 (.815)	.037 (.157)
Pest	.027 (.299)	.025 (.337)
Free and Reduced Price Meals (FRPM)	-.057 (.049)	-.010 (.731)
Sex (male)	.054 (.038)	.085 (.001)
Insurance	.054 (.034)	.083 (.001)
Child's Acculturation	.170 (.000)	.116 (.000)
Low Birth Weight	.012 (.769)	.035 (.261)
BMI	.020 (.506)	.037 (.207)

*Model fit:* The goodness of fit of my statistical model to the observed data was evaluated.

Because pooled model fit statistics are not provided by SPSS, the statistics from the original data are reported. I found the likelihood ratio chi-square to be significant for all six models, concluding that the

coefficients in these are different from 0 and that the models are acceptable (Garson 2012). To test whether the explained variance in my data was significantly greater than the unexplained variance, the deviance and Pearson Chi-Square values/df were considered (Garson 2012); all were close to 1 in the six models legitimizing the present model as well fitted. The Deviance and Pearson Chi-Square statistics were .881 and 1.010 for Model 1, .963 and 1.008 for Model 2, .969 and 1.007 for Model 3, .815 and .1.011 for Model 4, .838 and 1.005 for Model 5, and .837 and 1.043 for Model 6. The best fitting models for both dependent variables were the “main effects with risk factor controls” models (i.e., models 2 and 5) based on the fact that they had the lowest AIC and BIC statistics (Garson 2012). The AIC and BIC statistics were 1017.718 and 1028.135 for Model 1, 595.264 and 648.127 for Model 2, 608.832 and 705.747 for Model 3, 932.562 and 942.969 for Model 4, 519.187 and 572.010 for Model 5, and 530.378 and 627.220 for Model 6. While adding the interaction effects did not improve model fit, the results are still important for theoretical reasons.

*Main effects for children’s asthma symptoms:* In Model 1 (bi-variate), acculturation was a positive and significant predictor of children’s asthma symptoms (see Table 4). As acculturation increases by one standard deviation, the odds of a child of experiencing asthma symptoms were 1.623 times greater. In Model 2 (see Table 5), which includes the control variables, the mother having respiratory health problems, the child being male, and child’s acculturation were positive and significant predictors of current asthma symptoms. This means that if the mother had respiratory problems, the child had higher levels of acculturation, and if the child was male, he/she had higher odds of having current asthma symptoms. The odds ratio for acculturation dropped to 1.426, meaning that adding the control variables had a small effect on the observed relationship between acculturation and asthma symptoms, but acculturation remained statistically significant.

*Interaction effects for children’s asthma symptoms:* For the model predicting asthma symptoms with interaction terms added (Model 3, see Table 5), there were three significant (or nearly significant) interaction effects meaning that the effect of acculturation on asthma symptoms was mediated by three risk factors ( $p < .10$ ). Being of low birth weight, being exposed to tobacco smoke while in utero, and not having pest exposure intensified the association between acculturation and asthma symptoms. In terms

of the main effects for current asthma symptoms in this model, the sex and child's acculturation variables lost their significance, while the mother being U.S. born and pest exposure became positive and significant (Model 3, see Table 5).

*Main effects for children's asthma diagnosis:* Model 4 indicated that acculturation was a positive and significant predictor of children's doctor diagnosed asthma. As acculturation increased by one standard deviation, the odds of a child of being diagnosed with asthma were 1.415 times greater. In Model 5 (see Table 6), the variables insurance, child's acculturation, low birth weight, and BMI were positive and significant predictors of diagnosed asthma. This means that having health insurance, being more acculturated, having low birth weight, and having a higher BMI were associated with higher the odds of the child being doctor-diagnosed with asthma. Specifically, the odds of asthma were 1.262 greater when acculturation increased by one standard deviation. As was the case with asthma symptoms, the control variables reduced the effect of acculturation on asthma, but it remained significant.

*Interaction effects for children's asthma diagnosis:* In Model 6, there was one significant interaction term (Model 6, see Table 6). For the dependent variable doctor-diagnosed asthma, the interaction effect between acculturation and the variable breastfeeding was significant meaning breastfeeding modifies the relationship between child's acculturation and doctor-diagnosed asthma. Breastfeeding was more strongly associated with increased odds of doctor-diagnosed asthma as the child's level of acculturation increased; not being breastfed was linked to a weaker correlation between acculturation and asthma. In terms of the main effects for doctor-diagnosed asthma in the model with the interactions added, the child's acculturation variable lost its significance while pest became significant (Model 6, see Table 6); the rest of the findings remained the same in terms of directionality and significance.

Table 5. Generalized Linear Model Results for Hispanic Children's Current Asthma Symptoms: Main Effects (Models 1 & 2) and Interaction Effects (Model 3)

Variable	Model 1				Model 2				Model 3			
	B	OR.	Std. Error	Sig.	B	OR.	Std. Error	Sig.	B	OR.	Std. Error	Sig.
(Intercept)	-1.571	.208	.071	.000	-2.743	.064	.354	.000	-2.853	.058	.394	.000
Mother is U.S. Born					.275	1.317	.186	.140	.370	1.448	.202	.066
Breastfeeding					.020	1.020	.169	.908	-.004	.996	.188	.985
Mother's Respiratory Problems					1.025	2.787	.159	.000	1.087	2.965	.173	.000
Maternal Smoking					-.190	.827	.393	.629	-1.192	.304	.821	.147
Pest					.186	1.204	.153	.224	.367	1.443	.172	.034
Free and Reduced Price Meals (FRPM)					.125	1.133	.173	.469	.192	1.212	.228	.421
Sex (Male)					.301	1.351	.153	.049	.247	1.280	.167	.138
Insurance					.292	1.339	.236	.215	.262	1.300	.239	.273
Child's Acculturation	.484	1.623	.079	.000	.355	1.426	.106	.001	.497	1.644	.415	.231
Low Birth Weight					.286	1.331	.235	.222	.026	1.026	.285	.926
BMI					.057	1.059	.088	.515	.067	1.069	.094	.474
Mother is U.S. Born * Child Acc.									-.174	.840	.208	.405
Breastfeeding * Child Acc.									.059	1.061	.199	.768
Mother Respiratory Problems * Child Acc.									-.181	.834	.181	.319
Maternal smoking * Child Acc.									1.557	4.745	.850	.067
Pest * Child Acc.									-.402	.669	.182	.027
Free and Reduced Price meals (FRPM) * Child Acc.									-.090	.914	.257	.727
Sex * Child Acc.									.174	1.190	.176	.321
Insurance * Child Acc.									.094	1.099	.242	.697
Low birth weight * Child Acc.									.635	1.887	.313	.042
BMI * Child Acc.									-.059	.943	.082	.473

Table 6. Generalized Linear Model Results for Hispanic Children's Doctor-Diagnosed Asthma: Main Effects (Models 4 & 5) and Interaction Effects (Model 6)

Variable	Model 4				Model 5				Model 6			
	B	OR.	Std. Error	Sig.	B	OR.	Std. Error	Sig.	B	OR.	Std. Error	Sig.
(Intercept)	-1.756	.173	.076	.000	-3.084	.046	.369	.000	-3.089	.046	.389	.000
Mother is U.S. Born					.015	1.015	.1900	.936	-.018	.982	.216	.934
Breastfeeding					-.181	.834	.1768	.305	-.272	.762	.183	.137
Mother's Respiratory Problems					.731	2.077	.1740	.000	.811	2.250	.181	.000
Maternal Smoking					.318	1.374	.3854	.409	.215	1.240	.464	.643
Pest					.246	1.279	.1627	.131	.333	1.395	.179	.064
Free and Reduced Price Meals (FRPM)					.187	1.206	.1986	.346	.181	1.198	.253	.473
Sex (Male)					.466	1.594	.1640	.005	.486	1.626	.178	.006
Insurance					.702	2.018	.2758	.011	.705	2.024	.275	.010
Child's Acculturation	.347	1.415	.083	.000	.233	1.262	.1163	.046	.253	1.288	.410	.538
Low Birth Weight					.618	1.855	.2356	.009	.553	1.738	.266	.037
BMI					.104	1.110	.0824	.208	.105	1.111	.087	.227
Mother is U.S. Born * Child Acc.									.040	1.041	.232	.861
Breastfeeding * Child Acc.									.321	1.379	.194	.098
Mother Respiratory Problems * Child Acc.									-.240	.787	.196	.221
Maternal smoking * Child Acc.									.352	1.422	.560	.529
Pest * Child Acc.									-.257	.773	.194	.185
Free and Reduced Price meals (FRPM) * Child Acc.									.016	1.016	.264	.951
Sex * Child Acc.									-.059	.943	.196	.765
Insurance * Child Acc.									-.034	.967	.293	.908
Low birth weight * Child Acc.									.212	1.236	.313	.498
BMI * Child Acc.									.027	1.027	.090	.763

## Chapter 4: Discussion

Extensive literature supports the conventional hypothesis that a health paradox exists for Hispanic residents in the United States. Multiple studies have suggested the existence of such epidemiological paradox, one that is unlikely, given the strong association between socioeconomic disadvantage and poor health outcomes (Markides et al. 1986). This paradox is frequently attributed to the low acculturation of healthy immigrants; that is, people who have not yet adopted the mainstream attitudes and behaviors of U.S. culture appear to have some protection from adverse health outcomes (Martin et. al 2007). Acculturation can be defined as a process of cultural learning and behavioral adaptation that takes place when individuals are exposed to a new culture (Martin et. al 2007). Lower levels of acculturation among U.S. Hispanics with low socioeconomic status have been associated with better health outcomes within the Hispanic population. Preliminary studies of acculturation and asthma have shown that Mexican American adults and children born in Mexico had lower diagnosed asthma rates than those born in the United States (Martin et. al 2007), while others studies have found Hispanics have the lowest prevalence of asthma in the country when compared to other racial and ethnic groups (Svendsen et. al 2009). Expanding upon current knowledge, this study sought to investigate the relationships between risk factors, child's acculturation, and children's current asthma symptoms and children's diagnosed asthma.

Concerning my first and second research questions, and in concordance with extant literature (Eldeirawi et al. 2009; Martin et al. 2007; Mosnaim et al. 2007), my results show that lower levels of acculturation were associated with lower odds of asthma and/or asthma symptoms for Hispanic children. In this case, the acculturation finding existed for both dependent variables, even when controlling for the mother's nativity, which was not significant. Controlling for the specified risk factors reduced the association between children's acculturation and each of my dependent variables but acculturation remained statistically significant; child's acculturation remained statistically significant (main effects) until interaction effects were added. When the effect of child's acculturation was allowed to vary based on other risk factors, mother's nativity became significant, suggesting that there might be an independent effect of mother's nativity on children's symptoms, apart from child's acculturation. In



terms of the main effects for the other risk factors, this study's findings revealed a positive relationship between mother's respiratory health problems and children's current asthma symptoms and diagnosed asthma. It has previously been concluded that a history of asthma in primary or secondary relatives, or both, influences the level of airway responsiveness at an early age (Litonjua et al. 1998; Young et al. 1991).

Furthermore, this study supports current literature as being male, having insurance, and having had low birth weight were positively and significantly associated with higher odds of having current asthma symptoms or an asthma diagnosis. In a study by Mosnaim et al. (2007), asthma diagnosis was more common among boys than girls (14.0% vs. 10.0%,  $P < .001$ ). In relationship to insurance, Freeman et al. (2003) showed that children who had health insurance were more likely than those who lacked health insurance to have been diagnosed with asthma because health insurance improves access to health care. Furthermore, studies have shown children in the lowest quartile for birth weight have a significantly higher risk of respiratory illness, with low birth weight being a well-documented predictor of asthma (Gold et al. 1999). Relating to the interaction terms and my third research question, I found that acculturation matters in relationship to asthma symptoms and diagnosed asthma, but that is not equally risky for all children and its' effects are dependent on the child's exposure to specific risk factors: smoking, being low birth weight, breastfeeding, and pests in the home.

I found that prenatal smoking intensified the association between acculturation and asthma symptoms. My results add to the extensive body of evidence indicates that involuntary tobacco smoke exposure increases the prevalence of wheezing, cough, and phlegm and exacerbations in asthma (Gilliland et al. 2001) by demonstrating that it makes the association between the child's level of acculturation and asthma symptoms stronger, as seen in this study's findings. Evidence suggests that foreign-born Hispanics smoke less than their US- born counterparts and significantly less than non-Hispanic whites (Fenelon 2013). When compared to their Mexico-born counterparts, Eldeirawi et al. (2006) showed that US-born children had an increased risk of asthma independent of maternal smoking during pregnancy and personal smoking; they argue that differences in smoking behavior do not explain the difference in asthma rates between foreign born and US-born children. Here, I show that the effect of

maternal smoking is synergistic with acculturation and that it may contribute to some of the differences in the odds of asthma symptoms between children with lower and higher levels of asthma.

I found that low birth weight, an early-life risk factor, intensified the effect of acculturation on asthma symptoms. This study's low birth weight interaction effect aligned in direction with the smoking effect in that both risk factors intensify the association between acculturation and asthma symptoms: less healthy infants (e.g., those with these two risk factors) are more likely to have asthma symptoms, if they have high levels of acculturation. This runs counter to Eldeirawi et al. (2009), who found that early risk factors (i.e., maternal exposure to animals during pregnancy and ear infections in infancy) did not modify the association between nativity (US vs. Mexico) and asthma in a sample of Mexican-origin children in Chicago; although I studied different early risk factors than did Eldeirawi et al. (2009). However, like them, I did not find significant interactions between my acculturation variable and gender or parental history of respiratory problems. Lacking the initial advantage of their healthier counterparts, children who had mothers who smoked while pregnant and were low birth weight seem to be more vulnerable to acculturation and its negative effects in this El Paso sample.

Furthermore, I found that as the child's level of acculturation increased, breastfeeding was more strongly associated with higher odds of doctor-diagnosed asthma. This finding was unexpected although multiple studies have rendered mixed, controversial results in terms of whether breastfeeding is a risk or protective factor for asthma (e.g., Greer et al. 2008). In terms of breastfeeding as a risk factor, previous findings have suggested there is little evidence that breastfeeding protects against the development of allergy and allergy-related conditions (Björkstén et al. 2011), including asthma. A longitudinal study by Sears et al. (2002) showed that children who were breastfed reported higher rates of current asthma at different assessment points between age 9 ( $p=.0008$ ) and 26 years ( $p=.0008$ ) than those who were not; breastfeeding effects in this multifactor analysis were not affected by parental history of hay fever or asthma (Sears et al. 2002). However, contrary results have shown that exclusive breastfeeding during the first months after birth is associated with lower asthma rates during childhood (Gdalevich et al. 2001). In fact, breastfeeding has been associated with reduced prevalence of severe asthma in the Eastern Mediterranean and Latin America (Björkstén et al. 2011). If breastfeeding is indeed a risk factor, then

this interaction effect aligns with the smoking and low birth weight interactions in direction and provides another piece of evidence that early risk factors intensify the effect of acculturation on respiratory health. However, the correlation between breastfeeding and asthma is negative, suggesting that breastfeeding was protective in this study's sample; in the regression models, the adjusted odds ratio for breastfeeding is close to 1 and far from statistical significance suggesting basically no relationship.

Although I found the three formerly mentioned risk factors (if breastfeeding is considered to be a risk factor) to increase the effect of acculturation on asthma symptoms or asthma, I did not find this for pest exposure. Instead, not having pests increased the strength of the association between acculturation and asthma symptoms. The role of indoor allergens, including those generated from animals, molds, and household pests, in childhood asthma has been investigated in multiple studies (e.g., Salo et al. 2004). One possible explanation for this interaction finding comes from the hygiene hypothesis, which aims to explain how early-life exposure to agricultural environments (e.g., livestock) can be protective against the development of asthma and allergies (Subramanian et al. 2009). The hygiene hypothesis is a widely accepted as an explanation for increase in asthma in Western countries like the United States (Sears et al. 2002). This theory aids in understanding my pest finding: the lack of pests in the child's home may indicate a more sterile environment, one "too overly clean," where the lack of exposure to natural microbes in the child's surroundings may cause their immune system to not fully develop. When combined with high levels of acculturation, this "too clean" environment could act synergistically to increase the odds of asthma.

Another possible explanation is that the lack of pests may indicate the heavy use of pesticides, especially in El Paso where roaches are common many months of the year. This means that pesticide exposure would interact with acculturation to increase the odds of asthma. With young children being vulnerable to the effects of pesticides and other pollutants on the respiratory system, exposure to mild chemical irritants can have significant effects on their respiratory development. Epidemiologic studies suggest that children with asthma may breathe easier if they are exposed to fewer pesticides at home (Glaser 2005). However, in the interaction model, the overall effect of pest was negative and significant, indicating that pest exposure decreased the odds of asthma symptoms overall.

In sum, I found that the presence of certain risk factors modifies the associations between acculturation and children's health. This suggests that acculturation is not equally risky for all children. There were three significant (or nearly significant) interaction findings for current asthma symptoms in comparison to only one for diagnosed asthma. Underdiagnoses of asthma, perhaps due to the absence of insurance as Hispanics do have the lowest rates of insurance coverage, with children of immigrants being disproportionately affected (Padilla et al. 2009), or the under-utilization of care due to prohibitive costs, may help explain these findings. Symptoms were reported by caretakers, where as a diagnosis needs come initially from a medical professional. While specific reasons for my findings are open to debate, my study's examination of this extends previous work on the health effects of acculturation.

#### **4.1 Limitations**

This study has several limitations. The measure of asthma and current symptoms used in the analyses were derived from self-reports. However, I used the standardized International Study of Asthma and Allergies in Childhood (ISAAC) survey to ascertain asthma morbidity, an instrument which has been validated in Mexican and other Latin American populations (Subramanian et al. 2009). This study was restricted to El Paso County, which may limit generalization to other populations; because of a predominately large proportion of Mexican Americans in its Hispanic community (and therefore in my sample), El Paso may be an ideal laboratory to explain what factors associated with Hispanic ethnicity might be contributing to the existence of a Hispanic paradox for children in Hispanic families.

It may be possible that the observed and literature-reported health advantages for Hispanics are attributable to diagnostic bias arising out of language differences in administering the questionnaire or underestimates by immigrants. However, language differences are an unlikely source of bias in reported asthma rates because studies from Mexico (conducted with internationally comparable assessments) report comparably lower rates of asthma and wheezing (Subramanian et al. 2009). Also, it is possible that immigrant Mexicans might underestimate the presence of asthma morbidity and symptoms, given lower health expectations and less access to health care services (Subramanian et al. 2009). I did not ask questions about the child's physical fitness, which may be associated with asthma prevalence (Svendsen et al. 2009), and I lack of information on the child's diet and food (in)security. Also, this study's

estimates of nativity effects among children are primarily based on the primary caretaker's nativity, rather than the child's, due to the small sample size of children born outside of the United States (9%). Furthermore, studies recommend caution to researchers who use parent-reported heights, especially for very young children, in the calculation of BMI (Weden et al. 2013). My use of parent-reported height and weight may lead to discrepancies between self-reported and measured height and weight resulting in inaccurate estimates of BMI (Shields et al. 2011). Because acculturation is a complex construct, scholars have argued measures of acculturation reliant on language items may not be as useful on the U.S.-Mexico border (Byrd et al. 2000). However, I found that language items were most strongly loading on children's acculturation compared to the social relationships items. This might mean that language items may be important in this particular context, opening a line of research with regard to more diverse set of comparison measures.

## Chapter 5: Conclusion

Scholars have concluded that multiple, distinct causes may contribute to but not fully explain the Hispanic health paradox itself (Markides et al. 2005). Some aim to explain the Hispanic Health Paradox arguing that lower mortality is not "genuine" but rather caused by migratory factors (Abraído et al. 1999) and the "healthy migrant effect" hypothesis. This "health-selective return migration" theory hypothesizes that the arrival of mostly healthy Hispanic immigrants in the United States is reason behind the HHP (Markides et al. 2005). Selective migration of individuals with lower asthma morbidity may contribute to overall general health advantages (Markides et al. 1986; Subramanian et al. 2009). Epidemiological studies have underscored the importance of early childhood environment in asthma risk (Subramanian et al. 2009) when considering plausible explanations for the paradox. Because most studies have examined whether the child's caregivers' level of acculturation provides a protective effect on children's asthma burden (Martin et al. 2007), my assessment of children's level acculturation contributes new evidence to explain the effect of acculturation on Hispanic immigrant's health.

Furthermore, the results of this study expand on the current literature by employing a comprehensive measure of acculturation and by assessing the variable effect of children's acculturation on asthma based on the presence of certain risk factors. While the Hispanic majority context of the study site (El Paso, TX) is relatively unique, the Hispanic population in the US is rapidly growing making my findings relevant more broadly. The millions of immigrants that have come to the United States have played an instrumental role in transforming many American urban areas into ethnic enclaves. For this reason, it is important to examine the health consequences of living in contexts with other immigrants. El Paso provided an unparalleled laboratory to study this, as over 80% of residents are Hispanic.

Asthma afflicts a significant number of children and its etiology is poorly understood (Horwood et al. 1985). Further research should continue to investigate social and familiar correlates that might suggest ways in which social and environmental factors may contribute to the development of asthma in order to aid asthmatic children in the future. To better serve the health needs of Hispanic children, I must strive to better understand and further address the caregiver's and child's characteristics associated with the prevalence of asthma and related respiratory health symptoms among children (Martin et al. 2007).

In sum, the results from this study point to the influence of acculturation and potentially modifiable, risky exposures, especially in early childhood, on asthma symptoms and asthma diagnosis. These findings should stimulate further research to explain factors that may be responsible for the differentials in the risk of asthma among Hispanics.

## **5.1 Practical Implications**

To better serve the health needs of Hispanic children, we must strive to better understand and further address the caregiver's and child's characteristics associated with the prevalence of asthma and related respiratory health symptoms among children (Martin et al. 2007). As we look to advance the public's health and eliminate health disparities through programs and policies, the Hispanic population must be taken into deep consideration. To develop effective programs and policies to aid in the further understanding the health of fastest growing subgroup of the U.S. population, we must focus on the advantages and disadvantages associated with this particular racial/ethnic group and how these have an impact in our society.

The United States is most definitely not a healthy country to live in. Life expectancies are shorter and infant mortality rates are higher than in other "developed" countries; reports of mental instability and stress have skyrocketed along with rates of hypertension, and reported incidence rates have increased when it comes to chronic diseases (e.g., asthma, cancer, cardiovascular illness). If this study teaches us anything, it is that we must note the negative effect that acculturating into the American mainstream culture is having on health. Hispanics entering the United States are healthier than their U.S. born Hispanic counterparts. Clearly, acculturating to American culture signifies regression in the health status of this particular ethnic group. Whatever it is about American life that makes immigrants sick the longer they are here, it will eventually take a toll on all of us. What costs are immigrants paying to achieve the so-called American dream? The longer they live in the United States, the sicker they become. Is the trade off worth the possible health risks? Improving health in the US would be of benefit to long term as well as new residents.

Because a family history of asthma (or other afflictions such as allergies, sinusitis rhinitis, nasal polyps) is associated with the onset of asthma symptoms in children, being aware of this information is

vital for proper diagnosis. Findings from this study suggest that prompt diagnosis of asthma can be achieved if parents and medical personnel foster higher levels of awareness of asthma symptoms. Signs of asthma can vary and many times mimic other common childhood illnesses, making diagnosis difficult. Wheezing does not necessarily always mean asthma just as asthma may be present without wheeze. Medical professionals and school health staff can help children's caretakers to identify local resources available for pediatric asthma education and pharmaceutical assistance and to develop an asthma management plan. The promotion of best practice guidelines will allow for a better preparation of caretakers, doctors, nurses, and specialists, minimizing the occurrence of under/misdiagnoses.

Furthermore, tobacco smoking in pregnancy is a well-known trigger of asthma and asthma symptoms and remains one of the few preventable factors associated with complications in pregnancy (Lumley et al. 2009). Women should be advised of the significantly harmful effects of prenatal smoking on pregnancy-related outcomes and serious long-term health implications. There is no "safe" level of smoking while pregnant. Additionally, smoking should not be permitted around the asthmatic child, or the child's home environment for that matter. Educational materials and information on local tobacco cessation support groups should be made available to aid parents and caregivers to stop smoking (AAAAI 1999); this information could be targeted to acculturated Hispanic parents, whose children are likely at greater risk of asthma symptoms due to smoking based on my findings.

Low birth weight was a significant risk factor for asthma in this study, and it was especially risky for acculturated children; this makes interventions that seek to reduce low birth weight of great importance to reducing children's asthma. A review of clinical outcomes for pregnant women who quit smoking revealed a 20 % reduction in the number of low-birth-weight babies (Lumley et al. 2009). In fact, empirical evidence supports the association between prenatal care and reduced rates of low birth weight (Alexander et al. 1995). The significance of prenatal health care should be emphasized and related services made accessible to all racial/ethnic groups of women. Literature points out that the most likely known targets for prenatal interventions to prevent low birth weight rates are 1) psychosocial, aimed at smoking, 2) nutritional, aimed at low pre-pregnancy weight and inadequate weight gain, and 3) medical, aimed at general morbidity (Alexander et al. 1995).



Another aggravating factor of asthma is that of pests and indeed pests were a significant predictor of asthma symptoms in the full model. Effective and environmentally sensitive approaches, such as integrated pest management practices that avoid the use of toxic chemical and limit the use of pesticides to those that are produced from natural sources, are recommended. The environment in which the asthmatic child is situated, whether at home or at school, should be as hypoallergenic as possible.

Though it is unknown if breastfeeding is a risk or protective factor in relation to asthma, and because the results of this study rendered mixed results, one can only suggest the mother of the child do what she feels right considering the fact that acculturating to the American way of life is not entirely beneficial when it comes to health. Breastfeeding is currently promoted for many reasons, including optimum nutrition and reduction of risk of infant infections (Sears et al. 2002). However, while some consider infant feeding to be a basic health issue, others view it as a lifestyle choice. Studies have found that women who assimilate into American culture are inhibited in the initiation of breastfeeding (Rassin et al. 1994).

The results in this study also have implications for public health policies that will aim to control asthma in children. In order to foster effective change in this border city, local governments should work to promote health education regarding asthma, raising awareness of its symptoms, and facilitating low cost treatment services. To improve the management of children with asthma, specific interventions are needed and their outcomes should be carefully monitored (AAAAI 1999). Private and public funding for implementing and researching preventive care programs, targeted to at-risk children with asthma, should be encouraged. To advocate for children with asthma, one should support health care initiatives that encourage appropriate care. However, it is also important that U.S. citizens and immigrants use their own power to improve their health by improving their personal choices as much as possible.

Whatever the best explanation may be, the marked deterioration of immigrants' health as they move from the Third World to the First World is a fact. The difference between the health of new arrivals and longtime immigrants underlies the value of clichés about the importance of exercise and moderation in smoking, drinking alcohol, and eating healthy foods. It is important for public health researchers to understand how the process of acculturation may be influencing health outcomes of

individuals and their communities (Thomson et al. 2009). This study's findings suggest that factors modified by immigration and acculturation influence the risk of asthma and asthma symptoms. It is recommended that further research be conducted to identify those factors that may aid in the effective design of asthma prevention programs in multi-cultural communities.

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## Vita

Paola Chavez Payan was born and raised in El Paso, Texas. She has a Bachelor of Arts degree in Multimedia Journalism with a minor in Sociology from the University of Texas at El Paso. Paola's distinguished achievements awards included Univision's Department of Communications Endowed Scholarship Fund, the LULAC International Scholarship, and the Benjamin A. Gilman International Scholarship. After graduating, Paola worked as a reporter for Al Día Newspaper in Philadelphia, PA in 2011. In 2012, she entered the Sociology gradate program at the University of Texas at El Paso, where she served as a graduate research assistant for Dr. Sara Grineski and Dr. Tim Collins under the Environment Core of the Hispanic Health Disparities Research Center (HHDRC), which was funded by the National Institutes of Health (NIH). During her years as a graduate student, Paola presented an earlier version of this work, entitled *The Hispanic Health Paradox and Children's Respiratory Health in the U.S.- México Border Region* at the 2013 Association of American Geographers' (AAG) Annual Meeting in Los Angeles. She is a co-author of an article entitled *Social Disparities in Children's Respiratory Health in El Paso* which has been submitted to the Revista Panamericana de Salud Pública/Pan American Journal of Public Health. Paola received the "Academically Outstanding MA in Sociology" honor in December 2013.

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