

**BIOPSYCHOSOCIAL CONSIDERATIONS OF PEDIATRIC
ASTHMA MORBIDITY IN LATINO FAMILIES**

A Dissertation

by

MARISSA IMEE MENDOZA-BURCHAM

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

August 2012

Major Subject: School Psychology

Biopsychosocial Considerations of Pediatric Asthma Morbidity in Latino Families

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Approved by:

Co-Chairs of Committee,	William A. Rae Victor Willson
Committee Members,	Robert Heffer Anita McCormick Daphne Koinis-Mitchell
Head of Department,	Victor Willson

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ABSTRACT

Biopsychosocial Considerations of Pediatric Asthma

Morbidity in Latino Families. (August 2012)

Marissa Imee Mendoza-Burcham, B.A., University of California, Irvine;

M.A., McNeese State University

Co-Chairs of Advisory Committee: Dr. William A. Rae
Dr. Victor Willson

As the most prevalent chronic health condition in children under the age of 18, asthma is a disease for which significant health disparities exist. Current literature has established that ethnic minorities, families living in poverty, and families living in urban environments are at higher risk for worse morbidity. In recent years, studies focusing distinctly on Latino families, with emphasis on Puerto Rican families, have emerged. As a singular group, Puerto Rican children have demonstrated the worst outcomes and a significantly greater use of emergency room (ER) services, often related to poor adherence to adequate asthma care regimens.

Guided by the biopsychosocial approach, this study sought to examine cultural and family variables and their relationship to pediatric asthma morbidity. Data from a sample of 639 children and their families from the Rhode Island region and Puerto Rico participated in this study. The data derived from the Rhode Island/Puerto Rico Asthma Center (RIPRAC) study and collected between 2002 and 2007. Bivariate analyses investigated correlations among familism and morbidity variables. Group comparisons

were conducted between mainland Puerto Ricans living in the Rhode Island region and island Puerto Ricans and between Latino and non-Latino White families living in mainland United States. Confirmatory factor analysis using *Mplus* software evaluated a measurement model of familism and morbidity, followed by invariance testing in multiple group analyses by asthma severity and ethnicity. Lastly, structural equation modeling investigated a predictive relationship between the latent variables of familism and morbidity and mediational relationships through balanced integration. A secondary analysis for families who endorsed alternate child caregivers investigated a mediational relationship between familism and morbidity through involvement in asthma management by alternate caregivers.

Significant correlations and group differences on mediator variables and observed familism variables and morbidity variables were found. Although a significant relationship between familism and morbidity was not found, significant relationships between familism and balanced integration and between balanced integration and morbidity were identified. This study contributes to emerging research on family variables as potential protective factors in pediatric asthma by focusing on familism as a primary concept amongst biological and psychosocial variables.

DEDICATION

This is dedicated to my husband, Ryan, for without his unfailing love and faith this journey would not have been possible. He recognized and believed in what I could do before anyone, including myself.

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The important concepts of this dissertation pertain to family, both nuclear and extended, as protective factors against stressors. The joy that is my husband, Ryan, and my sons, Charlie and Eric, has been central in balancing life and dissertation. The unconditional love of my parents, Imelda and Carlos Mendoza, and the humor of my siblings, Carlos, Marie, and Alex, have helped me “keep it real” and stay grounded. The support of my extended family has made the execution of this dissertation possible and so I thank James and Candace Douglas, Rachel Weber, and Melissa Andersen.

TABLE OF CONTENTS

	Page
ABSTRACT	iii
DEDICATION	v
ACKNOWLEDGEMENTS	vi
TABLE OF CONTENTS	vii
LIST OF FIGURES	ix
LIST OF TABLES	x
 CHAPTER	
I INTRODUCTION.....	1
Rationale for the Study.....	8
Research Questions	9
Significance of the Study	13
II REVIEW OF THE LITERATURE.....	14
Pediatric Asthma	16
Pediatric Asthma Morbidity	23
Asthma Disparities in the Latino Population	26
Biopsychosocial Conceptual Models	30
Influence of Family Context	39
Biological and Psychosocial Influences on Asthma	50
Summary	61
III METHODS.....	62
Source of Data	62
RIPRAC Recruitment and Data Collection Procedures.....	63
Study Sample.....	65
Variables and Measures	66
Data Analysis	77

CHAPTER	Page
IV RESULTS.....	87
Descriptive Statistics	87
Group Comparisons.....	91
Data Preparation and Screening: SEM Assumptions.....	94
Confirmatory Factor Analysis.....	95
Measurement Invariance	98
Structural Regression and Mediation Analyses.....	101
V DISCUSSION AND CONCLUSIONS.....	107
Discussion	108
Conclusions	119
Limitations	122
Future Directions.....	123
REFERENCES.....	125
VITA	155

LIST OF FIGURES

		Page
Figure 1	Engel’s biopsychosocial hierarchy of natural systems.....	33
Figure 2	Miller and Wood’s conceptual model of family issues.....	34
Figure 3	Shalowitz’s contextual model of childhood chronic illness.....	36
Figure 4	Biobehavioral family model.....	37
Figure 5	Conceptual model: Influences on pediatric asthma treatment adherence	38
Figure 6	Hypothesis 6 measurement model.....	84
Figure 7	Hypothesis 8 structural regression model	84
Figure 8	Hypothesis 9 primary mediational model	85
Figure 9	Hypothesis 10 secondary mediational model.....	86
Figure 10	Measurement model of familism and morbidity	96
Figure 11	Primary structural regression model	102
Figure 12	Secondary structural regression model	104

LIST OF TABLES

	Page
Table 1 Percentage of Sample by Setting by Site	64
Table 2 Variables and Measures	67
Table 3 Family Asthma Management System Scale Subscales	71
Table 4 NAEPP Classification Guidelines for Asthma Severity	75
Table 5 Demographic Characteristics of Participants	88
Table 6 Correlation Matrix of Study Variables	89
Table 7 ANOVA and T-Test Results	93
Table 8 Independent Chi-Square Results	93
Table 9 Goodness-of-Fit Indexes for Measurement Model (Familism and Morbidity)	97
Table 10 Measurement Model Unstandardized and Standardized Parameter Estimates	98
Table 11 Goodness-of-Fit Indexes for Ethnicity Groups	100
Table 12 Goodness-of-Fit Indexes for Asthma Severity Groups	101
Table 13 Goodness-of-Fit Indexes for Primary Structural Regression Model.....	102
Table 14 Results from Primary Structural Regression	104
Table 15 Goodness-of-Fit Indexes for Secondary Structural Regression Model.....	105
Table 16 Results from Secondary Structural Regression	105

CHAPTER I

INTRODUCTION

Asthma is the most prevalent chronic health condition in children, with over 7 million children under the age of 18 being reported as having asthma in 2009 (Akinbami, Moorman, & Liu, 2011). Although asthma statistics indicate that African-American children have the highest prevalence rates, Puerto Ricans as a singular group have higher prevalence rates and worse morbidity (National Center for Health Statistics, 2011; see also Asthma and Allergy Foundation of America & National Pharmaceutical Council, 2005). Asthma prevalence surveys reveal that in the United States, when compared to non-Hispanic Black and non-Hispanic White children, Mexican children have the lowest prevalence of lifetime asthma and recent asthma attacks; however, the second largest Hispanic subgroup, Puerto Rican children, has the highest rates (Lara, Akinbami, Flores, & Morgenstern, 2006; see also Moorman et al., 2007). Similarly, Homa, Mannino, and Lara (2000) found that within the U.S. Hispanic ethnic group, Puerto Ricans had the highest asthma mortality rates followed by Cuban-Americans and Mexican-Americans and that these rates also varied by the region in which they lived.

Significant research has shown that asthma is a complex chronic illness in which varying combinations of environmental (extrinsic influences), biological (intrinsic influences), and psychological status variables play a role in asthma onset and ongoing

This dissertation follows the style of *Journal of Pediatric Psychology*.

aggravation of symptoms (Fritz, McQuaid, Spirito, & Klein, 1996; McQuaid & Walders, 2003; Sperry, 2006). A more recent refined focus in pediatric asthma research indicates that sociocontextual variables, such as neighborhood contexts, cultural practices, immigration, and acculturation (Koinis-Mitchell et al., 2011) might be additional contributors to pediatric asthma morbidity (Lougheed, 2007; Koinis-Mitchell, Adams, & Murdock, 2005; Koinis-Mitchell, Murdock, & McQuaid, 2004). The medical model (Ludwig & Othmer, 1977), which emphasizes physical symptomatology and treatment based on physiological etiology and minimized psychosocial variables, has been the dominant perspective in conceptualization of chronic health illnesses in past decades. However, current research supports that pediatric asthma requires approaches that extend beyond the narrowness of the medical model (Miller & Wood, 1991; Sperry, 2006).

To support this argument, the current study was guided by the biopsychosocial (BPS) approach (Engel, 1977) and sought to examine cultural and family variables and their relationship to pediatric asthma morbidity. Engel (1977) proposed BPS as an alternative to the unidimensional, reductionistic medical model, arguing that though a person may be organically diseased, such as physically indicated by poor lung function and inflammation in asthma, how these physiological manifestations are experienced and reported by a person will be significantly impacted by cultural, psychological, and social factors. The BPS approach maintains that an illness can be negatively or positively impacted by the social and emotional functioning of a child and by the interrelationships between biological and psychosocial variables (Carlson, Kubiszyn, & Guli, 2004). In

particular, variables related to the family and support may serve as protective factors in pediatric asthma.

Asthma is a chronic pulmonary disease, characterized by airway inflammation and obstruction, for which there is great variability in symptom onset, reversibility, and intermittency (National Heart, Lung, Blood Institute [NHLBI], 2007). According to the BPS perspective, for optimum asthma management, treatment must include both biological and psychosocial considerations. In regards to biological considerations, the medication regimen can be complex and confusing. Medication can include either quick-relief medications (e.g., short-acting beta-agonist inhalers or nebulizers) or preventive controller drugs (e.g., xanthine drugs), or a combination of both. One study that looked at children whose family was insured and had access to primary care found that approximately 64% of the study's sample with persistent asthma inadequately managed asthma with medication (Lozano, Finkelstein, Hecht, Shulruff, & Weiss, 2003). Similarly, McQuaid, Kopel, Klein, and Fritz (2003) found that, on average, their study's sample of children took only half of their prescribed preventive medication. Furthermore, a study focused on treatment regimens and health care utilization patterns found only 14% of the study sample was under an optimal regimen, and of the half of the symptomatic children in the sample who had a health care visit, nearly 61% did not indicate any corrective treatment prior to arriving (Yoos et al., 2006). Interestingly, a more recent study of Latino children with asthma found that medication use was impacted by concerns and beliefs about medication in addition to medication accessibility (McQuaid et al., 2009). Altogether, these studies suggest that even with

access to health care and availability of medication, asthma morbidity is further impacted by lack of preventative management of asthma.

Research has shown that families who established a routine for managing medication predicted better child medication adherence (Fiese, Wamboldt, & Anbar, 2005). However, difficulties in following prescribed medication regimens arise due to several psychosocial factors. Some reasons include poor child and family response to symptoms (McQuaid et al., 2007) and discrepant expectations of management responsibility between parent and child (Dozier, Aligne, & Schlabach, 2006; Walders, Drotar, & Kerckmar, 2000). Other reported adherence difficulties relate to symptom recognition, asthma self-efficacy, medication efficacy or belief about medication effectiveness, diagnosis acceptance, social support, and feasibility of trigger avoidance (Buston & Wood, 2000; Knight, 2005).

The BPS model asserts that reciprocal influences of biological and psychosocial variables impact the course of asthma in a developing child. The family unit is a primary and proximate context in which a child with asthma exists. One of the primary focuses of this study was balanced integration, which is defined as a family's ability to balance the demands of asthma management with the family needs and stressors of daily living. A chronic illness can greatly disrupt typical family functioning, yet the family is an essential contributing factor in establishment or interference with patterns of health behaviors, regimen assistance, teaching of self-management, and development of health orientations to a disease (Fiese & Everhart, 2006; Kaugars, Klinnert, & Bender, 2004; Kerns, 1995; Sperry, 2006). In other words, while the family plays a large, impacting

role on the disease experience of a child, child health status and illness-related needs directly impact family functioning and relationships within the family.

Although a large proportion of research is dedicated to identifying discrete barriers to regimen adherence and successful asthma management, a growing area of research has focused on family as a potential protective factor for children with asthma (Mangan, Wittich, & Gerald, 2007; Markson & Fiese, 2000). In a critical review of the pediatric asthma literature, Kaugars et al. (2004) described how family characteristics are associated with asthma outcomes through asthma management. Kaugars and colleagues identified family relationships, racial or ethnic background (culture), and family organization and asthma management responsibility as likely mechanisms for the link between family characteristics and asthma morbidity.

The BPS paradigm takes into consideration the social contexts that may contribute to difficult illness experiences. The context in which a child lives integrates the child into multiple systems (e.g., family, school, age group, and ethnic group). As such, not only is it important to understand biological features of asthma that influence a child psychologically and socially, but it is just as important to comprehend the reciprocal nature of this relationship and understand how psychosocial variables impact the organic and biological course of asthma.

The BPS perspective proposes a transactional impact of disease features and psychosocial variables. In other words, severity, an organic objective characteristic, can impact the psychosocial experience of a child with asthma, but psychosocial variables can also influence subjective levels of the perceptions of asthma severity. Asthma

severity and family asthma management practices each independently account for a significant amount of variance in a child's functional impairment from asthma (Klinnert, McQuaid, & Gavin, 1997). Several studies have found that poor family functioning is associated with more severe levels of asthma (Sawyer, Spurrier, Kennedy, & Martin, 2001; Wood et al., 2007).

The younger a child is in age and maturity, the greater his or her dependence on caregivers for the development of knowledge and skills. Specifically for pediatric asthma, studies indicate that children and their families rate the child's management responsibility as relatively low, responsibility increases with age, and children are more likely to report a greater degree of responsibility (McQuaid, Penza-Clyve, et al., 2001; Wade, Islam, Holden, Kruszon-Moran, & Mitchell, 1999). Family response to symptoms can mediate the relationship for children who over- and underestimate their symptoms (McQuaid et al., 2007). Interrelationships with the most proximate influential entities, such as nuclear and extended family members, are crucial for the developmental path of a child.

Culture is an organized social structure that Engel (1977, 1980) acknowledged as a major psychosocial consideration when embracing the illness experience of an individual. Cultural values and beliefs are principal influences on human behavior. Beliefs of causes and cures for disease can serve as barriers to effective asthma treatment for various reasons, including parental reliance on folk remedies instead of prescribed medication (Bearison, Minian, & Granowetter, 2002). One study examining intracultural and intercultural asthma beliefs and practices among the four Latino

subgroups of Mexican-Americans, Mainland Puerto Ricans, Mexicans, and Guatemalans found consensus among the groups regarding causes of asthma but divergence in symptoms (Pachter et al., 2002). Likewise, this study examined cultural values that may be relevant across ethnic subgroups, which then may be integrated into interventions to increase their cultural appropriateness.

Within the Latino culture, *familism* may possibly be one such cultural value. Familism is a cultural value relating to reciprocal supportive relationships between family members in the nuclear and extended family, which includes non-related friends. Despite within-group differences of Latino subgroups, familism has long been recognized as a core cultural value central to families across subgroups in the Latino culture. Familism has been identified as an influencing factor on decision-making regarding family issues, including discipline, parenting, and health issues (Campos, Schetter, & Abdou, 2008; Coohy, 2001; Guilamo-Ramos et al., 2007; Triandis, Marín, Betancourt, Lisansky, & Chang, 1982).

Familism, which is conceptualized as close bonding between family members and high levels of instrumental and emotional support between members, influences family practices that are more collectivist in nature. Including non-nuclear family members or unrelated close family friends in the same manner as immediate blood-related family members in the home is a prevalent practice. Often, non-nuclear family members or family friends unrelated by blood become involved in family decisions and participate in child rearing. In other words, these members become alternative

caregivers and can participate in numerous child-rearing activities, such as discipline and health management.

Given that pediatric asthma management occurs within the family system and family characteristics have been shown to influence asthma management, it is important to investigate family variables that may mitigate asthma morbidity. Because the Latino population represents a particularly vulnerable population for pediatric asthma, it is important to identify familial and cultural variables that may function as protective factors to offset those factors that increase Latinos' risks. Few studies exist that consider specifically cultural variables as impacting pediatric asthma. Koinis-Mitchell et al. (2011) emphasized variables associated with acculturation and immigration that present a unique contribution to pediatric asthma disparities for Latino families. Examined variables included child and parent nativity, duration and timing of residency in the U.S., and acculturative stress. In contrast, this study focused on familism as a strong Latino cultural value that may be particularly salient in pediatric asthma management. The BPS model offered a relevant guide to accomplish this study's aim to examine biological and psychosocial variables and their association with pediatric asthma morbidity in the Latino population.

Rationale for the Study

In spite of the manageable nature of asthma and medical advances for its treatment, prevalence, morbidity, and mortality rates have not improved over the last few decades. Health disparities research provides evidence that effective management is impacted by health care access, medical services delivery, and medical insurance.

However, health disparities still exist even when analyses have controlled for socioeconomic differences and access to care (Mangan et al., 2007). This being said, a closer examination is necessary for psychological and social variables of asthma management beyond external obstacles for which families and children have limited control, such as health care delivery and/or allergens in the environment. Research has provided evidence for the role of family, social structures, and behavioral health practices of individuals in asthma management (Strunk, Ford, & Taggart, 2002; Weiss, 2007). Koinis-Mitchell et al. (2012) examined family cultural variables functioning as protective processes and found that higher levels of family connectedness were associated with lower levels of functional limitation, which is an aspect of morbidity. Given that asthma morbidity outcomes are related to asthma management within a family context (Kaugars et al., 2004; Klinnert et al., 1997; McQuaid et al., 2007; McQuaid, Walders, Kopel, Fritz, & Klinnert, 2005), it is worthwhile to investigate internal variables (e.g., values, beliefs, and practices) that may provide clarity as to why these disparities exist. Cultural and family contexts are important to consider, as these may be factors that can contribute to future development of more culturally tailored asthma interventions (Koinis-Mitchell et al., 2011).

Research Questions

Current research demonstrates a need to study pediatric asthma with a multidimensional approach. Koinis-Mitchell et al. (2004) provided support for an interdependence of factors related to a child's sociocultural context, management of asthma, and developmental characteristics in an examination of risks and resources for

ethnic children residing in urban contexts. The results of their study suggested the utility of considering the multiple contextual, cultural, and illness-related factors that can simultaneously affect asthma management and morbidity for ethnic minority, inner-city children. This approach, the authors argued, might best approximate what children with asthma and their families negotiate on a daily basis with respect to managing asthma in the context of the many stresses faced on a daily basis. Thus, this study sought to examine the illness experience of pediatric asthma as impacted by family and cultural variables in Latino families as emphasized by the biopsychosocial perspective. The following research questions guided this study:

- How do mediator variables of balanced integration and management by alternate caregivers and observed variables of familism and morbidity relate to demographic child-specific variables (poverty level, age, asthma severity level, location of residence, sex)?
- What significant differences exist for mediator variables of balanced integration and management by alternate caregivers and observed variables of familism and morbidity when comparing by location of residence (mainland versus island) and by ethnicity (Latino versus non-Latino White)?
- To what extent do the data fit the latent variables of familism and pediatric asthma morbidity?
- To what extent does this measurement model operate equivalently across groups by the child-specific variables of asthma severity and ethnicity?

- To what extent does the cultural value of familism predict pediatric asthma morbidity?
- To what extent does balanced integration mediate the relationship between familism and asthma morbidity?
- For families reporting participation of alternate caregivers in asthma management, how well do family variables of management by alternate caregivers mediate the relationship between familism and pediatric asthma morbidity?

Previous literature has found that family cohesion and utilization of social support are components of familism, and therefore this study predicted that family cohesion and social networking (contact and reliance) would be positively correlated. It was hypothesized that child-specific variables would be related to these familism indicators. Age and asthma severity level was expected to have an inverse relationship with family cohesion, social network (contact and reliance), and balanced integration. Many studies have used service utilization as a measure of morbidity, and therefore it was hypothesized that the number of times a child has seen a doctor, gone to the emergency room, and been hospitalized would be positively correlated. Age and asthma severity level were expected to have a positive relationship with morbidity indicators. Finally, sex, poverty level, ethnicity, and location of residence were expected to have moderate relationships with familism indicators and morbidity indicators.

Based on literature suggesting that familism is a cultural value held centrally in the Latino culture (Campos et al., 2008; Cooney, 2001; Guilamo-Ramos et al., 2007;

Triandis et al., 1982), this study predicted that Latino families would report significantly greater levels of familism variables and higher levels of morbidity variables. Further, it was proposed that island Puerto Rican children would report greater levels of familism and higher levels of morbidity variables than those Puerto Rican children from Rhode Island. It was hypothesized that Latino families would report significantly greater use of asthma management by alternate caregivers but lower levels of balanced integration than non-Latinos. Furthermore, it was proposed that island Puerto Rican families would report significantly greater use of asthma management by alternate caregivers and lower levels of balanced integration than those Puerto Rican families treated at mainland U.S. care sites.

It was expected that the data would support the latent constructs of familism and morbidity, and it was hypothesized that these constructs would be measured similarly for children with pediatric asthma regardless of asthma severity and ethnicity. Research literature indicates that asthma management from a family approach leads to improved morbidity (Klennert & Bender, 2002). Therefore, it was hypothesized that familism would negatively predict pediatric asthma morbidity.

Further, it was expected that balanced integration would mediate the relationship between familism and asthma morbidity. This question was investigated with the total sample. Looking specifically at families who endorsed involvement of non-primary caregivers in asthma management, it was predicted that management by alternate caregivers would mediate the relationship between familism and asthma morbidity. As such, only a subsample of families was included in this secondary analysis.

Significance of the Study

Literature supports that significant health disparities exist in pediatric asthma, particularly for Latino children. Results of this study contribute to the burgeoning research focusing on the impact of cultural variables and family practices in asthma management. Since great difficulty exists in identifying causal variables of asthma and a limited ability to control or change external variables, such as outdoor allergens or low socioeconomic status (SES), pursuing improvements within psychosocial and behavioral realms is a worthwhile endeavor to contribute to improving pediatric asthma outcomes. Recent literature provides strong evidence for pediatric asthma management when considered from a developmental perspective within the context of a family. Examination of the impact of a central Latino cultural value, familism, and how this value manifests through family-related asthma management practices may illuminate these cultural beliefs and practices as strengths. By investigating the potential of cultural features as strengths, these features may, in the future, be integrated into family-oriented asthma interventions.

CHAPTER II

REVIEW OF THE LITERATURE

Asthma, a chronic disease of the respiratory system, is the most prevalent chronic illness in school-aged children. Akinbami et al. (2011) estimated that in 2009, approximately 7.1 million children ages 0 to 17 years in the United States had asthma. According to the 2010 National Health Interview Survey, age-adjusted estimates showed that approximately 14% (10 million) of the population under the age of 18 reported ever having a diagnosis of asthma in the United States and 10% (7 million) reported currently having asthma (National Center for Health Statistics, 2011). Several studies have found that children in dense urban neighborhoods with greater numbers of low-income ethnic minority families experience greater prevalence rates (Claudio, Stingone, & Godbold, 2006; Mvula et al., 2005). Aligne, Auinger, Byrd, and Weitzman (2000) asserted that all children, not just ethnic minorities, living in an urban setting were at increased risk for asthma due to the unique exposure and contextual variables associated with an urban setting. The literature reveals that although there has been an improvement in the technology and pharmacological treatment for pediatric asthma over the last few decades, outcomes for school-aged children have not met similar levels of improvement. Due to the complex nature and chronicity of the disease, which includes variance in triggers and unpredictability in symptom manifestation and cessation, the treatment regimen presents a challenge for children and their families (Fiese & Everhart, 2006; Kaugars et al., 2004; McQuaid et al., 2003).

Asthma stands apart from other respiratory diseases due to the nature of onset, escalation, and/or reversibility of symptoms, both spontaneously and with pharmacological assistance (Taitel, Allen, & Creer, 1998). With proper adherence to asthma treatment as recommended by the most current clinical guidelines (e.g., taking daily or as-needed medications consistently, avoiding triggers, identifying symptoms; NHLBI, 2007), asthma can be controlled with a great reduction in symptoms, thus allowing a child to function and live a life typical for peers without asthma.

Unfortunately, the variability in quantity and quality of episodic symptom manifestations within and between children with asthma discourages consistent day-to-day adherence to treatment plans. In addition, there are a variety of factors related to the individual (e.g., development changes, adherence, biological), environment (e.g., exposure to allergens and irritants, inner-city stressors), family (e.g., family stresses, family management strategies), culture (e.g., cultural beliefs toward illness and medications, acculturation), and health care system (e.g., insurance status, access to care) that have been shown to contribute to variations in asthma outcomes in pediatric populations (Canino et al., 2006; Koinis-Mitchell et al., 2010).

This study examined the relationship of a social cultural value, familism, and pediatric asthma morbidity as conceptualized by Engel's BPS model. According to Engel (1977), the biomedical model, which depended on a medical diagnosis of asthma alone, was not adequate for garnering a full understanding of asthma. Instead, Engel proposed the following:

To provide a basis for understanding the determinants of disease and arriving at rational treatments and patterns of health care, a medical model must also take into account the patient, the social context in which he lives, and the complementary system devised by society to deal with the disruptive effects of illness. (p. 196)

He also asserted that by including psychosocial factors in combination with biological features, the BPS model could provide some insight into why different individuals vary in their illness experience. Based on a systems approach, this conceptual model provides a framework that considers psychosocial factors from multiple systems contributing to pediatric asthma outcomes.

Pediatric Asthma

Asthma is the most common chronic illness in children, with an estimated current asthma prevalence of 9.6% of people under the age of 18 in the United States (Akinbami et al., 2011). Trend analyses indicate that the number of asthma-related deaths has declined by over 8% since 1999, but there has been a pattern of increase in asthma prevalence and morbidity (American Lung Association, 2005). There is a greater incidence of asthma in children than adults, and asthma is more common in male children than female children (Akinbami et al., 2011; National Center for Health Statistics, 2011). Although epidemiological statistics have shown higher prevalence and incidence rates for non-Hispanic Black children than Hispanic children and non-Hispanic White children, evidence reveals that Puerto Ricans have significantly higher rates than non-Hispanic Black children (Akinbami et al., 2011; Canino et al., 2006;

National Center for Health Statistics, 2006). According to the National Asthma Education and Prevention Program (NAEPP) Expert Panel Report 3 (NHLBI, 2007), asthma is currently defined as:

a chronic inflammatory disorder of the airways in which many cells and cellular elements play a role: in particular, mast cells, eosinophils, T lymphocytes, macrophages, neutrophils, and epithelial cells. In susceptible individuals, this inflammation causes recurrent episodes of wheezing, breathlessness, chest tightness, and coughing, particularly at night or in the early morning. These episodes are usually associated with widespread but variable airflow obstruction that is often reversible either spontaneously or with treatment. The inflammation also causes an associated increase in the existing bronchial hyperresponsiveness to a variety of stimuli. Reversibility of airflow limitation may be incomplete in some patients with asthma. (p. 14)

Impact on Behavioral Functioning

Significantly elevated levels of behavioral problems, which include oppositional behaviors, aggression, and hyperactivity, have been reported in the pediatric asthma population (Bussing, Halfon, Benjamin, & Wells, 1995; Halterman et al., 2006; McQuaid, Kopel, & Nassau, 2001). While many studies have examined the impact of emotional and psychological symptoms on the ability of a child to accurately monitor symptoms, a recent study suggests that attention skills may also have a role in accurate symptom perception (Koinis-Mitchell et al., 2009). Given that accuracy in symptom perception is key in asthma management and can impact perceptual ability, it is alarming

that parents of children with asthma reported in an analysis of the 2003 National Child Health Survey (NCHS) that a health professional indicated attention-deficit/hyperactivity disorder (ADHD) for their child twice as often when compared to parents of children without asthma completing the NCHS (Blackman & Gurka, 2007).

Impact on Emotional/Psychological Functioning

Asthma can have an enormous toll on a child's emotional and psychological functioning. Several studies suggest a strong association between asthma and anxiety and depression (Katon et al., 2007; McCauley, Katon, Russo, Richardson, & Lozano, 2007) and report that in comparison to children without asthma, children with asthma are more likely to experience internalizing behavior problems (Blackman & Gurka, 2007; Klinnert, McQuaid, McCormick, Adinoff, & Bryant, 2000). In a sample of youth ages 11-17, children with asthma were nearly twice as likely to meet Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) criteria for one or more anxiety and mood disorders (Katon et al., 2007). Chaney and colleagues (1999) found that in a comparison of older adolescents and young adults with and without longstanding asthma, those with longstanding asthma were more likely to develop depression and learned helplessness deficits. Another study found that adolescents who experienced severe episodes of asthma attacks exhibited high levels of posttraumatic stress symptoms (Kean, Kelsay, Wambolt, & Wamblot, 2006). Finally, Gillaspay, Hoff, Mullins, Van Pelt, and Chaney (2002) discovered that asthma acted as a significant independent contributor to increases in anxiety, depression, and global psychological distress for at-risk youths who were of an ethnic minority group or low SES.

Several studies revealed that specifically within a sample of island Puerto Rican children with asthma, a strong association existed between pediatric asthma and psychiatric disorders (Ortega, Huertas, Canino, Ramirez, & Rubio-Stipec, 2002; Ortega et al., 2003). In a community sample of island Puerto Rican children between the age of 4 and 17, Ortega, McQuaid, Canino, Goodwin, and Fritz (2004) found that although 32% of their sample reported diagnoses of asthma, only 22% reported experiencing asthma attacks. In their study, having a diagnosis of asthma was associated with only some psychiatric disorders, while having asthma attacks was associated with almost all anxiety and mood disorders, even after controlling for family socioeconomic level and maternal mental health. The relationships between asthma and anxiety and depression disorders were replicated in an analysis using the same population at 1-year follow up (Feldman, Ortega, McQuaid, & Canino, 2006). Of note, these associations remained robust after controlling for mother's mental health status, which potentially might impact parent perception of child mental status. Altogether, these studies indicate that Puerto Rican children with asthma are likely to be vulnerable to a strong association with anxiety and mood disorders.

Research literature suggests negative outcomes for children and adolescents with asthma and a comorbid mental health disorder. Specifically, having anxiety and depression symptoms can impact asthma management. One major area of research has focused on the connection between emotions and asthma symptoms. Chen, Hermann, Rodgers, Oliver-Welker, and Strunk (2006) found that elevated trait anxiety was associated with heightened symptom perception. In a review of the literature focused on

the psychological aspects of asthma, Lehrer, Feldman, Giardino, Song, and Schmaling (2002) highlighted how emotions and stress can serve as episode triggers, worsen exacerbations, or blunt a child's ability to accurately perceive asthma symptoms. Richardson, Russo, Lozano, McCauley, and Katon (2008) found that in a sample of adolescents with asthma, those who also had a diagnosis of anxiety and/or mood disorders had higher rates of health care utilization (i.e., primary care visits, emergency room visits, outpatient mental health specialty visits, and other outpatient services) before adjusting for asthma severity and other covariates.

Impact on Social Functioning

Asthma can affect the social functionality of children and adolescents. In a study by Lang, Butz, Duggan, and Serwint (2004), children with asthma were less likely to participate in physical activities, which may interfere in their formation and maintenance of social relationship with peers. In a second study, 149 adolescents with and without a chronic illness were surveyed, and peers with asthma were perceived as less negatively impacted compared to other chronic illnesses, such as leukemia and epilepsy (Wirrell, Cheung, & Spier, 2006). Interestingly, this same study found that 4% of the sample voiced reluctance over befriending another adolescent with asthma. Symptomatic adolescents with asthma perceived themselves significantly different from those without asthma, reporting lower rates of well-being, lower health satisfaction, lower self-esteem, and less family involvement along with higher levels of physical and emotional symptoms (Forrest, Starfield, Riley, & Kang, 1997). In a sample of adolescents who were predominantly Hispanic and Black, those who were afraid to disclose their asthma

condition to friends, who felt embarrassed to have an asthma attack in front of peers, or who were reluctant to take medication in front of friends were less likely to report feeling in control of their asthma symptoms (Cohen, Franco, Motlow, Reznik, & Ozuah, 2003). Adolescents have reported that the excessive desire to be normal potentially serves as a barrier to effective asthma management (Velsor-Friedrich, Vlasses, Moberley, & Coover, 2004).

Impact on School Functioning

The average number of school days missed in 2002 and 2003 was approximately 13.75 million among children who were reported as having at least one asthma attack in the preceding 12 months (National Center for Health Statistics, 2006.). The research literature reports mixed findings, with several studies finding no difference in absences between children with asthma and children without asthma (Clark et al., 2004; Millard, Johnson, Hilton, & Hart, 2009) and other studies indicating that on average, children with asthma miss significantly more days of school than peers without asthma (Fowler, Davenport, & Garg, 1992; Roder, Kroonenberg, & Bockaerts, 2003; Shendell, Alexander, Sanders, Jewett, & Yang, 2010; Silverstein et al., 2001). One of the first studies looking at national prevalence data found that children with asthma were absent almost 10 days of school on average, with approximately 40% of those with severe asthma reporting they had difficulty participating in school activities (Newacheck & Halfon, 2000). Studies by Moonie, Sterling, Figgs, and Castro (2006, 2008) compared students with and without asthma and concluded that those with asthma on average missed 1.5 more days of school per school year and that the number of absences

increased with severity level. In a study analyzing data from the National Survey of Children's Health with a sample of 8,689 children ages 0 to 17, parents reported three times the number of absences for children with asthma than children without asthma (Blackman & Gurka, 2007). Mizan, Shendell, and Rhoads (2011) examined absence rates in a sample of 914 children in the fourth and fifth grades and similarly found evidence that children with asthma had significantly more absences, but they specifically found this to be true for single-day absences with no difference between groups in regards to tardiness or lengthier absences.

With two exceptions indicating that kindergarteners with asthma had poorer school readiness and that some children with asthma suffer sleep loss due to asthma symptoms, a review of 66 empirical studies provided a lack of clear support for any other impact on school performance aside from absenteeism (Taras & Potts-Datema, 2005). In this review, studies that supported the notion of lower academic achievement or ability of children with asthma indicated worse academic outcomes for students with more severe and persistent asthma. Literature reflects that the actual percentage of children with asthma who are affected academically as a direct result of neurocognitive impairment resulting from respiratory arrest and hypoxia during an asthmatic episode or indirectly by associated variables such as a higher absenteeism rates, side-effects of medication, or related psychosocial conditions is very small (Bender, 1995; Naude & Pretorius, 2003).

Although the literature provides mixed findings regarding whether asthma impairs academic functioning, a study by Stingone and Claudio (2006) found that in a

New York sample of children, students with asthma were 60% more likely to be enrolled in special education across all categories of disabilities. Children with asthma can receive support under the Individuals with Disabilities Education Improvement Act (IDEIA; 2004) disability category of Other Health Impaired (OHI) to assist with managing treatment regimen as well as with other associated issues that may impact academic functioning.

Pediatric Asthma Morbidity

Defined as quality-of-life impacting events, such as asthma-related emergency room visits, hospitalizations, and asthma doctor visits, morbidity is an outcome variable often used in asthma research. Other definitions of morbidity have also considered the limitations imposed on an individual's life due to asthma, including activity restrictions, daily functioning, and missed sleep (Brotanek, Halterman, Auiger, & Weitzman, 2005; McQuaid et al., 2007). Morbidity costs, or the economic calculation derived from disease burden costs, make up between two-thirds and three-quarters of indirect costs from asthma in general; however, between 80% and 90% of morbidity costs can be attributed to pediatric asthma specifically (Gergen, 2001). The total estimated cost of impact on school-aged children estimated from 1996 data was about \$19.9 billion, calculated from direct medical expenditures, millions of school-day absences, loss of parental workdays, and lifetime earnings lost due to mortality (Wang, Zhong, & Wheeler, 2005).

For asthma, direct costs of asthma morbidity are expenses related to asthma prevention, treatment, and rehabilitation, and indirect costs or opportunity costs of

asthma morbidity are the value of resources lost as a result of absences from school, work, or other daily activities due to events related to asthma (Gergen, 2001). Direct costs are more easily assessed because actual cost amounts can be obtained from records, such as payments for ambulatory care visits, hospital outpatient visits, hospitalizations, emergency department utilizations, and medical prescriptions (Smith et al., 1997). Indirect costs, on the other hand, are not readily available because information relating to missed workdays, school absences, lost future earnings, and quality of life are not always routinely collected or rely too much on self-reports (Gergen, 2001).

Not only does pediatric asthma have potential serious negative impacts on individual children and their families, but the excessive burden on the health care system is also taxing and unnecessary because asthma is a chronic condition that can be successfully managed. Lozano, Sullivan, Smith, and Weiss (1999) estimated from the 1987 National Medical Expenditure Survey that nearly 41% of families with children with asthma had no primary insurance and across all categories of care utilized health services more often than those with children without asthma. More importantly, trends from studies indicate worse morbidity outcomes and varying service utilization patterns for different groups by age, ethnicity, and social economic status (Chestnut & Mills, 2003; Lozano et al., 1999; Smith et al., 1997; Wang et al., 2005; Weiss, Sullivan, & Lyttle, 2000). Results of some studies support the idea that Latino children with asthma are less likely to have health insurance coverage and have higher rates of utilizing urgent care services and the emergency department rather than primary care physicians to

manage their asthma (Berg et al., 2004). A study analyzing data for 2003-2004 emergency department and hospital admissions found similar trends with non-Hispanic Black children, who were three times more likely than Hispanic children and two times more likely than non-Hispanic White children to be admitted for asthma—3.6 and 1.6, respectively (Kruse, Deshpande, & Vezina, 2007). Everhart et al. (2011) similarly found that even after controlling for poverty, Latino families had a strong association with emergency department use and environmental control. This was not found for African-American and non-Latino White comparison groups. Jandasek et al. (2011) found that Latino children living in Puerto Rico were significantly more likely to utilize emergency room services and have been hospitalized to manage asthma when compared to non-Latino White children with asthma living in Rhode Island.

The direct costs of asthma morbidity are staggering. The total cost of asthma rose from an estimated \$4.5 billion in 1985 to nearly \$10.7 billion in 1996 (Gergen, 2001; Wang et al., 2005; Weiss et al., 2000), and individuals aged 18 and younger accounted for a third of that cost (Gergen, 2001). A study by Smith et al. (1997) concluded that approximately 80% of health care resources were being used by only 20% of the population and defined individuals with asthma as high-cost patients. As costly as pediatric asthma is at a system level, cost at the individual level is more than financial, as it includes disruption to a child's behavioral, social, and emotional functioning.

Asthma Disparities in the Latino Population

Latino Subgrouping

A distinction between ethnicity and race is necessary to understand the significance of dissolving the catchall grouping of “Hispanic” and focusing on specific subgroups. In research, ethnicity and race have been used interchangeably with culture. Ethnicity and race are used as proxy variables, and conclusions drawn from group difference analyses can be very limited in practicality. Race originally was based on the notion of biological race, with the idea that groups were genetically isolated and that ethnicity is a socially constructed grouping category based on national origin or patterns of cultural beliefs and behaviors (Schaefer, 2006). The catchall ethnic category of Hispanic holds meaning only in the context of the United States, where it was conceived as a categorical tool for statistically tracking the population in the 1970 census (Rumbaut, 2006). This Hispanic grouping category represents a group based more on dissimilarities from other groups in the United States (e.g., Caucasian/White, African descent, Asian) and loose commonalities (e.g., dominant language of Spanish, historical originations from Spain). Many studies with analyses between ethnic groups do not differentiate between the Hispanic subgroups. Such grouping may not adequately capture the complex construct of individual subgroup cultures, which can minimize a fuller understanding of how culture influences development in a child’s life.

The practice of grouping and using ethnicity and race interchangeably creates a masking phenomenon for the Latino ethnic group. Latinos, or Hispanics, are individuals from a large variety of countries with Spanish heritage resulting from historical ruling of

the Spanish empire. A distinction between the terms *ethnicity* and *race* help clarify disparities that exist in terms of asthma rates of prevalence, morbidity, and mortality amongst Latino subgroups, in which some numbers exceed those of the non-Hispanic Black ethnic group. Ethnicity is a sociocultural construction that entities such as research scientists and government bodies use to group people based on a subjective system of agreed-upon social values, whereas race is grouping based more on objective parameters such as shared genes and other biological features (Kato, 1996). According to the 2000 U.S. Census, the Hispanic ethnic group category is comprised of the following: Mexican (59%), Puerto Rican (9.6%), Central American (5.1%), South American (4%), Cuban (3.5), Dominican (2.2%), Spaniard (.3%), and Other Hispanic (15.7%; U.S. Census Bureau, 2004).

Latino Within-Group Differences in Pediatric Asthma

Several studies provide evidence that asthma occurs disproportionately within the Hispanic ethnic group. Asthma prevalence surveys suggest that in the U.S., Mexican children have the lowest prevalence of lifetime asthma and recent asthma attacks compared to non-Hispanic Black and non-Hispanic White children, yet the second largest Hispanic subgroup, Puerto Rican children, has the highest rates (Lara et al., 2006; see also Moorman et al., 2007). Homa et al. (2000) found that within the U.S. Hispanic ethnic group, Puerto Ricans had the highest asthma mortality rate followed by Cuban-Americans and Mexican-Americans and that these rates varied by the region in which they lived. In a study of New York City, Rosenbaum (2008) found that after controlling for household size and deteriorated housing conditions, Puerto Ricans exhibited

significantly higher levels of asthma compared to other Hispanic households and similar levels to non-Hispanic Black households. In California, where the Latino population is predominantly of Mexican descent, the asthma prevalence rates calculated from a sample of 462,147 children who participated in the California Healthy Kids Survey were 22.8% for Puerto Rican children and 23.0% for Cuban-American children, compared to only 13.2% for Mexican-American children (Davis, Kreutzer, Lipsett, King, & Shaikh, 2006). Tortolero et al. (2007) similarly found in their screening of asthma symptoms in Houston, Texas, that prevalence of parent-reported asthma and asthma symptoms were lowest in Mexican-American families and significantly lower than prevalence rates for Puerto Rican children living in the U.S.

The Latino within-group difference is particularly salient in this regard, as the ethnicity grouping may be made up of different racial groups. Genetically, individuals from Puerto Rico have a greater African ancestry compared to Mexican individuals (Salan & Burchard, 2007). Results of a study examining bronchodilator responsiveness among a sample of African-Americans, Puerto Ricans, and Mexicans found that Puerto Rican children (< 16 years) had significantly poorer pulmonary functioning compared to Mexican children (Navqi et al., 2007). This study also found that in a moderate-to-severe asthma subgroup, the African-American group and Puerto Rican group had significantly lower bronchodilator responsiveness to albuterol compared to the Mexican children but were not significantly different from one another. These findings support the existence of biological differences within the Latino ethnic group. Genetic research that includes race as a grouping variable is appropriate. However, research looking to

examine behaviors and practices for purposes of intervention and prevention development should not group by race but by ethnicity. Further, research should be explicit and specify cultural features that may be relevant.

Latino Between-Group Differences in Pediatric Asthma

While there are similarities across all Latino subgroups, there are important individual differences between the Latino subgroups. In a study of asthma beliefs and practices of four Latino subgroups—mainland Puerto Ricans, Mexican-Americans, Mexicans, and Guatemalans—there existed an overall shared belief of some of the causes of asthma, but more importantly, there was a measurable variation in beliefs and practices that were specific to site and cultural group (Pachter et al., 2002). Koinis-Mitchell et al. (2008) also found similarities about general beliefs about asthma with differences related more to asthma management and treatment practices in a group of Latino (Puerto Rican and Dominican) caregivers in Puerto Rico and Rhode Island. One recent study found that nativity of Latino caregivers of children with asthma was marginally statistically significant with emergency department visits related to asthma care (Koinis-Mitchell et al., 2011).

The literature supports disproportionality in pediatric asthma for Puerto Rican children (Lara et al., 2006). A study of children in North Puerto Rico by Loyo-Berrios, Orengo, and Serrano-Rodriguez (2006) estimated that nearly half of the 6- and 7-year-old children and nearly a quarter of the 13- and 14-year-old children in the sample had asthma. Another study found that Puerto Rican children whose parents were born in Puerto Rico had a higher odds-ratio for a lifetime asthma diagnosis than Puerto Rican

children whose parents were born in the U.S. (Lara et al., 2004). The disproportionate pattern of higher asthma prevalence and morbidity rates among different groups of Puerto Rican children is a continuing trend, as evidenced by studies over the last two decades (Akinbami, 2006; Flores, Abreu, Olivar, & Kastner, 1998; American Lung Association, 2005; Homa et al., 2000; Ledogar, Penchaszadeh, Garden, & Acosta, 2000).

Biopsychosocial Conceptual Models

The BPS model makes a distinction between disease and illness, such that disease is objective and definable by pathophysiological and pathological processes, while illness is the subjective experience of a diseased state (Engel, 1977; Sperry, 2006). This distinction is key because the subjective experience of asthma has been found to be a greater determinant of asthma morbidity outcomes, much more so than the objective disease state (Fritz et al., 1996; Meng & McConnell, 2002; Rietveld & Brosschot, 1999). This aspect is particularly important for asthma because a large body of pediatric asthma research has indicated incongruence between accurate perception of asthma symptoms (e.g., chest tightness, dyspnea) and actual changes in pulmonary functioning (Fritz et al., 2007; Lane, 2006; Rietveld, Prins, & Colland, 2001). Inaccuracy in symptom perception can range from blunted (difficulties detecting present symptoms) to hypersensitive (magnifying symptom severity). This incongruence between subjective abilities to accurately perceive asthma symptoms and objective measures of pulmonary functioning has large implications for treatment and intervention, particularly with taking as-needed medications or seeking medical attention.

Engel's Biopsychosocial Conceptual Model

Engel (1977) offered the BPS perspective as an alternative to the traditional biomedical model, which focused solely on the biological and physical dysfunction of the body to understand a disease. Engel asserted that depending on a biomedical model for conceptualizing and treating a disease was insufficient and that the experience of illness must be integrated to create healthier relationships between doctors and patients, establish more effective treatments, and increase adherence to medical regimens (Nicassio & Smith, 1995; Sperry, 2006). To account for variance in an individual's illness experience, Engel (1977) proposed the following as necessary considerations in conceptualizing a disease:

- The physiological objective processes of disease are not sufficient for the occurrence of the human experience of a disease, and information gathered about an individual's social context, cultural background, and psychological experience are essential in modifying and improving the illness experience.
- Descriptions reported by individuals about their disease (physical body symptoms) coexist and overlap greatly with expressions of their illness experience, allowing for poor perceptual accuracy of symptoms and confusion over the distinction between subjective psychological distress and actual physiological disturbance.
- The context in which an individual exists provides a multitude of variables that impact his or her response to his or her disease, including realizing the onset of symptomatology, severity, and variations in the course of a disease.

- Psychological and social variables are major influencing factors contributing to whether and when individuals will be viewed as sick by others and by themselves.

The BPS model was developed by Engel as a proposal to improve quality of care by physicians. In criticizing the medical model, Engel (1980) maintained that the “crippling flaw of the model is it does not include the patient and his attributes as a person, a human being” (p. 536). Scherger (2005) acknowledged that the BPS model, which demands more time and consideration per patient, is not compatible for physicians with present structures of primary care (e.g., high-volume care), but mental health clinicians with lower patient loads and greater face-to-face time per patient can work collaboratively in family health care to integrate BPS approaches in treatment. The BPS model of care has been recognized as “relationship-centered care” (Suchman, 2005, p. 450), which given the restrictive care structure of physicians, promotes an even more prominent role for psychologists in behavioral health medicine.

Engel’s BPS model, which is presented in Figure 1, is a broad conceptual model. Engel provided a hierarchy that demonstrates influence at multiple levels of different systems that come into play in a person’s experience with a chronic illness. More recently, several researchers have offered conceptual models of asthma and asthma processes that embrace the systems theme of BPS. They similarly incorporate the premise of psychosocial contextual and family relational variables as influencing asthma outcomes. These other models are discussed next.

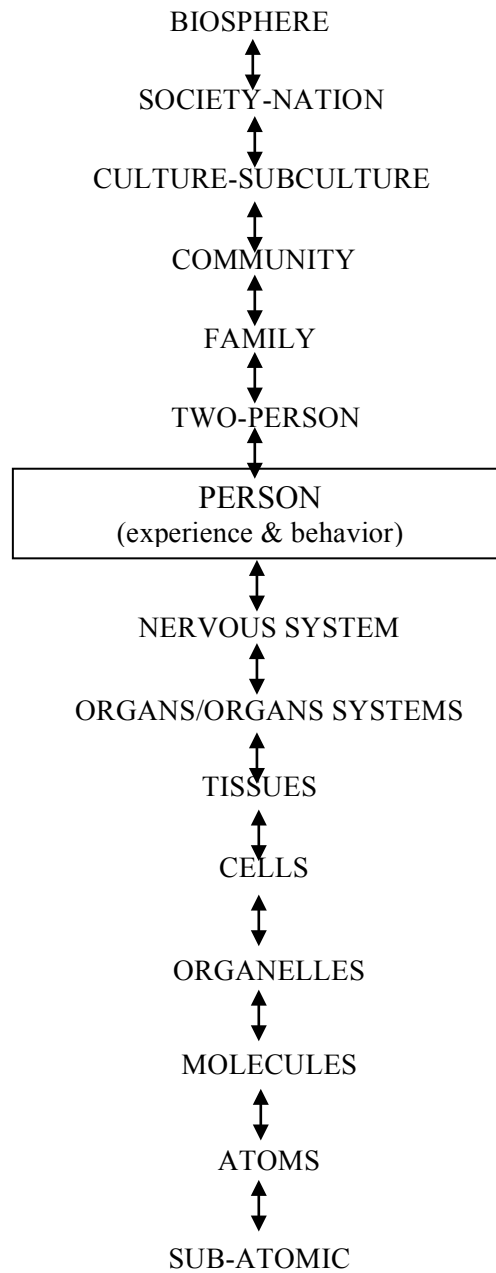


Figure 1. Engel's biopsychosocial hierarchy of natural systems. From "Clinical Application of the Biopsychosocial Model," by G. L. Engel, 1980, *American Journal of Psychiatry*, 137, p. 537. Copyright 1980, displayed with permission from American Psychiatric Publishing.

Miller and Wood's Conceptual Model of Family Issues

Miller and Wood (1991) posited four critical contexts for the psychosocial development of a child with a chronic illness are necessary for improving health care. These four critical contexts—family, school, peer group, and health care system—are described as not only interacting with the child but also interacting with one another. Miller and Wood narrowed the broader model when discussing each of the individual contexts and their importance in supporting the health care provider in improving a child's response to asthma (see Figure 2). Family is identified as a child's most important support source for better adjustment to asthma; however, maladaptive interactions and relationships may cause family to be a source of stress instead.

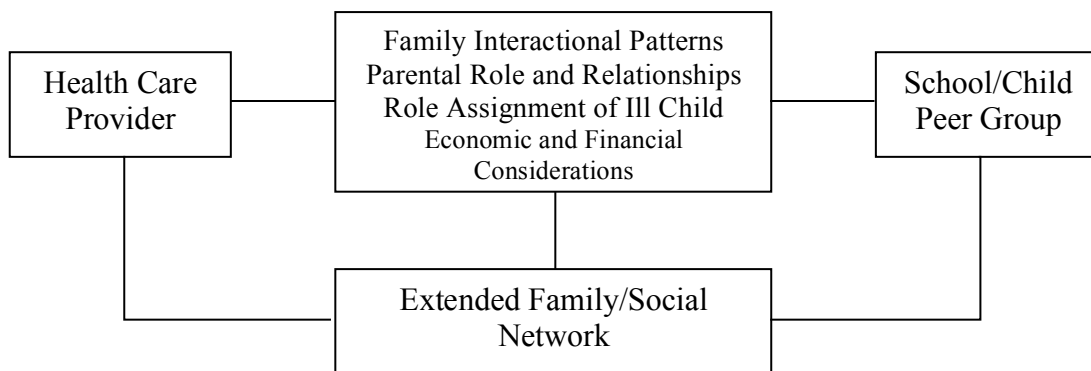


Figure 2. Miller and Wood's conceptual model of family issues. From "Childhood Asthma in Interaction with Family, School, and Peer Systems: A Developmental Model for Primary Care," by B. D. Miller & B. L. Wood, 1991, *Journal of Asthma*, 137, p. 406. Copyright 1991 Marcel Dekker, Inc., displayed with permission from Informa Healthcare.

This model supports the importance of the role of family, the interactive nature of multiple levels of systems in which the child is embedded that can be impacted by asthma, and the reciprocal influence of asthma that can disrupt development of natural family processes. This model also specifies extended family members as an important variable, for extended family members can function as a resource for the nuclear family. Although this model highlights “the pivotal position of the family in the adaptation of the child and his or her psychosocial surroundings” (Miller & Wood, 1991, p. 407) and the importance of family patterns there is no emphasis of culture, which may directly impact family patterns.

Shalowitz’s Contextual Model of Childhood Chronic Illness

Conceptual models in the last decade have built on Miller and Wood’s 1991 model and incorporate culture and society influences. Shalowitz (2008, p. 497) provided an interactive and multidimensional conceptualization, suggesting illness attributes are but one dimension of a child (see Figure 3). This model highlights the large influence of parent and family variables. Shalowitz visualized parent involvement through an eye toward the child to represent that parents’ involvement is dependent on how their perceptions are shaped by contextual variables within the different systems and more broadly by culture and society. Although Shalowitz’s conceptual model is simple in appearance, it emphasizes the importance of striving for more sophisticated analytic methods in child health outcome research to better illuminate important interactions of biological, psychosocial, and environmental variables.

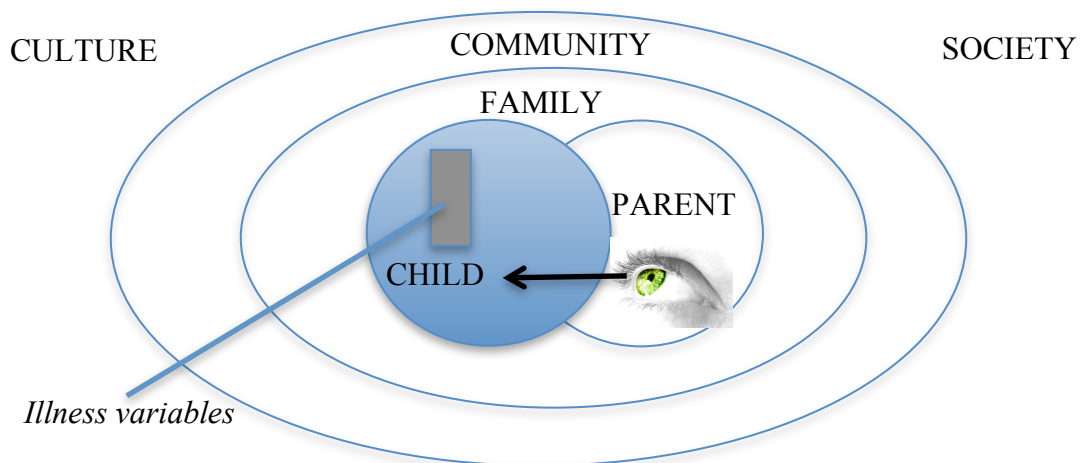


Figure 3. Shalowitz’s contextual model of childhood chronic illness. Adapted from “Advancing Analytic Methods to Understand Asthma Control and Disease Morbidity,” by M. U. Shalowitz, 2008, *Journal of Allergy & Clinical Immunology*, 122, p. 497. Copyright 2008, displayed with permission from Elsevier.

Biobehavioral Family Model

Wood and colleagues (2008) offered the biobehavioral family model (BBFM; see Figure 4), which like the BPS model and Shalowitz’s contextual model (2008), emphasizes relational, emotional, and physiological processes. The model of course provides a conceptualization of asthma; however, it lacks an inclusion of broader contextual considerations. The BBFM acknowledges that environmental factors could influence asthma processes but more specifically through gene-environment interaction, which implies greater emphasis on the biological and psychological aspects of a child’s life. In other words, this model more narrowly emphasizes family relational processes, while psychosocial variables (e.g., lower SES levels, culture, and ethnicity) are not heavily emphasized.

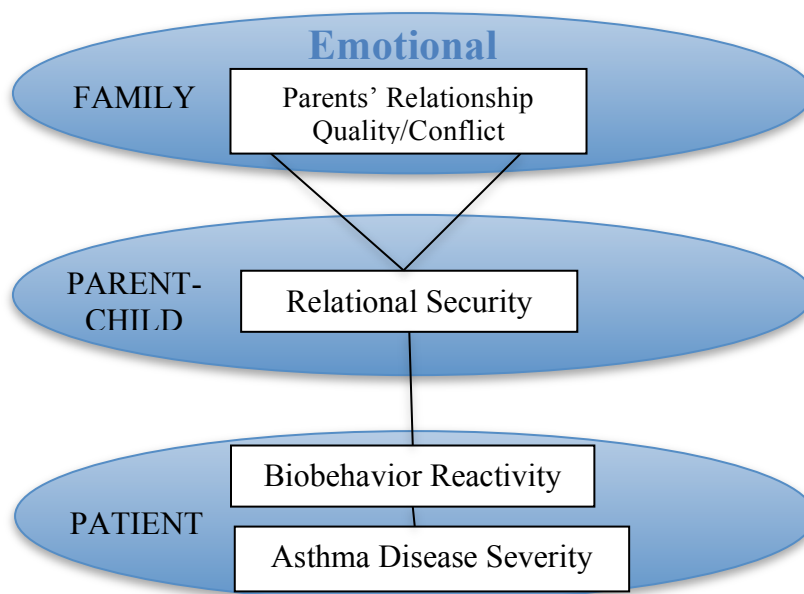
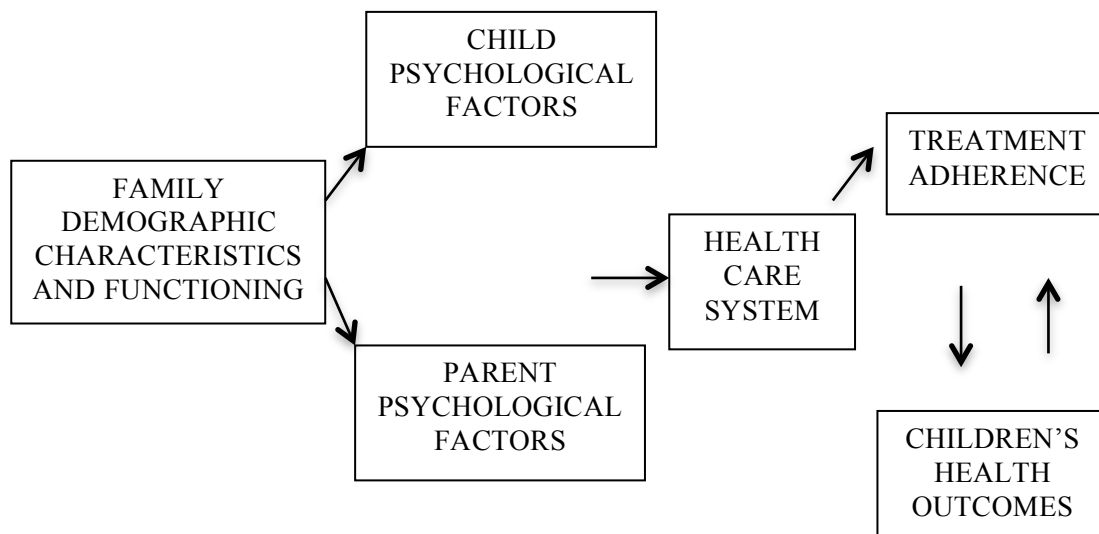


Figure 4. Biobehavioral family model. Adapted from “Testing the Biobehavioral Family Model in Pediatric Asthma: Pathways of Effect,” by B. L. Wood et al., 2008, *Family Process*, 47, p. 22. Copyright 2008, displayed with permission from Blackwell Publishing, Inc.

More sophisticated conceptual models illuminating multiple influences on asthma processes and outcomes exist. These models include more levels within different systems that better emphasize biological and psychosocial variables. One example is a conceptual model suggested by Drotar and Bonner (2009). This example (Figure 5) presents psychosocial variables that are captured within systems related to the individual child, parent, family unit, and medical care, all of which influence child health outcomes and illness processes. This particular model, however, does not include the reciprocal relationship of illness biological variables on psychosocial variables.

The aforementioned models contain components of the biopsychosocial model, but none offer all components. While all models include variables of the family system, which is one of the primary contexts of the current study, varying emphasis is conceptualized in each model. For example, Drotar and Bonner’s (2009) model presents such family unit variables as an initial layer (to the far left), while Shalowitz (2008) conceptualized family and parents as central and nested concentrically within different systems. The BBFM includes bi-directionality in influence, whereas Shalowitz and Drotar and Bonner did not conceptualize a mutual dynamic influence between illness demands and the family. All model conceptualizations consider family processes (e.g., functioning and relational processes) rather than singular discrete family characteristics (e.g., low SES).



*Figure 5. Conceptual model: Influences on pediatric asthma treatment adherence. Adapted from “Influences on Adherence to Pediatric Asthma Treatment: A Review of Correlates and Predictors,” by D. Drotar and M. S. Bonner, 2009, *Journal of Developmental & Behavioral Pediatrics*, 30, p. 574. Copyright 2009, displayed with permission from Lippincott Williams & Wilkins*

This brief overview of the aforementioned models is intended to demonstrate different conceptualizations of pediatric asthma for which BPS principles are applicable.

This study explored pediatric asthma and morbidity within the family context. In the same framework offered by Engel (1977) and the aforementioned specific models of asthma, this study utilized cultural beliefs and practices, which though included theoretically in other studies, have been implemented empirically in very few. Conceptualization of the relationship between family variables and asthma morbidity must put emphasis on cultural values and practices, particularly in collectivistic populations. Thus, familism, a specific cultural value prevalent in the Latino population that places great significance on the family unit and family relationships, was examined in association with asthma morbidity. This study carried on the conceptualization of bidirectional influences through balanced integration, a family's ability to balance the demands of asthma management and the family demands of daily living. Lastly, several biopsychosocial variables, including asthma severity, socioeconomic level, and age, were examined through multiple group comparisons.

Influence of Family Context

Impact of Family on Chronic Illness

The association of systemic factors, particularly family dynamics in pediatric asthma, has more recently come into focus for both researchers and clinicians (Sperry, 2009). By considering a child with a chronic illness within the context of interrelationships with other family members (e.g., parents, siblings), adjustment and coping in other family members, and interaction between the family system with other

systems (e.g., school, health service agencies), a better understanding of the complexities involved with a child's adaptation to a chronic illness can be accomplished (Kazak, Rourke, & Crump, 2003). Mental health well-being of parents and siblings, marital relations, and parent-child relationships have been supported in research as factors in helping or hindering the seeking and accessing of health services, adherence to treatment, and child coping and adjustment to a health condition (Kazak et al., 2003; Shepard & Mahon, 2002). Several recent reviews of research studies found that important components of improved outcomes in pediatric chronic illness were at the family-system level. For example, Fogel and Weissberg-Benchell (2010) found in their review of research studies that parent involvement and support in diabetes tasks were associated with improved diabetes control.

Family cohesion and family conflict, in particular, have been a focus in child health outcome research in different chronic illness. Family cohesion has been broadly considered as affection, emotional bonding, and support from other family members. Higher levels of parent-child conflict related to diabetes-specific issues (e.g., responsibility of management tasks, treatment regimen, eating habits, monitoring) were related to worse outcomes in adherence, metabolic control, and quality of life (Fogel & Weissberg-Benchell, 2010). A study of youth with cystic fibrosis that controlled for sex and age found that higher levels of family cohesion were positively associated with higher rates of treatment adherence as reported by youth and their parents (White, Miller, Smith, & McMahon, 2009). This study used subjective self-reported outcome measures indicating perceptions of adherence rather than objective measures, such as

nebulizers or pill count. However, even perceptions of family support in disease-management-related tasks could be impactful. In a cross-sectional study of youth with Type I diabetes, Geffken et al. (2008) discovered that those youth who perceived their parents as more supportive and positively involved with their treatment regimen experienced fewer episodes of diabetic ketoacidosis (DKA). Helgeson, Janicki, Lerner, and Barbarin (2003) found that family cohesion had stronger associations with higher self-esteem and lower appearance worry in younger children with juvenile rheumatoid arthritis.

Evidence exists that improving family climate improves family functioning and indirectly improves child health outcomes. Better family interactions during mealtimes that provide opportunities for effective communication and instructional control and higher-quality interpersonal involvement have been associated with improvements in chronic illness-specific management tasks for diabetes, cystic fibrosis, and asthma (Hammons & Fiese, 2010; Markson & Fiese, 2000; Patton, Dolan, & Powers, 2008). Given implications that family involvement and interaction are strongly associated with child health outcomes in pediatric chronic illnesses, further focused research on pediatric asthma would benefit the knowledge base that informs the design of appropriate and effective interventions.

Family Involvement in Pediatric Asthma

Family support and involvement in asthma management have been found to be associated with asthma outcomes (Kaugers et al., 2004). A study by Rhee, Belyea, Ciurzynski, and Brasch (2009) found that high levels of family support resulted in

improved asthma control, quality of life, and emotional functioning through reduction of negative adolescent attitudes toward medicine regimen and health providers. Although the sample included in this study were primarily low-income families, approximately 80% of the families regularly accessed care and had a child on controller medication, which limits the generalizability to low-income families who typically experience difficulty with accessing care.

According to the BPS model, even if a family had adequate access to medication to treat the disease aspect of asthma, treatment would not be sufficient without consideration of the social context in which the child lives. Not only does asthma treatment include a medication regimen for prevention and quick relief of exacerbations but also a change in the physical environment and the daily behaviors of people close to the child to address environmental triggers. For example, exposure to environmental tobacco smoke and animal dander are known triggers. A recent study suggests that asthma education alone is not effective in changing parental behavior related to smoking in the home (Wu & Takaro, 2007). Trigger avoidance strategies requiring permanent change for a family with pets and/or with parents that are daily smokers can be perceived as unfeasible and less appealing to implement.

The BPS perspective provides understanding of determinants for the course of asthma as well as rationale for treatment when conceptualization takes into account the relationships between the experience of asthma for children and the experience of asthma for their parents. In other words, information about how asthma impacts family functioning is just as valuable as information about child functioning in the context of

the asthma experience. More recently, the BBFM was applied to investigate how family processes affect asthma process in a sample of adolescents involved with child protective services (Woods & McWey, 2012). By including BBFM core components, such as family emotional climate, caregiver relationship quality, and relational security, the study demonstrated significant pathways from negative family emotional processes to health quality of adolescents.

Balanced Integration of Asthma and Family Life

The family's ability to balance the integration of asthma management with the needs and demands of the family impacts a child with asthma in a reciprocal, transactional nature, which supports the principles of the BPS model. As mentioned earlier, even though it is expected that children gain more responsibility over asthma management with increase in age, children largely still depend on their family for assistance with medical regimens or look to parents to access medical attention (Barton et al., 2002; Rhee et al., 2009). Balanced integration, defined by the authors of the Family Asthma Management System Scale (FAMSS; McQuaid et al., 2005) as a "balance of attention to asthma management and other developmental and family issues (e.g., school attendance, participation in extracurricular and family activities)" (p. 494), has been found to have a significant and positive correlation with data from MDILoggs, which are objective electronic monitors measuring medication adherence. Walker, Chim, and Chen (2009) found that a family's ability to integrate management of asthma in daily living without great disruption was linked with reduced biological inflammatory

profiles. These studies support the idea that improved asthma management within the family context (e.g., behaviors and beliefs) can be related to improved biological states.

Onnis and fellow researchers (2001) emphasized the development of pediatric asthma prevention and intervention strategies within a family context. Improving medical adherence to treatment regimen over time can be promoted by collaboration between involved caregivers and a cohesive family climate (Fiese & Everhart, 2006). Markson and Fiese (2000) suggested that the family and family behaviors serve as protective factors against anxiety in children with asthma. Their study extended previous findings indicating that children value family rituals, such as family dinners, and that these family rituals serve as protective factors against development of emotional dysfunction through alleviation of family stress. This is particularly important for children with asthma because emotional turmoil can trigger asthmatic episodes. Stress within the family can derive from the constant struggle between tending to asthma and other typical family demands (e.g., work, other siblings' needs). In a reciprocal manner, the stress on the family can affect the child and cause greater emotional stress.

Familism

Particular cultural values are not exclusive to individual cultural groups so much as some are held more centrally in different cultural belief systems. The literature has identified specific cultural values that are strongly embedded within the Latino culture. Despite within-group differences of Latino subgroups, many cultural values have long been recognized as central to families across subgroups. Marín and Marín (1991) identified allocentrism, *simpatía*, *familismo*, *respeto*, and *machismo* as some basic

cultural values relevant to behavior processes and outcomes in research studies with Latino populations. Other cultural values also seen in research with Latino populations are *personalismo*, *marianismo*, *fatalismo*, and *espiritismo* (see Andrès-Hyman, Ortiz, Añez, Paris, & Davidson, 2006; Antshel, 2002; Cauce & Domenech-Rodriguez, 2000; Guilamo-Ramos et al., 2007). Of the cultural values listed above, *familismo*, also known as familism, is particularly salient when considering the family system context of pediatric asthma management. Familism has been conceptualized in research as perceptions of obligation of material and emotional support, family members as reliable support and help, and family members as referents for behaviors and attitudes (Sabogal, Marín, Otero-Sabogal, Marín, & Perez-Stable, 1987).

Familism has been more loosely defined in the wider, more recent research literature. Often, researchers utilize concepts related to family cohesion and contact and reliance on social networks. Clark (2001) described *la familia* similarly to familism, in that nuclear and extended family members provide emotional support, cooperation, and mutual aid. In an integrated literature review of parent control in Latino families and cultural childrearing goals, familism was seen as strong family ties, expectation of family support, family loyalty, and prioritization of the needs of the family over the needs of any single individual (Halgunseth, Ispa, & Rudy, 2006). Davila, Reifsnider, and Pecina (2010) more simply defined familism as “importance of family” but also indicated this to mean family responsibility and familial support. Common components across varying operationalization of familism are family cohesiveness, or the closeness of family bonding and high value of the family unit (Marsiglia, Kulis, Parsai, Villar, &

Garcia, 2009), and mutual social support and assistance from family members and close family friends.

Empirical literature, though scarce, supports familism as a protective factor in several different health research areas. In a prospective study focused on pregnancy, Hobel, Glynn, and Sandman (2008) found familism to be higher among Latinas compared to European Americans. Familism negatively correlated with stress and anxiety during pregnancy, and more interestingly, for Latinas, higher social support was positively associated with higher infant birth weight. Higher levels of familism have been found to significantly predict higher levels of parental monitoring and lower levels of engaging in risky behaviors (e.g., alcohol, drugs) to cope with stress in adolescent Mexican-American families (Romero & Ruiz, 2007). Familism emphasizes family involvement and acceptance of support by other family members, which may contribute to improvements in asthma management.

Family Cohesion

This cultural value is generally defined as a collectivistic orientation in behaviors, attitudes, and norms that promote strong identification with the family through loyal and reciprocal relationships with the nuclear and extended family, which influence personal and family decision-making behaviors related to daily living, such as parenting practices or medical treatment (Antshel, 2002; Cooney, 2001; Guilamo-Ramos et al., 2007; Marín & Marín, 1991). Familism emphasizes the importance of family solidarity and obligation toward kin to the point of prioritizing the family unit before an individual's own needs and desires (Guilamo-Ramos et al., 2007; Triandis et al., 1982).

A qualitative study by Rehm (2000) indicated “*apegados a mi*” (p. 92; which means “keeping my child close to me”) as devotion and emotional and physical closeness, or family cohesion without the perceived threat of enmeshment, as a main component of helping Mexican families adjust and positively manage a child with a chronic illness.

Reichenberg and Broberg (2005) found in their study of emotional and behavioral adjustment of children with asthma that although their measure of cohesion spanned from low (disengaged) to high (enmeshment), the results of their study did not support the notion that high cohesion creates negative effects of enmeshment. Rather, their results indicated that high levels of family cohesion and perceived parental capacity are strongly associated with better psychological adjustment, as measured by the Child Behavior Checklist in their sample of 7- to 9-year-olds with asthma.

Family cohesion as an aspect of familism may serve as a protective factor for Latino families; however, there exist studies indicating that first- and second-generation Latinos experiencing dual cultures in the United States may view close family ties as distressing and increase family conflict, thereby increasing negative health and at-risk behaviors. Marsiglia and fellow researchers (2009) found that extremely high or extremely low levels of cohesion increased risk factors and alcohol use for adolescents.

Not only could family cohesion differ between generations in Latino families but also between Latino groups that have immigrated to the United States. Koinis-Mitchell et al. (2011) made two comparisons between Latino caregivers of children with asthma. The first comparison was between Latino caregivers who were born in the Dominican Republic or Puerto Rico and Dominican and Puerto Rican caregivers who were born in

the mainland United States. The second comparison was between Latino caregivers who were raised in the Dominican Republic or Puerto Rico and Dominican and Puerto Rican caregivers raised in the mainland United States. For both comparisons, Dominican caregivers reported significantly higher levels of family cohesion compared to Latino caregivers in the mainland United States. These differences between generations and Latino families who have immigrated to mainland United States may suggest conflicting cultural values embraced by the Latino family, which are collectivistic oriented, and those in the societal practices in the United States, which are more individualistic oriented.

Social Support

As mentioned earlier, research has established that the family plays an essential role in pediatric asthma and may serve as a protective factor (Markson & Fiese, 2000; McQuaid et al., 2007). Cultural values and practices that tap into natural structures within the social context should be engaged to optimize the success of asthma interventions developed from a systems perspective. Familism is a cultural value related to reciprocal supportive relationships between family members in both nuclear and extended families, which includes non-related friends.

In addition to family interaction, friends and extended family can serve as a valuable resource of support. A social support network contributes to reduction of negative impacts of illness through direct instrumental support and to stress buffering through emotional support. Gustafsson, Kjellman, and Bjorksten (2002) found that with very young children with atopic disease (asthma or eczema), better functionality of

family interactions and social networking favorably affected the course of the disease. Interestingly, comparisons between Latino caregivers of children with asthma who were born and raised in mainland United States and those who were born and raised in the Dominican Republic or Puerto Rico found that caregivers of Dominican nativity and upbringing reported significantly greater levels of contact with their social network (Koinis-Mitchel et al., 2011).

Management by Alternative Caregivers

The practice of participation in child rearing by non-nuclear family members and close family friends is prevalent in collectivist cultures, such as the Latino culture. One study indicated that even when accounting for economic and other demographic variables, there is evidence that Latino families have a tendency toward horizontally extended households, which include relatives or non-related friends in similar life stages as immediate family members, as opposed to Asian-Americans, who have a preference for upward extension (e.g., having elderly parents live with adult children) and African-Americans, who prefer downward extension (e.g., having adult children return home to live with their parents; Kamo, 2000). Support by extended family members and friends can include assistance with childcare. Additional participants in a child's management of asthma potentially can be beneficial—in that there are more resources for assistance—or detrimental—in that opposing or incongruent ideas of how to manage asthma could be introduced into the family system. In a study with 789 children with asthma, more than one-third of families reported greater than four asthma caregivers

(Wade et al., 1999), which may contribute to regimen mismanagement if all caregivers are not similarly trained.

Familism is a value not exclusive to the Latino culture. Rather, it occurs in varying degrees in different ethnic groups (Mindel, 1980; Schwartz, 2007). Sarkisian, Gerena, and Gerstel (2006) examined extended family ties among Mexican, Puerto Rican, and Caucasian families and found that Latinos, compared to Caucasians, lived in closer proximity to one another. They also found that Mexican families tended to provide more assistance instrumentally, while Caucasian families provided greater support financially. Pediatric asthma management within a family context can be greatly influenced by the level of familism, but there is very limited research examining the impact of familism on asthma management or morbidity.

Biological and Psychosocial Influences on Asthma

Asthma Severity

In accordance with the BPS perspective, studies support that there exists a transactional relationship between organic characteristics of asthma, in this case severity, and psychosocial variables. Not only have studies shown that children with asthma report worse mental and physical health and worse social functioning than peers without asthma but that children with moderate to severe asthma have significantly worse emotional, behavioral, physical, and social functioning than children with mild asthma (Sawyer, Spurrier, Whaites, et al., 2001). A study examining data from 40 emergency departments across 18 states found that children accessing the emergency room for asthma treatment were presenting with similar levels of severe respiratory distress,

regardless of ethnicity; however, Hispanic and Black children were noted to have greater rates of previous hospitalizations and emergency room visits (Bourdreaux, Emond, Clark, & Camargo, 2003).

While many studies provide evidence of worse outcomes for children with asthma compared to same-aged peers without asthma, some studies show that severity of asthma is associated with significantly more reported physical limitations and greater social dysfunction (Sawyer, Spurrier, Kennedy, et al., 2001). Several studies indicate worse outcomes in other domains for children with more severe asthma. One study found that in its sample of children, those with more severe levels of asthma reported poor self-efficacy and high panic/fear (Silverglade, Tosi, Wise, & D'Costa, 1994). Although Moonie et al. (2008) found that children with asthma as a group performed no differently from children without asthma on academic achievement testing, in an examination of the asthma subgroup, the relationship between asthma severity and an increase in absenteeism and decrease in achievement test scores remained significant after adjusting for demographic covariates. In another study, parents of children with more severe asthma reported that their child had repeated a grade and that they were contacted by school personnel regarding concerns about academic achievement, learning difficulties, substance abuse, self-esteem, depression or anxiety, and bullying by classmates significantly more than parents with minor and moderate asthma (Blackman & Gurka, 2007).

Many studies have focused on the interrelation between asthma and emotions. Findings from a recent study found a direct and indirect pathway of effect between

depressive symptoms and asthma severity (Wood et al., 2007). There is evidence that severity level is associated with increases in emotional difficulties and problematic behavior (Klennert et al., 2000). A study with a sample of adolescents with severe asthma found that approximately 20% of the sample met criteria for posttraumatic stress (Kean et al., 2006).

In contrast, Rietveld and Colland (1999) found that schoolchildren with severe asthma did not significantly differ from children without asthma in the areas of memory, concentration, school performance, physical condition, and negative emotions. However, the authors recognized that the small sample size of their study and the likelihood that participants may have been more adjusted and accepting of their asthma condition may have affected the study's outcomes. Absenteeism, which causes disruptions to a child's learning over time, was not accounted for. This study may indicate that given proper support for better school adjustment, children with asthma would be able to perform commensurate to peers without asthma.

Children with moderate to severe asthma have been found to be more vulnerable for higher risks of fatality and worse morbidity outcomes. There is evidence that this subgroup of children with asthma adheres less to treatment or is undertreated, with one study citing that only 26% of those in its sample with moderate to severe asthma used maintenance medication in the month prior (Halterman, Aligne, Auinger, McBride, & Szilagyi, 2000). Some research studies have found that higher levels of severity are associated with blunted symptom perception, which may contribute to worse outcomes relating to poor medical adherence (Chen et al., 2006; Yoos et al., 2006). Clearly,

research has established asthma severity level as an important variable to include in studying asthma from a biopsychosocial perspective.

Age and Developmental Maturation

Clark (1998) highlighted that issues in pediatric asthma self-management are greatly associated with a child's current stage of development, social environment, and the learning process itself. The NAEPP (NHLBI, 2007) provides recommendations for asthma management and presents information by the three age groups of 0-4, 5-11, and > 12 with rationale developed from current asthma research indicating the following: (a) safety and efficacy of medication is age dependent, (b) drug delivery and handling issues are often age dependent, (c) U.S. Food and Drug Administration medicine approval is based on age, (d) lung function measures for asthma severity level are unlikely for children under the age of 5 because of limitations on measuring impairment and risk domains, and (e) physiological changes over time as a child grows. Pradel, Hartzema, and Bush (2001) found significant differences between 7- and 12-year-old children with asthma in areas of asthma knowledge, awareness of symptoms, and medicine regimen. Guided by the research literature, the current study made similar age breaks and created three age groups of 6-9, 10-12, and 13-16.

Self-management is one of the primary objectives of asthma management, yet consideration for child development and age must be taken into account as families transfer responsibility from caregiver to the child. Although there is evidence that children as young as 7 can be valuable informants regarding their asthma status (Olson et al., 2007), younger children and older children have expressed different experiences

with asthma (Isles & Robertson, 1993; Pradel et al., 2001). Specifically, a study by Pradel et al. (2001) found that during an exacerbation, younger children tended to look to a caregiver for medication assistance, only half of the sample notified an adult of symptoms, and all relied on families to access medical care. In addition, Pradel et al. (2001) found significant differences in that older children were better at recognizing early symptoms, had a better awareness of the need to take action, and better identified medication that was part of their regimen. An earlier study had found that for children over the age 11, parental information added very little to child reports of quality-of-life status and asthma control (Guyatt, Juniper, Griffith, Feeny, & Ferrie, 1997).

Research indicates that age and developmental stage also play a role in asthma management. A study of adolescents found that while older children were more knowledgeable about asthma than younger children, younger children with more severe asthma were significantly more knowledgeable about asthma compared to those with mild/moderate asthma (Barton et al., 2002). Despite evidence that children understand the need for medication in alleviating asthma exacerbations, they have exhibited poor understanding of the multiple types of medication and how the medication works. In the study done by Pradel et al. (2001), although there were significant differences between 7- and 12-year-olds, overall, children relied on adults to seek medical assistance and still sought clarification and knowledge from their family. In a study of Australian children, Barton et al. (2002) found that children's asthma knowledge was associated with the mother's levels of asthma knowledge, but that age and father's level of asthma knowledge significantly predicted adolescent asthma knowledge. Rhee et al. (2009)

found that early adolescents negatively viewed parent involvement while older adolescents who may have achieved independence more positively viewed family support. Even with increasing age, families evidently still play a role in the development of asthma management skills of children.

In a review of studies, Clark et al. (2010) found that children transitioning from childhood to adolescence, generally the age range of 10 to 13 years, may particularly have difficulty with asthma management. A significant maturation in cognitive abilities, social awareness, and better understanding of the abstract occurs. During this time when management of asthma is expected to transition more to the adolescent, individuation typically begins. Adolescents begin to socialize and seek support more from peers than from family. Additionally, Clark et al. (2010) suggested that the social environment exists primarily at school, and in middle school and high school, it is structured much more broadly, meaning that less individual attention is provided. Yang, Sylva, and Lunt (2010) similarly emphasized the developmental change of social support. In their study of early adolescents with asthma, changes in peer social support accounted for a strong association between older age and diminishing healthy lifestyle behavior related to asthma management.

Gaining autonomy and responsibility over oneself are some of the primary developmental tasks of children as they age. Asthma management must similarly be transitioned in stages over time from the family to a child in accordance with age, level of cognition, maturity, and responsibility skills of that child (Buford, 2004). Literature supports that parents and children have different perceptions of the amount of

responsibility parents and children each have in asthma management. Although age is positively correlated with the correspondence between mothers' and children's report of child responsibility, children overall tend to report higher levels of responsibility for asthma-related tasks (McQuaid, Penza-Clyve, et al., 2001; Wade et al., 1999). Parental over-involvement in asthma management, as an attempt to help provide a normal childhood experience for a child, can be just as counterproductive as under-involvement in that children may be prevented from engaging in management tasks that they are capable of accomplishing given their age and maturity level (Meah, Callery, Milnes, & Rogers, 2009). Clear management roles should be established at younger ages and continues to be negotiated as children enter the developmental transition into early adolescence.

Gender

The literature provides some evidence for gender differences in pediatric asthma. Katon et al. (2007) examined anxiety and depression in youth with asthma and used a logistic regression model analysis to investigate factors that increased the likelihood of meeting DSM-IV criteria for an anxiety or depression disorder, among which "being female" was found to be significantly associated. In a sample of 126 youths and young adults ages 13-20, males were significantly more likely to mismanage asthma due to issues with social influences and denial of negative consequences for mismanagement compared to females (Rhee et al., 2009). Thus, this study investigated the importance of psychosocial factors in pediatric asthma management.

Poverty Level and Environmental Context

Engel (1977) suggested that psychological and social factors are important in symptom manifestation and the process of seeking medical attention. Significant research suggests that socioeconomic level can be just as important in asthma morbidity. Kozyrskyj, Kendall, Jacoby, Sly, and Zubrick (2010) followed family income trajectories (over time rather than single time points) and found significant differences between asthma risk in children in low-income families and high-income families. Children in low-income families were twice as likely to have asthma. More interestingly, children who consistently lived at a low-income status had a 60% greater risk of asthma compared to children living in families whose income increased over time.

Low socioeconomic status, through limited access to medical insurance and primary health care, poor living conditions, greater exposure to allergens and environmental triggers, and lower levels of parental education, contributes to poor outcomes for Latino children with asthma (Canino et al., 2006; Cohen & Celedón, 2006; Flores et al., 1998; Hunninghake, Weiss, & Celedón, 2006). In a recent review of the literature, Forno and Celedón (2009) provided compelling arguments that socioeconomic status is only a rough indicator of a constellation of different environmental/behavioral exposures (e.g., cigarette smoke, air pollution, low access to services, stress and violence) more commonly associated with low levels of poverty, to which certain minority ethnic groups are overrepresented.

Within the proposed BPS framework, contextual factors should be taken into account when considering asthma outcomes. Emerging literature focused on better understanding of the multidimensionality of differences between ethnic and cultural groups in pediatric asthma aligns with the BPS framework. Koinis-Mitchell et al. (2010) provided a more targeted analysis of contextual and cultural dimensions of risk to investigate functional morbidity of pediatric asthma in different ethnic groups. Specifically, the authors utilized a cumulative risk index composed of the following: contextual/environmental dimension (i.e., poverty, neighborhood disadvantage), cultural dimension (i.e., perceived discrimination, acculturative stress), and asthma-specific dimension (i.e., asthma severity, environmental tobacco smoke). Koinis-Mitchell et al. (2012) further applied the cumulative risk index in a more recent study as a means to control for multiple urban risks in an investigation of protective factors. The study's sample was diverse (African-American, Latino, and non-Latino White) and included an examination of family and cultural variables as potential protective factors. Some interesting findings suggested that though Latino families in the sample had the highest levels of poverty, Latino children might be more resolute in that greater self-efficacy to manage asthma helped minimize the limitation of daily functioning.

Lower SES has been shown to be unrelated to emergency room utilization for treatment of severe asthma exacerbations yet significantly related to patterns of repeated emergency room visits and frequency of hospitalizations (Amre, Infante-Rivard, Gautrin, & Malo, 2002; Boudreaux et al., 2003). Nazario and fellow researchers (2004) used enrollment in a private or public school in the San Juan metro area in Puerto Rico

as a proxy variable for high and low family income level. They found that children with asthma attending public school had significantly more absences from school, more emergency room visits, and more hospitalizations than children with asthma attending private school. The study recognized the imprecise nature of using the type of school as an indicator for SES; however, the authors suggested that opportunities associated with higher income, such as better quality health care and better environmental living circumstances, may contribute to better morbidity outcomes.

Location of Residence

The BPS model considers an individual's place of residence as important as ethnicity, age, occupation, and asthma severity level because it identifies another particular system in which the individual exists. One study examining prevalence rates for the U.S. and territories supported earlier statistical prevalence studies indicating that the island of Puerto Rico had the highest prevalence rates of lifetime asthma (Pérez-Perdomo, Pérez-Cardona, Disdier-Flores, & Cintrón, 2003).

Several pediatric asthma studies have shown that significant differences in asthma statistics exist between the island of Puerto Rico and the mainland United States. In a comparison between Puerto Rican children living in the Bronx, New York, and island Puerto Rican children, study findings indicated that children living in Puerto Rico had a significantly higher risk of lifetime asthma (Cohen et al., 2007). Vasquez et al. (2009) found evidence that Latino children in Rhode Island reported somatic symptoms significantly more than Latinos in Puerto Rico. In comparing Puerto Rican and Dominican children living in the U.S. with those living in Puerto Rico, Koinis-Mitchell

et al. (2008) found that a majority of significant differences between sites related to island Latinos endorsing asthma management practices, such as beliefs in biologically based home remedies (e.g., teas, spoonful of honey, aloe vera with honey and lemon) and manipulative and body-based practices (e.g., rubbing chest and back, applying compress of hot coffee on the head).

Though Esteban et al. (2009) also found that island Puerto Rican children had milder levels of asthma severity, they reported that island Puerto Rican children utilized emergency department visits significantly more often. The authors discussed the potential contribution of health care practices regarding asthma guidelines and asthma medication accessibility on the island of Puerto Rico that could motivate higher health care utilization despite reporting significantly milder asthma severity. Though Puerto Rico has provided universal health care access since 1998, it has been estimated that preventive practices of primary care are underutilized; care is only sought when asthma symptoms manifest that are likely seen more frequently in emergency rooms (Cohen et al., 2007). There is a small body of asthma research that makes comparisons of asthma statistics between the U.S. and Puerto Rico. A recent study published in 2011 found varying fluctuations in island Puerto Rican annual asthma mortality rates between 1980 and 1998 followed by a steady decline through 2007; however, asthma mortality rates ranged from 1.77 to 4.0 times higher in Puerto Rico compared to the U.S. (Bartolomei-Diaz, Amill-Rosario, Claudio, & Hernández, 2011). Findings from the current study will contribute to this growing area of research by providing direct comparisons of

Puerto Ricans in the U.S. and on the island of Puerto Rico as well as comparisons between Latino and non-Latino ethnic groups.

Summary

Pediatric asthma is an area in which associations among family and child variables and morbidity should be examined given asthma's potential to affect children and multiple members of the family and the disproportionate impact on low-income and minority populations (Fiese, Winter, Anbar, Howell, & Poltrock, 2008). The family system presents a psychosocial context that directly influences a child's perspective and understanding of biological features of asthma. As outlined by the BPS model, it is important to examine psychological and situational variables and relationships that contribute to the illness experience, which may inform the future development of more culturally appropriate pediatric asthma interventions. Familism is a cultural value comprising strong beliefs and practices related to close emotional family relationships and accessing a network of family and friends as a source of support. Familism influences decisions related to health, discipline, and parenting. Research has established a strong relationship among family functioning, family participation in asthma, and asthma morbidity. Familism, as a cultural value directly relating to family relationships and practices, may function as a protective factor in pediatric asthma. The research literature offers many conceptual models of asthma that are biopsychosocial in nature; however, few have empirically tested specific cultural values and practices as primary variables. This current study fills this gap in the literature by examining asthma morbidity from a biopsychosocial approach with a primary emphasis on culture.

CHAPTER III

METHODS

Source of Data

This study utilized archival data produced by the Rhode Island-Puerto Rico Asthma Center (RIPRAC) and collected from 2002-2007. RIPRAC research was funded in part by NIH Research Grant U01 HL 72438 for which the primary investigators were Gregory K. Fritz, M.D., at Brown University School of Medicine, and Glorisa Canino, Ph.D., at University of Puerto Rico. RIPRAC is a joint asthma research venture between Brown Medical School/Hasbro Children's Hospital and the University of Puerto Rico that investigates asthma health disparities and is funded by the National Heart, Blood and Lung Institute of the National Institute for Health. Using a cross-sectional design, RIPRAC primarily investigates asthma disparities through four distinct arms of research (Canino et al., 2009): (a) potential disparities in diagnoses; (b) cultural variables that impact family asthma management; (c) disparities relating to health service systems and health care access and provisions; and (d) cultural influences on the asthma symptom perception process. Variables included in the present study were selected from across the four domains of the RIPRAC research. Permission was obtained from the appropriate research entities of RIPRAC for use of RIPRAC data for analyses in the current study. Approval was also obtained from the Texas A&M University Institutional Review Board prior to any data analysis. The next section details the methodology utilized by RIPRAC for recruitment and data collection followed by a description of the

current study's sample. Canino et al. (2009) provided extensive details on RIPRAC methodology, which includes descriptions of measures utilized in the current study, to exemplify challenges in health disparities research.

RIPRAC Recruitment and Data Collection Procedures

This study analyzes data collected from children with asthma aged 7 to 15 years and their parent or primary caregiver. The RIPRAC project included sampling from the following four groups closely proportionate to the asthma prevalence rate by ethnicity group of each recruitment site: Puerto Rican children on the island of Puerto Rico and Puerto Rican, Dominican, and non-Latino White children serviced in Providence, Rhode Island. Further breakdown of sample by ethnicity is provided elsewhere (see Variables and Measures—Child Specific Characteristics). Recruitment of study participants occurred at multiple settings within each of the major sites of Rhode Island and Puerto Rico. Table 1 provides the percentage of study participants recruited by setting at each recruitment site.

As part of the RIPRAC study, participants completed the study protocols in four sessions over a period of 4 months. Initial contact was established when families arrived at one of the recruitment sites for health services. If parents answered affirmatively when the clinic receptionist asked, “Does your child have asthma?” they were given a release form that allowed a fluently bilingual research assistant to make a follow-up meeting appointment at the clinic or the family's home. The research assistant then provided an explanation of the RIPRAC study, obtained informed consent/assent, and obtained a release for information form to access medical records. An appointment for

the first session was then scheduled. A total of three sessions were conducted to complete measures, and two contacts were made in between these sessions for continued monitoring of AM2 (electronic diary spirometers) and MDILogs (portable, electronic device that monitors and logs metered dose inhaler use) utilization. Interval contact was generally done by phone. Home visits were conducted when communication by phone was not possible.

Table 1

Percentage of Sample by Setting by Site

Site by Setting	Respondents (<i>N</i> = 639)
Rhode Island	56.5%
Community primary care clinics	29%
Hospital-based asthma education program	20%
Health fair/other community events	18%
Grassroot sources (e.g., flyers)	13%
Ambulatory pediatric clinic (Hasbro Children's Hospital)	12%
Schools (greater Providence, RI area)	8%
Puerto Rico	43.5%
Hospital ambulatory pediatric clinics and independent provider organizations	68.7%
Private practices	29.4%
Private referrals	1.9%

Information obtained from these sessions allowed for exploratory analysis of group difference. This study included multiple group analyses of a structural equation model. In the analysis testing specifically for the group differences by location of residence, only Puerto Ricans receiving care in the United States (mainland) were compared with those treated on the island of Puerto Rico. For group differences by ethnicity, the mainland sample was used to examine differences between non-Latino White children and Latino children. The Rhode Island Latino sample was composed of Puerto Ricans and Dominicans.

Study Sample

A total of 639 children participated in the RIPRAC study. A majority of the sample was male (57.1%). A majority of the sample participated from the Rhode Island recruitment site (56.5%). More Latino children (34.4%) than non-Latino children (22.1%) participated at the U.S. site. The ages of the sample ranged from 6.5 years to 16.5 years, with a mean of 10.7 years. At the first sessions, interviews were conducted predominantly with biological mothers (93.7%) rather than biological fathers (2.7%). The remaining caregiver respondents (4.6%) were comprised of stepparents, foster and adoptive mothers, foster and adoptive grandmothers, and aunts. Trained qualified members of the RIPRAC team assessed language proficiency during original data collection. This study similarly determined the language in which the respondents chose to complete the surveys and interviews, reflecting a language preference.

Variables and Measures

Data analyzed in the current study used data solely collected by the RIPRAC research project. The following section is a discussion of the variables utilized in this study and the instruments utilized by RIPRAC, also summarized in Table 2.

Language Considerations

All report measures used in this study that were not readily available in a Spanish form were translated into Spanish, re-translated, and back-translated to maximize appropriateness by the Puerto Rican RIPRAC investigators (Canino et al., 2009). Methods for translating material used with Spanish-speaking Puerto Rican and Dominican families have been previously employed in research addressing cross-cultural equivalence semantically, technically, and in content to yield comparable data across research sites. The RIPRAC investigators also reviewed items to increase appropriateness of use with low levels of literacy.

Latent Variables

Familism (FA). As a measure of familism, a latent variable was created using indicator variables of family cohesion (FC), social networking–contact (SC) and social networking–reliance (SR) as indicators. Olson (2000) defined family cohesion as “the emotional bonding that family members have towards one another” (p. 144), which is an integral aspect of familism. A seven-item scale, formerly named a scale of “Family Pride,” was utilized in the RIPRAC study and was derived from the Family Adaptability and Cohesion Evaluation Scales-II (FACES-II; Olson, Russell, & Sprenkle, 1983). This assessment scale is well established in the research literature as a child measure of

Table 2

Variables and Measures

Construct	Measure	Description
Morbidity	RIPRAC Asthma Assessment Form	Latent factor using the following indicators: In last 12 months: number of hospitalizations, emergency room visits, and outpatient visits.
Familism	Family cohesion: seven-item subscale of FACES-II; social networking contact; items from National Survey of Health and Stress and Social Networking Reliance (Mulvaney-Day et al., 2007)	Items tap domains of family and friend support and relationships. Social networking (SN) factor using SN-contact and SN-reliance as indicators. Latent factor using family cohesion and SN variable as indicators.
Balanced Integration	FAMSS—Balanced Integration Subscale	Items pertain to how coping and managing asthma is balanced with typical family responsibilities.
Management by Alternate Caregivers	FAMSS—management by alternate caregivers	Items relate to adequacy of asthma management by alternate caregivers (used in secondary analysis).
Asthma Severity	Determination by study clinician using NAEPP guidelines	From clinician assessment using multiple measurements: mild intermittent, mild persistent, moderate persistent, severe persistent.
Child-Specific Characteristics	Age, gender, ethnicity (Latino or non-Latino), location of residence (Rhode Island, U.S., or Puerto Rico), poverty level	From demographic interview, poverty level determined by income-to-need ratio.

family cohesion (Gil & Vega, 1996; Vega, Gil, Warheit, Zimmerman, & Apospori, 1993). Gil, Vega, and Dimas (1994) established the seven-item scale with the following alphas: T-1 = .87, T-2 = .90, T-3 = .91. The National Latino and Asian American Study (NLAAS), a 2002-2003 comprehensive survey on mental health issues, consisted of 2,554 Latino respondents and 2,095 Asian-American respondents (Alegría et al., 2004). The Latino sample of the NLAAS included Mexican, Cuban, and Puerto Rican respondents. The NLAAS utilized the seven-item scale, along with the 10-item parent completed scale, as a measure of cohesion, resulting in Cronbach's alphas of .91 for the English version interview and .92 for the Spanish version interview. Items on this scale include "family members respect one another" and "we share similar values and beliefs as a family." These items are rated on a 4-point Likert scale ranging from *strongly agree* (1) to *strongly disagree* (4). Total full-scale scores range from 7 to 28, with lower numbers representing stronger ratings of family cohesion.

Social network–contact and social network–reliance tap into the degree of support by friends and families (Kessler et al., 2003). Items from the National Survey of Health and Stress (NSHS; Kessler, 1990) and four items from a six-item support measure by Mulvaney-Day, Alegria, and Sribney (2007) were included as part of the RIPRAC family interview. The four items from the NSHS were measures of social network–contact, whereas the other four items were measures of social network–reliance. An example of a social networking item is the following: "How much can you rely on relatives who do not live with you for help if you have a serious problem?" Higher total social networking scores, ranging from 4 to 18, indicate higher levels of

support from a social network. Based on the responses of participants, RIPRAC computed a social network–contact score of 0 = *no frequent contact* or 1 = *frequent contact* and a social network–reliance score of 0 = *rely little* and 1 = *rely some or a lot*.

Mulvaney-Day et al. (2007), in a study analyzing NLAAS data with approximately 577 Cuban, 495 Puerto Rican, 868 Mexican, and 614 other Latino respondents, indicated alphas of .71 for the English version and .72 for the Spanish version for items related to family support and .75 for the English version and .78 for the Spanish version for items related to emotional support from friends.

Morbidity (MI). This study sought to provide information useful for improving asthma morbidity, specifically information that can be useful for designing culturally appropriate intervention and prevention strategies. Morbidity, defined by the NHLBI (2007) as quality-of-life impacting events (e.g., asthma-related emergency room visits, hospitalizations, and asthma doctor visits), is frequently utilized as an outcome measure in pediatric asthma research. Morbidity is a recognized measure reflecting asthma management over time, as poor asthma management results in higher use of health services. Morbidity is a latent variable composed of the following three components related to the child’s asthma in the 12 months prior to study participation as indicators: (a) number of hospitalizations, (b) number of emergency room visits, and (c) number of outpatient visits. For this study, these three components were taken from information provided on the RIPRAC Asthma Assessment Form (AAF) as reported by the child’s caregiver. The AAF is a RIPRAC-created objective measure that collects background information about a child’s health status specific to asthma for two time periods: the 12

months prior to completing the AAF and the 4 weeks immediately prior. The caregiver reports for the 12-month period are used to calculate morbidity to capture consequences of asthma management behaviors over a span of time.

Mediators

Balanced integration (BI). Balanced integration is the balance and integration of asthma, which includes management and daily coping, with family life and priorities (Klinnert & Bender, 2002). In a sense, a balance between demands of asthma management and demands of daily family life promotes healthier adjustment for the child and for other members of the family. The goal for effective asthma management is dealing with asthma without detracting from typical healthy family living while not allowing neglect of asthma management in the mix of other family events and priorities. Balanced integration is measured as a domain of the FAMSS (Klinnert et al., 1997; McQuaid et al., 2005).

The FAMSS is a semi-structured, multidimensional interview that measures the strengths and weaknesses of families' asthma management behavior (Klinnert & Bender, 2002). The interview is conducted with the caregiver, but school-aged children may also participate as an additional source of information. The FAMSS assesses asthma management behaviors across multiple domains to better capture the complex nature of managing pediatric asthma. The first version of the FAMSS (Klinnert et al., 1997) was comprised of 12 scales, but the current version used in this study is comprised of seven core scales and two optional scales (McQuaid et al., 2005). Table 3 summarizes the nine

Table 3

Family Asthma Management System Scale Subscales

Subscale	Number of Items	Description
Asthma Knowledge	3	Knowledge of basic anatomy of asthma; knowledge of function and use of medications.
Symptom Assessment	5	Awareness of basic signs of exacerbation; understanding and identification of early signs.
Response to Symptoms and Exacerbations	3	Appropriateness of actions taken to manage initial symptoms and acute exacerbations.
Environmental Control	5	Evidence and extent of exposure to environmental triggers, e.g., tobacco smoke, pets and pests.
Medication Adherence	7	Availability and appropriate use of quick-relief medications; adherence to long-term medications.
Collaboration with Health Care Provider	5	Relationship with identified care provider, including effective communication and agreement on treatment and action plan provided.
Balanced Integration of Asthma and Family Life	5	Balance of attention to asthma management and other developmental and family issues.
Child Response to Symptoms and Exacerbations	3 (optional)	Appropriateness of actions taken by the child to manage initial symptoms and exacerbations.
Management by Alternate Caregiver	9 (optional)	Confidence in the understanding by and communication with others who care for child.

Note. Adapted from “Pediatric Asthma Management in the Family Context: The Family Asthma Management System Scale,” by E. L. McQuaid, N. Walders, S. J. Kopel, G. K. Fritz, and M. D. Klinnert, 2009, *Journal of Pediatric Psychology*, 30, p. 493. Copyright 2005, displayed with permission from Oxford University Press.

scales of the FAMSS. The FAMSS interview can be completed in less than 1 hour. In this study, the FAMSS was administered by research assistants who underwent FAMSS training for administration and scoring. Upon completion of the interview or review of the audiotape, the trained research team members rated the interview according to a standard manual that provided rating guidelines for each management scale. Ratings for each scale ranged from 1 to 9 for which 1 = *ineffective or harmful management* and 9 = *highly adaptive management*. McQuaid et al. (2005) provides greater details about the FAMSS protocol established to ensure standard ratings, reliability monitoring, and minimization of rater drift.

The FAMSS, like other measures, was translated into Spanish, re-translated, and back-translated to maximize appropriateness of use with this study's sample. The FAMSS was reported to have good internal consistency in a reliability analysis (Cronbach's $\alpha = .84$; McQuaid et al., 2005). The FAMSS summary score was shown to be negatively associated with the baseline functional morbidity index ($r = -0.32, p < .001$).

The Balanced Integration Scale has been shown to be significantly associated with the other six subscales of the FAMSS, ranging from $r = .23, p < .01$ (Symptom Assessment) to $r = .55, p < .01$ (Medication Adherence; McQuaid et al., 2005). Analysis of convergent validity indicated that balanced integration was significantly and positively correlated with a measure of treatment adherence ($r = .41, p < .01$) and was significantly and negatively correlated with a measure of asthma morbidity ($r = -0.29, p < .01$; McQuaid et al., 2005).

Adequacy of management by alternate caregiver (MAC). Because asthma management is recognized as occurring within a system, people other than a child's primary caregiver are likely to participate in the child's management of asthma. Inconsistent ideas of what constitutes asthma management as well as collaboration with caregivers outside the home introduce room for mismanagement, which ultimately may contribute to poor outcomes (Klennert & Bender, 2002). The Management by Alternate Caregiver Scale, an optional scale of the FAMSS (see above for overall reliability and validity) was utilized for this study, which measured how well the family communicates with alternate caregivers, how much alternate caregivers take responsibility for supervision, and perceived care competency of alternate caregivers. As described above for mediating variable BI, MAC is rated along with other scales of the FAMSS immediately after the interview or review of the audiotape. Scoring of the MAC is also based on a 1 to 9 point rating by the trained interviewer according to a manual, which outlines guidelines for rating (McQuaid et al., 2005). There are no current studies available using the Management by Alternative Caregiver Scale independent of the FAMSS; therefore, reliability information is limited. Because only part of the participating sample endorsed using alternate caregivers in asthma management, this variable was included in a secondary analysis that used data from families who reported use of alternate caregivers.

Child-Specific Variables

Demographics. General demographic information was collected in the first session interview. The demographic interview collected information on age, gender,

ethnicity, family size, and family income. For purposes of this study, a multiple group structural equation modeling (SEM) analysis was conducted on the variable of ethnicity. With attrition in mind, the RIPRAC study estimated that approximately 1,100 participants were recruited, and approximately 900 completed all protocols. The Rhode Island recruitment site included approximately 300 Caucasian children and 200 Latino children, of which approximately half were Puerto Rican and half were Dominican. The Puerto Rican recruitment site obtained complete participation of approximately 400 children and their caregivers. Ethnicity was determined by the child's primary caregiver(s) on a demographics form included as part of the RIPRAC protocols.

Asthma severity. Asthma severity categories were consistent with severity classification as outlined by the National Asthma Education Prevention Program (NHLBI, 2007) guidelines. These classification levels consist of severe persistent, moderate persistent, mild persistent, or mild intermittent. To ensure consistent and accurate definitions of asthma diagnosis and severity, RIPRAC researchers manualized a process implemented at both data collection sites. Pediatric asthma specialists utilized the “gold standard” diagnosis of asthma and determined categorization in accordance with the NAEP criteria and Global Initiative for Asthma (GINA) guidelines. This was determined after RIPRAC clinicians reviewed participant medical history, conducted a physical examination, and performed a test of pulmonary function. Table 4 summarizes NAEP criteria guidelines for determining severity level. Criteria for determination of asthma severity include frequency of reported symptoms, pre-albuterol forced expiratory volume per second, and current dose of medication used to control asthma.

Table 4

NAEPP Classification Guidelines for Asthma Severity

Severity	Symptoms	Nighttime Symptoms	Lung Function
Severe Persistent	Frequent exacerbations, limited physical activity, continual symptoms	Frequent	FEV1/PEF \leq 60% PEF variability > 30%
Moderate Persistent	Daily symptoms, daily use of short-acting beta-agonist medication, post-activity exacerbations	> 1/week	FEV1/PEV 60% < x < 80% PEF variability > 30%
Mild Persistent	Symptoms > 2/week, but < 1/day, exacerbations may affect activities	> 2/month	FEV1/PEF \geq 80% PEF variability 20% < x < 30%
Mild Intermittent	Infrequent, brief exacerbations, asymptomatic between episodes	\leq 2/month	FEV1/PEF \geq 80% PEF variability < 20%

Note. FEV1: forced expiratory volume/second; PEF: peak expiratory flow.

Pediatric asthma specialists were trained to ensure acceptable interrater reliability at the initiation of the RIPRAC study as well as periodically throughout to guarantee diagnostic standardization. Case vignettes with various levels of severity were used to train five pediatric asthma specialists, and ratings were discussed until consistent agreement in ratings was reached. A multiple group analysis was conducted using the SEM model between the four severity groups.

Poverty threshold and location of residence (mainland or island). According to Canino et al. (2009), the RIPRAC project made an effort to recruit with variability of income levels in mind. Although a greater percentage of Dominican and Puerto Rican families in Rhode Island were of lower SES, RIPRAC researchers obtained a range of income levels for the non-Latino White sample to be able to compute differences while controlling for income level. The RIPRAC research team considered multiple indicators in determination of SES level, which included characteristics of neighborhood (measures derived from the U.S. Census), measures of annual family income, income-to-needs ratio, perception of poverty, financial strain, and parent level of education. At the Puerto Rico site, 25% of the sample recruited was from higher income levels. Families were identified as at or below the poverty line if a 1.0 or less was calculated using an income-to-needs ratio. This ratio divided annual household family income by the poverty threshold determined by size of family during the year the family participated in the RIPRAC study.

Data were collected and organized in four different groups from two different settings: Rhode Island (U.S. mainland) and Puerto Rico. Puerto Rican children living in Puerto Rico comprised the first group. The remaining three groups were created from data collection in Rhode Island: Puerto Rican children living in Rhode Island, Dominican children living in Rhode Island, and non-Latino White children living in Rhode Island. For the group comparison of the location of residence variable, the island Puerto Rican children and U.S. mainland Puerto Rican children were analyzed. For purposes of investigating measurement invariance of confirmatory factor analysis (CFA)

measurement models, groups were compared as U.S. mainland non-Latino, U.S. mainland Latino, and Puerto Rican Latino children.

Data Analysis

Statistical analyses were conducted in several stages. First, preliminary analyses were performed using Statistical Package for the Social Sciences (SPSS) software, which included descriptive analysis to obtain frequencies, means, and standardizations to summarize the demographic information of participants. To investigate group differences, analyses of variance (ANOVAs) were conducted for continuous variables (i.e., family cohesion, balanced integration, number of ER visits, number of hospitalizations, and number of doctor visits) and independent chi-square analyses were conducted for categorical variables (i.e., social contact and social reliance) based on the child-specific characteristics of age, gender, ethnicity, poverty level, and location of residence. Data were screened to ascertain whether requirements were met for SEM analysis. Next, a CFA was conducted to test a measurement model for familism as a latent variable. Following the CFA, the data were analyzed to examine the relationship between familism and asthma morbidity. Then, two multiple group analyses were conducted to test the invariance across groups by asthma severity level and by ethnicity. Next, an SEM analysis was conducted to examine how well the data fit for a model in which familism predicts asthma morbidity. Then, an analysis investigated whether balanced integration mediated the relationship between familism and asthma morbidity. Last, a secondary mediated structural analysis was run on data for families that endorsed participation of alternate caregivers in the child's asthma management to investigate

mediating effects on the relationship between familism and asthma morbidity.

Overview of Structural Equation Modeling

SEM was used as the statistical analysis method for the current study. The premise of this analysis approach is to determine how well sample data support a theoretical model postulated by a researcher (Schumacker & Lomax, 2004). SEM is *a priori*, which requires an assertion of relationships between variables based on theory or empirical literature prior to any analysis. SEM permits analysis of more complex theoretical models, takes measurement error explicitly into account when analyzing data, and allows for the use of multiple observed variables simultaneously (Schumacker & Lomax, 2004). For these reasons, SEM analysis best approximates the interaction of multiple relationships characteristic of the BPS framework. SEM is a favored method of analyzing non-experimental and experimental data from large sample sizes and permits simultaneous use of observed and latent variables (Kline, 2005). More importantly, Nelson, Aylward, and Steele (2008) concluded that despite the potential of SEM as a tool for advancing research in pediatric psychology, it is greatly underutilized (< 4% between 1997 and 2006). SEM has been used in asthma research to investigate interrelationships, particularly because SEM allows testing of a hypothetical model with anticipated relationships in cross-sectional studies (Shalowitz, 2008).

Mplus software was utilized to execute the SEM analyses. *Mplus* was selected not only because it is as capable as other SEM programs available (e.g., LISREL, Amos, EQS) but also because *Mplus* contains unique analytic features that permit use of continuous and categorical latent variables (Muthén & Muthén, 2010). *Mplus* also has

the ability to deal with missing data through preferred methods (i.e., full information maximum likelihood estimation).

The first step of SEM is to specify a model. Guided either by a theory or research, a researcher postulates a plausible theoretical model in a structural equation model. This expression of a hypothesis of relationships can be done in a visual drawing of variables using a widely accepted set of SEM symbols or in a set of equations that represent the variable relationships (Kline, 2005). The researcher specifies relationships of observed variables to a hypothesized underlying factor in CFA and specifies relationships among factors in SEM.

After specification, the researcher next determines whether the model can be identified. Prior to running analyses, a researcher must evaluate whether it is theoretically possible for a unique estimate of parameters to be attained (Kline, 2005). This is accomplished when the parameters of the observed data variance-covariance matrix are created. If parameters are subject to arbitrariness, the model will not be identifiable (Byrne, 2011). Schumacker and Lomax (2004) provided a simplified example to illustrate identification. Suppose the proposed theoretical model is $X + Y = \text{unknown value}$ and the data supports that $X + Y = 10$; this indicates an infinite number of solutions and therefore the model is not considered identified. Imposing constraints on parameters to narrow the solutions is desirable. During the specification stage, the researcher specifies whether parameters are free (unknown and therefore can be estimated), fixed (given a specific value), or constrained (can be unknown but set equal to other similarly specified parameters). The goal of SEM is to specify an over-

identified model or to show that there exists enough information in the sample variance-covariance matrix (S) to allow for more than one way of estimating a parameter. If a model is just-identified, there is a one-to-one correspondence of sample data to parameters and a unique solution for parameters can be attained; however, Byrne (2011) asserted that “the just-identified model is not scientifically interesting because it has no degrees of freedom and therefore can never be rejected” (p. 32). Lastly, if a model is under-identified, insufficient information is available because the number of parameters to be estimated exceeds the number of variances and covariances of the data, leading to an infinite number of solutions (Byrne, 2011; Schumacker & Lomax, 2004).

Once a model is identified, SEM software is utilized for estimation. Estimation techniques appropriate to the data are used to estimate parameters such that the difference between the sample variance-covariance S and model implied variance-covariance matrix Σ is minimal (Schumacker & Lomax, 2004). To analyze the categorical variables of the current study’s model, the variance adjusted weighted least squares (WLSMV) estimator was utilized. Other available estimator techniques include but are not limited to maximum likelihood (ML), weighted least square (WLS), unweighted least squares parameter (ULS), and generalized least square (GLS; Muthén & Muthén, 2010).

As part of estimation, model fit must be examined. If the model does not fit the data, it is necessary to re-specify and revise the model. However, if the model fits the data well, parameter estimates can be interpreted. In considering goodness-of-fit, Kline (2005) suggested that researchers be mindful of limitations in the meaning of fit indexes.

Specifically, fit indexes only evaluate an overall fit of the model that allows the possibility of parts of the model to fit poorly, fit should be based on multiple indexes as there is no single gold standard index, good fit does not equate to interpretation that the results are theoretically meaningful or that predictive power is high, and the sampling distribution of many fit indexes are unknown or currently being researched and therefore general cut-offs for the various fit indexes should be taken as interpretive guidelines.

The likelihood ratio chi-square (χ^2), also known as the model chi-square or generalized likelihood ratio, is one of the most common fit statistics reported in SEM research. This statistic represents the discrepancy between the sample variance-covariance matrix S and the variance-covariance matrix Σ . The null hypothesis is that the model is correct and is a perfect fit in the population. As such, the researcher strives for a chi-square that is not significant so that the null hypothesis cannot be rejected. Problematic aspects of this test statistic have led to the recommendation that the evaluation of model fit should not rely solely on this single statistic. These problematic aspects include the following: (a) as a ratio test statistic, it is very sensitive to sample size; (b) for samples that are small and/or non-normally distributed, the significance statistic is distorted because the underlying distribution is not χ^2 distributed; and (c) the χ^2 is evaluating an excessively stringent hypothesis asserting that the sample variance-covariance S is equal to the model implied variance-covariance Σ (Byrne, 2011). Since not solely relying on the chi-square is recommended, other fit indexes are used as descriptive adjuncts. The alternative descriptive indexes reported in the current study were the root mean square error of approximation (RMSEA), comparative fit index

(CFI), and weighted root mean residual (WRMR). Recommended cut-offs used in the current study for each statistic were $RMSEA = \leq 0.06$, $CFI = \geq 0.95$, and $WRMR = \leq .90$, respectively (Yu & Muthén, 2002).

Analysis of Research Questions

The current study examined the following research questions and corresponding hypotheses. For investigations utilizing SEM analyses, models are presented.

- Research Question 1: How do mediator variables of balanced integration and management by alternate caregivers and observed variables of familism and morbidity relate to demographic child-specific variables (poverty level, age, asthma severity level, sex, and ethnicity)?
 - Hypothesis 1: Mediator variables (balanced integration and management by alternate caregivers) and observed familism variables (family cohesion, social networking–contact, social networking–reliance) will be significantly related among each other and observed morbidity variables (number of doctor visits, hospitalizations, and emergency room visits) will be significantly related among each other.
 - Hypothesis 2: Age and asthma severity level will have a negative relationship with mediators and observed familism variables and a positive relationship with observed morbidity variables.
 - Hypothesis 3: Child variables of sex, poverty level, ethnicity, and location of residence will have a moderate ($r = .3-.5$) association with mediators and observed familism and observed morbidity variables.

- Research Question 2: What significant differences exist for mediator variables of balanced integration, management by alternate caregivers and observed variables of familism and morbidity when comparing by location of residence (mainland versus island) and by ethnicity (Latino versus non-Latino White)?
 - Hypothesis 4: Latino families will report significantly greater levels of observed familism variables, observed morbidity variables, and management by alternative caregivers but lower levels of balanced integration compared to non-Latino White families.
 - Hypothesis 5: Island Puerto Rican families will report significantly greater levels of observed familism variables, observed morbidity variables, and management by alternative caregivers but lower levels of balanced integration compared to mainland (Rhode Island) families.
- Research Question 3: To what extent do the data fit the latent variables of familism and pediatric asthma morbidity?
 - Hypothesis 6: The measurement model shown in Figure 6 that uses family cohesion, social reliance, and social contact as indicators of familism and number of hospitalizations, ER and outpatient visits for morbidity will meet guidelines for goodness-of-fit in CFA analyses.
- Research Question 4: To what extent does this measurement model operate equivalently across groups by the child-specific variables of asthma severity and ethnicity?

- Hypothesis 7: The latent constructs of familism and morbidity will operate equivalently by different asthma severity levels and by different ethnicity groups as investigated through multiple group analyses.

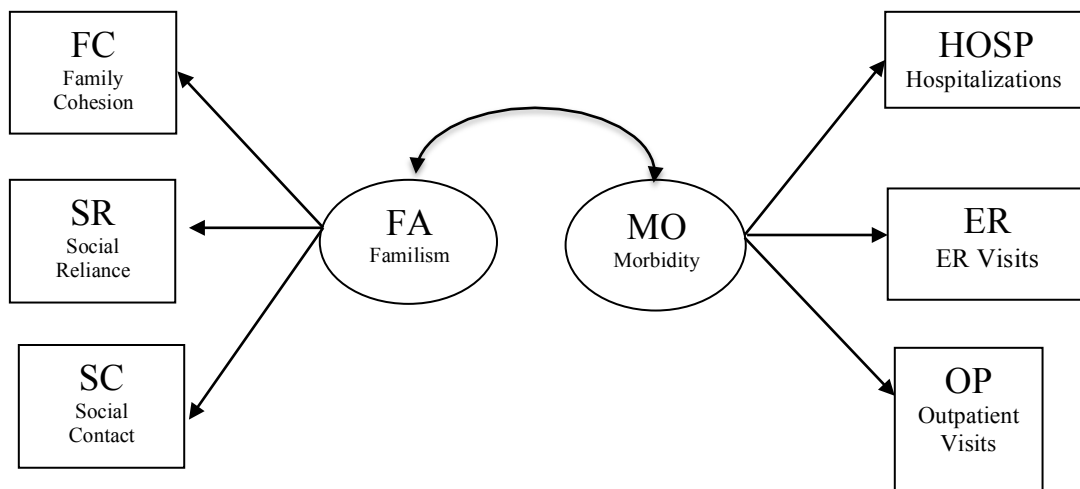


Figure 6. Hypothesis 6 measurement model.

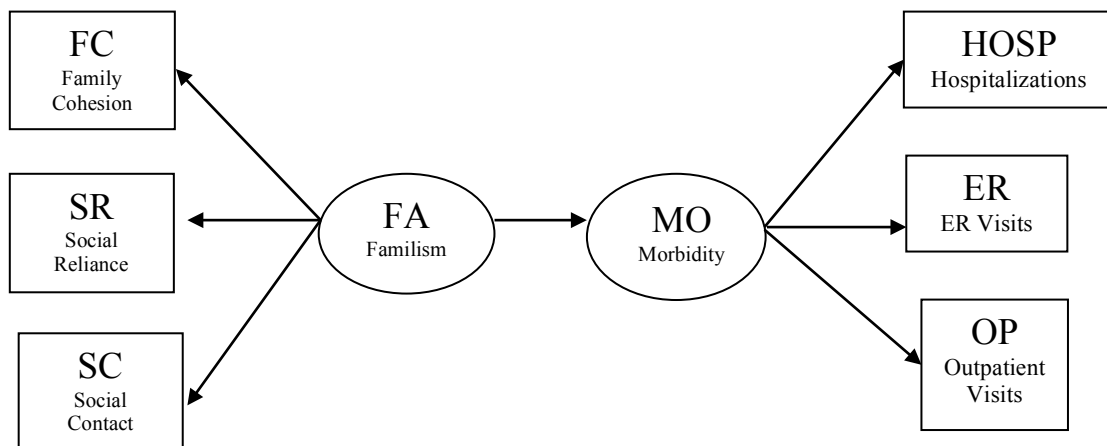


Figure 7. Hypothesis 8 structural regression model.

- Research Question 5: To what extent does familism predict morbidity?
 - Hypothesis 8: Familism will negatively predict morbidity such that as familism increases, morbidity will be reduced, depicted in Figure 7.
- Research Question 6: To what extent does balanced integration mediate the relationship between familism and asthma morbidity?
 - Hypothesis 9: Balanced integration will mediate the relationship between familism and morbidity, as shown in Figure 8.

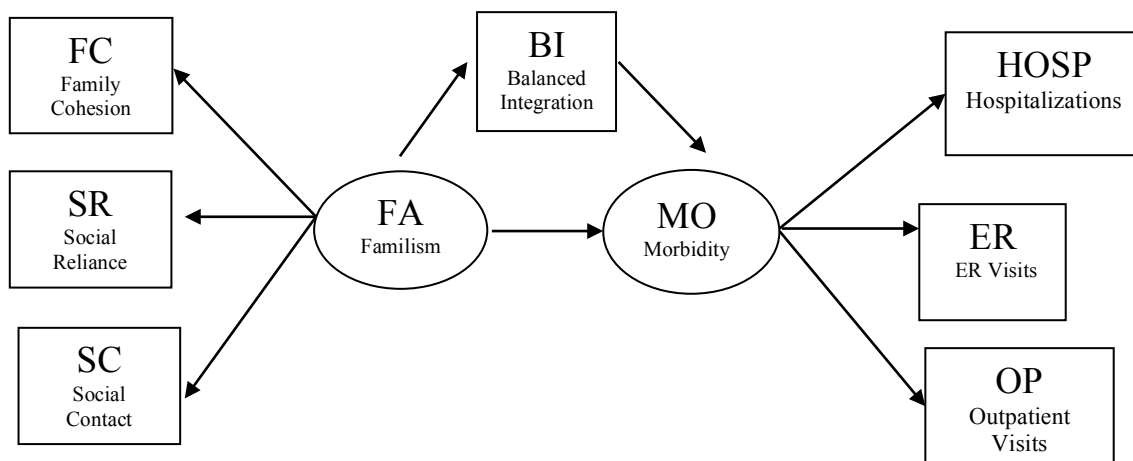


Figure 8. Hypothesis 9 primary mediational model.

- Research Question 7: For families reporting participation of alternate caregivers in asthma management, how well do family variables of management by alternate caregivers mediate the relationship between familism and pediatric asthma morbidity?

- Hypothesis 10: Management by alternate caregivers will mediate the relationship between familism and morbidity, as shown in Figure 9.

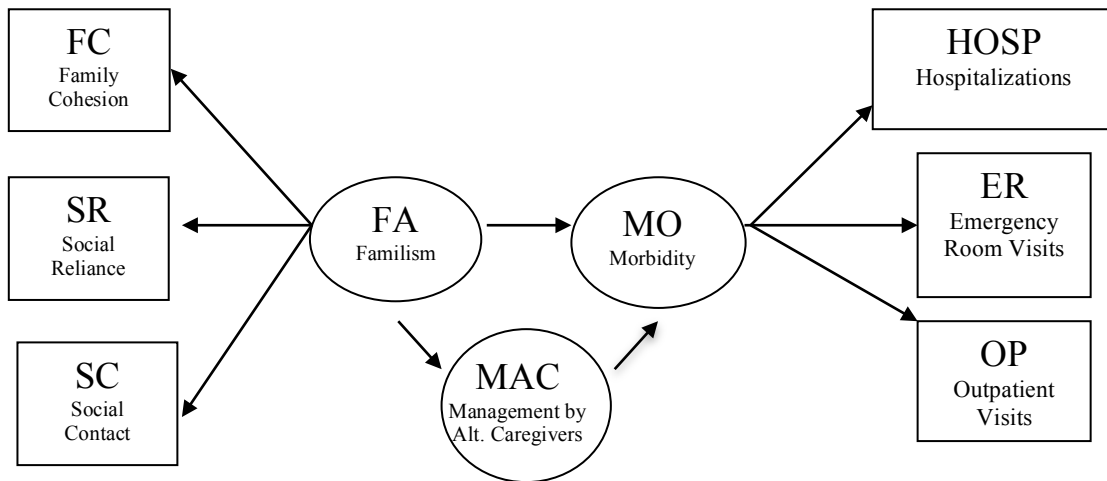


Figure 9. Hypothesis 10 secondary mediational model.

CHAPTER IV

RESULTS

Descriptive Statistics

Table 5 presents an overview of the sample's demographic characteristics. A total of 639 children participated in the RIPRAC study. As shown in Table 5, a slight majority of the sample was male (57.1%). A majority of the sample participated from the Rhode Island recruitment site (56.5%). More Latino children (60.9%) than non-Latino children (39.1%) participated at the U.S. site. The ages of the sample ranged from 6.5 years to 16.5 years, with a mean of 10.7 years.

During the first session, interviews were conducted predominantly by biological mothers (93.7%) rather than biological fathers (2.7%). The remaining caregiver respondents (4.6%) were comprised of stepparents, foster and adoptive mothers, foster and adoptive grandmothers, and aunts. Qualified members of the RIPRAC team assessed language proficiency during original data collection. This current study also determined in which language respondents chose to complete the surveys and interviews, reflecting a language preference.

Table 6 presents a correlation matrix among variables with one-tailed significance statistics reported. The correlation matrix revealed significant correlations among familism indicator variables, ranging from $r = .19, p < .01$ to $r = .32, p < .01$. Significant correlations were found among morbidity indicator variables, ranging from r

= .28, $p < .01$ to $r = .48$, $p < .01$. Among relationships between familism indicators and morbidity variables, the number of times the child had seen a doctor had a positive relationship with family cohesion ($r = .09$, $p < .05$) and social network–reliance ($r = .08$, $p < .05$).

Table 5

Demographic Characteristics of Participants

Item	Respondents ($N = 639$)
Gender (Male %)	365 (57.1%)
Ethnicity by Site	
Puerto Rico—Latino	278 (43.5%)
Rhode Island—Non-Latino White (NLW)	141 (22.1%)
Rhode Island—Latino	220 (34.4%)
Puerto Rican	99 (15.5%)
Dominican	121 (18.9%)
Age	Mean = 10.7 (SD = 2.5)
Poverty Threshold	
At or Below Poverty Threshold	321 (50.2%)
Language Opted to Complete Interview (Spanish)	
Caregiver	434 (67.9%)
Child	307 (48%)
Responding Caregiver in First Session	
Biological Mother	559 (93.7%)
Biological Father	17 (2.7%)
Other	22 (4.6%)

Table 6

Correlation Matrix of Study Variables

Variables	1	2	3	4	5	6	7
1. Location of Residence	1						
2. Ethnicity	.84**	1					
3. Poverty Level	-.21**	-.02	1				
4. Child Age	-.45	-.03	.13**	1			
5. Asthma Severity Level	.25**	.27**	.003	-.02	1		
6. Sex	-.004	.03	.07*	.06	-.04	1	
7. Family Cohesion	-.20**	-.14**	-.08**	.02	-.08*	-.01	1
8. Social Network–Contact	-.02**	-.02	-.08*	.03	.02	.01	.19**
9. Social Network–Reliance	-.04**	-.11**	-.26**	-.02	-.02	-.08	.20**
10. Balanced Integration	.42**	.33**	-.23**	-.02	.09*	.003	.03*
11. Management Alt. Caregiver	-.26**	-.09	-.11	.02	.07	-.09*	.03
12. # Times in Hospital	-.22**	-.18**	.07*	.05	.18**	.003	.02
13. # Times in ER	-.31**	-.22**	.20**	.004	.13**	-.002	.04
14. # Times Outpatient	-.14**	-.10**	-.05	-.13**	.25**	-.002	.09*

Variables	8	9	10	11	12	13	14
8. Social Network–Contact	1						
9. Social Network–Reliance	.32**	1					
10. Balanced Integration	.03	.09*	1				
11. Management Alt. Caregiver	.06	.09	.483**	1			
12. # Times in Hospital	.03	-.005	-.01	.07	1		
13. # Times in ER	.02	-.01	-.09*	.08	.46**	1	
14. # Times Outpatient	.02	.08*	-.05	.19**	.28**	.38**	1

Note. Management by Alt. Caregiver only calculated for those that endorsed use of alternate caregivers.

*Correlation is significant at the 0.05 level (one-tailed).

**Correlation is significant at the 0.01 level (one-tailed).

Age had a significant negative relationship with the number of times the child had seen a doctor in the previous 12 months due to asthma ($r = -.13, p < .01$). Asthma severity level was negatively correlated with family cohesion ($r = -.08, p < .05$) and positively correlated with the number of times the child had seen a doctor ($r = .18, p < .01$), been hospitalized ($r = .13, p < .01$), and visited the emergency room ($r = .25, p < .01$). Sex had significant weak correlations with poverty level ($r = .07, p < .05$) and management by alternate caregivers ($r = -.09, p < .05$). Poverty level had weak correlations with age ($r = .13, p < .01$), sex ($r = .07, p < .05$), number of times in the hospital ($r = .07, p < .05$), and number of times in the emergency room ($r = .20, p < .01$). Poverty level was weakly correlated with family cohesion ($r = -.08, p < .01$), social network–contact ($r = -.08, p < .05$), social network–reliance ($r = -.26, p < .01$), and balanced integration ($r = -.23, p < .01$). Ethnicity had significant weak correlations with asthma severity level ($r = .27, p < .01$), family cohesion ($r = -.14, p < .01$), social network–reliance ($r = -.11, p < .01$), number of times in the hospital ($r = -.18, p < .01$), number of times in the emergency room ($r = -.22, p < .01$), and number of times to see a doctor ($r = -.10, p < .01$). Ethnicity had a moderate relationship with balanced integration ($r = .33, p < .01$). Location of residence had significant weak correlations with poverty level ($r = -.21, p < .01$), asthma severity level ($r = .25, p < .01$), family cohesion ($r = -.20, p < .01$), social network–contact ($r = -.02, p < .01$), social network–reliance ($r = -.04, p < .01$), management by alternate caregivers ($r = -.26, p < .01$), number of times in the hospital ($r = -.22, p < .01$), and number of times to see a doctor ($r = -.14, p < .01$). Significant moderate correlations were found between location of

residence and balanced integration ($r = .44, p < .01$) and number of times in the emergency room ($r = -.31, p < .01$).

Group Comparisons

Hypotheses about group differences in familism and morbidity indicator variables were asserted between Latino and non-Latino families and between mainland and island Puerto Rican families. Only a subsample of families living in Rhode Island was used for the group difference analysis between Latino and non-Latino families. Results are presented in Tables 7 (ANOVA/t-test) and 8 (independent chi-square). The ANOVA and t-tests were conducted for continuous variables (i.e., balanced integration; family cohesion; and number of times in emergency room, hospital, or doctor office in previous 12 months), and independent chi-square tests were conducted for categorical variables (i.e., management by alternate caregivers, SN-contact, and SN-reliance). Results showed that island Puerto Rican families ($M = 26.09, SE = .210$) reported significantly higher levels of family cohesion compared to mainland Puerto Rican families ($M = 23.44, SE = .513; t = 4.76, p < .001$). Island Puerto Rican families ($M = 3.53, SE = .110$) endorsed significantly lower balanced integration compared to mainland Puerto Rican families ($M = 4.39, SE = .159; t = -4.15, p < .001$). Only number of visits to the emergency room significantly differed, with island Puerto Rican families ($M = 1.97, SE = .154$) endorsing more visits than mainland Puerto Rican families ($M = 1.03, SE = .151; t = 4.339, p < .001$). The association of location of residence and participation of alternate caregivers in management of asthma was significant ($\chi^2(1, 376) = 26.04, p < .001$). Based on odds ratio, the odds of a Puerto Rican family

endorsing participation of alternate caregivers in asthma management was 4.68 higher if living in Rhode Island. The association of location of residence to contact with social network was significant ($\chi^2(1, 376) = 26.04, p < .001$). The odds of a Puerto Rican family having frequent contact with its social network were 1.88 times higher if they lived in Rhode Island. The association of location of residence to reliance on social network was significant ($\chi^2(1, 376) = 14.01, p < .001$). The odds of a family relying more on its social networks were 2.42 higher if living in Rhode Island.

In comparing Latino families with non-Latino families living in Rhode Island, significant differences were found for all variables with the exception of contact with social network and endorsement of asthma management by alternate caregivers. Non-Latino families reported significantly higher family cohesion ($M = 25.43, SE = .272$) and balanced integration ($M = 5.51, SE = .152$) compared to Latino families ($M = 24.52, SE = .302$ and $M = 4.92, SE = .108$, respectively; $t = 1.99, p = .024$ and $t = 3.19, p = .001$, respectively). Latino families ($M = .23, SE = .071$) reported significantly more visits to the hospital than non-Latino families ($M = .09, SE = .029; t = -1.81, p = .035$). Latino families ($M = .94, SE = .109$) reported significantly more visits to the emergency room than non-Latino families ($M = .58, SE = .128; t = -2.15, p = .016$). Latino families ($M = 2.95, SE = .174$) reported significantly more visits to a doctor's office than non-Latino families ($M = 2.49, SE = .198; t = -1.73, p = .043$). The association of ethnicity to reliance on social network was significant ($\chi^2(1, 358) = 24.47, p < .001$). The odds of a family relying more on its social network were 3.16 higher if the family was Latino.

Table 7

ANOVA and T-Test Results

Variable	Family Cohesion		Balanced Integration		Hospitalizations		ER Visits		Outpatient Visits	
	t-statistic	p-value	F/t statistic	p-value	F/t statistic	p-value	F/t statistic	p-value	F/t statistic	p-value
Ethnicity	t = 1.988	.024	t = 3.188	.001	t = -1.812	.035	t = -2.152	.016	t = -1.728	.0425
Location of Residence	t = 4.764	< .001	t = -4.146	< .001	t = 1.336	ns	t = 4.339	< .001	t = 1.086	ns

Note. ns = not significant; p-value is one-tailed significance.

Table 8

Independent Chi-Square Results

Variable	Social Network–Contact		Social Network–Reliance		Management by Alternate Caregivers	
	Pearson Chi-Square	p-value	Pearson Chi-Square	p-value	Pearson Chi-Square	p-value
Ethnicity	$\chi^2(1, 358) = 2.88$	ns	$\chi^2(1, 358) = 24.47$	<.001	$\chi^2(1, 358) = .305$	ns
Location of Residence	$\chi^2(1, 376) = 5.93$.015	$\chi^2(1, 376) = 14.01$	<.001	$\chi^2(1, 376) = 26.04$	<.001

Note. ns = not significant.

Data Preparation and Screening: SEM Assumptions

Data screening is a crucial step prior to SEM analysis to assess that certain assumptions of distributional characteristics necessary for estimation methods of SEM analysis, such as multivariate normality, are met and to ensure data are prepared properly for analysis using SEM computer programs (Kline, 2005). Screening allows the investigator the opportunity to manage the analyses process *a priori* given that SEM is a confirmatory analytic process. In this study, data analyses for this stage were conducted utilizing SPSS 19.

Missing Data

In preparing for structural equation modeling, the data were examined for missing data. There were one to three data points missing depending on the variable. Using SPSS 19, an expectation-maximization (EM) analysis was conducted to evaluate the variables of interest. This analysis indicated that no variables were missing data that exceeded 5%. Because less than 5% of data for each variable was missing, separate variance t-tests (quantitative variables) and cross-tabulations (categorical variables)—two analyses that help identify patterns of missing values that may be influenced by other variables—were not produced. Additionally, Little's missing completely at random (MCAR) test was statistically non-significant, $p = .532$, which indicated that MCAR could be inferred. A listwise deletion approach was implemented, and only cases with complete data present were included in analyses. This approach excluded three cases, which was less than 1% of the entire sample.

Outliers and Multivariate Normality

Data were inspected for outliers. Data variables were converted from raw scores into z-scores. Creating new standardized values allowed for examination of data on a distribution in which the mean was 0 and the standard deviation was 1. Z-scores were created within each variable by taking each individual raw score, subtracting the mean of all scores, and dividing by the standard deviation of all scores. Values in excess of 3.29 ($p < .001$, two-tailed test) were examined as potential outliers (Tabachnick & Fidell, 2007). Family cohesion and variables related to seeking services in the last 12 months (morbidity variables) demonstrated univariate outliers. Transforming data reduced the impact of outliers by reducing their distance from the center of a distribution and improved normality distribution.

Transformation of non-normally distributed count variables was attempted using a natural logarithm transformation; however, it was not possible to achieve acceptable normality. Therefore, these variables were recoded into quartiles (morbidity variables) and quintiles (family cohesion), thus rendering acceptable distribution. Analyses for skewness and kurtosis were conducted following the guideline that values exceeding absolute values of 3.0 were considered abnormal. No violations of extreme skewness and kurtosis were detected.

Confirmatory Factor Analysis

The first step in conducting the structural equation modeling was specifying a measurement. In specifying a measurement model, sets of indicators were postulated to load onto latent factors, familism and morbidity, as graphically depicted in Figure 10.

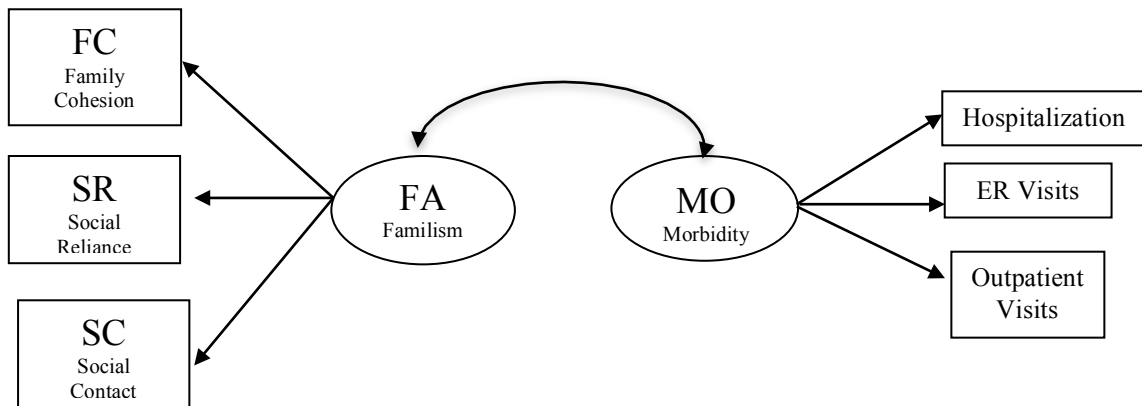


Figure 10. Measurement model of familism and morbidity.

This process of confirmatory factor analysis was conducted in *Mplus*. All indicators in the model were categorical, and therefore WLSMV, a robust weighted least squares parameters estimator, was utilized (Muthén & Muthén, 2010). Following specification, the steps of model identification, model estimation, and, as necessary, model modification occurred.

Mplus output indicated that the model converged and processed terminated normally using the WLSMV estimator. Goodness-of-fit indexes were examined and are reported in Table 9. The results indicated that the chi-square was not significant ($\chi^2 = 11.46$, $df = 8$, $p = .17$, *ns*). This suggests that the null hypothesis, which stated that the model proposed was correct, could not be rejected. However, given the problematic aspects of the chi-square (as discussed in Chapter 3) and the general practice of supplementing this statistic with descriptive fit indexes, other statistics were reported (i.e., RMSEA, CFI, and WRMR). All fit indexes similarly reflected that the data adequately fit the measurement model. Modification indices were requested, but no

Table 9

Goodness-of-Fit Indexes for Measurement Model (Familism and Morbidity)

Goodness-of-Fit Index	Value
χ^2	11.46, $p = .17$ (ns)
Degrees of freedom	8
CFI	.993
RMSEA	.026
RMSEA Confidence Interval	.000-.057
WRMR	.598

indices were produced, suggesting that no modification indices were above the minimum value of 10, which is *Mplus*'s default value. Standardized residuals were produced for continuous variables under maximum likelihood estimators (Muthén & Muthén, 2010); however, as all indicators included for the measurement model were categorical and thus WLSMV was the estimator, no standardized residuals were produced and therefore were not reported.

With an acceptable model specified, estimated, and identified, parameter results were evaluated for further evaluation of fit. Specifically, examination of the viability of estimated values for correct signs and values within admissible ranges, standard errors that were not at the extremes of too large or too small, and statistical significance as measured by the estimate divided by the standard error was conducted (Byrne, 2011). The unstandardized and standardized parameter estimates are reported in Table 10. In examining the standardized estimates, parameter estimates were positive and did not exceed the value of 1. All parameter estimates were statistically significant, which

Table 10

Measurement Model Unstandardized and Standardized Parameter Estimates

Latent/Indicator	Unstandardized			Standardized		
	Estimate	SE	Z	Estimate	SE	Z
Familism						
Family Cohesion	1.000	0.000	--	0.709*	0.087	8.113
SN–Contacts	1.006*	0.226	4.452	0.713*	0.089	8.052
SN–Reliance	0.557*	0.112	4.953	0.395*	0.061	6.475
Morbidity						
Hospitalizations	1.000	0.000	--	0.858*	0.063	13.551
ER	1.013*	0.116	8.737	0.869*	0.049	17.784
Outpatient	0.644*	0.064	10.044	0.552*	0.043	12.971

* $p < .05$.

allowed for the rejection of the null hypothesis that the parameter estimate was zero in the population from which the sample was drawn. Standard errors were neither excessively small nor excessively large.

Measurement Invariance

The measurement model was tested to see if the model was invariant across ethnicity groups and asthma severity levels. The first step to assessing invariance involved establishing a well-fit model within each group (i.e., ethnicity groups were Puerto Rican, Rhode Island non-Latino White, and Rhode Island Latino; asthma groups were mild intermittent, mild persistent, moderate persistent, and severe persistent). Goodness-of-fit statistics are presented in Table 11 for ethnicity groups and Table 12 for

asthma severity groups. All fit indexes indicated a good fit for the measurement model within each individual group for both ethnicity and asthma severity, which suggests that the measurement model functioned as an acceptable baseline model.

To conduct multiple group analyses on a measurement model in *Mplus*, a series of models with increasing restrictions were compared using chi-square testing. Because the WLSMV estimator was utilized in the current study due to the use of categorical indicator variables, model comparisons had to be done using the DIFFTEST command (Muthén & Muthén, 2010). Unlike chi-square testing estimated by other estimators, changes in chi-square values and fit indexes were not evaluated. Rather, the significance value of the chi-square was evaluated. A non-significant chi-square was desirable so that the null hypothesis that the more constrained model did not worsen the model could not be rejected; hence, the model was invariant.

The next step in establishing configural invariance involved testing the model in all groups at once rather than as in the previous step, which evaluated the model with each individual group separately. This simultaneous analysis was the least restrictive because it tested that the model, with no equality constraints, functioned across groups. This enabled the assessment of whether the same items were associating with the same factors in the same way across groups. For both ethnicity and asthma severity level, the model converged and analyses terminated normally using the WLSMV estimator. For ethnicity, the chi-square was not significant, suggesting a good-fit ($\chi^2 = 36.01$, $df = 24$, $p = .06$, *ns*). Descriptive fit indexes also supported a good fit (CFI = .972, RMSEA = .049, RMSEA CI = .000-.080, WRMR = 1.096). For asthma severity level, the chi-square was

Table 11

Goodness-of-Fit Indexes for Ethnicity Groups

	χ^2	df	CFI	RMSEA	RMSEA CI*	WRMR
Puerto Rico n = 278	14.93 <i>p</i> = .06 (ns)	8	.968	.056	.000-.099	.695
Non-Latino White n = 139	11.14 <i>p</i> = .19 (ns)	8	.965	.053	.000-.120	.639
RI Latino n = 219	9.96 <i>p</i> = .27 (ns)	8	.985	.033	.000-.090	.555

*CI is the .90 confidence interval.

not significant, suggesting a good-fit ($\chi^2 = 37.49$, $df = 32$, $p = .23$, *ns*). Descriptive fit indexes also supported a good fit (CFI = .989, RMSEA = .033, RMSEA CI = .000-.070, WRMR = 1.052).

With configural invariance established, the next step was to assess for metric invariance. Establishing metric invariance was used to indicate whether the strength of the relationship between indicators and latent factors was operating similarly across groups. To accomplish this, factor loadings were constrained to be equal between groups in order to create a more restrictive model. Chi-square testing was accomplished by use of the DIFFTEST command in *Mplus*, comparing this more restrictive model with the previous configural model. For ethnicity, the chi-square test for difference testing statistic was not significant, indicating that the more restrictive model did not worsen the fit ($\chi^2 = 11.05$, $df = 8$, $p = .19$, *ns*). Likewise, for asthma severity level, the chi-square test for difference testing statistic was not significant, indicating that the more restrictive model did not worsen the fit ($\chi^2 = 12.56$, $df = 12$, $p = .40$, *ns*). These results

indicate that metric invariance holds across asthma severity levels and across ethnicity groups, suggesting that the constructs are similarly perceived and are on equal metrics.

Table 12

Goodness-of-Fit Indexes for Asthma Severity Groups

	χ^2	df	CFI	RMSEA	RMSEA CI*	WRMR
Mild Intermittent n = 141	11.61 <i>p</i> = .17 (ns)	8	.913	.057	.000-.122	.606
Mild Persistent n = 167	9.31 <i>p</i> = .32 (ns)	8	.986	.031	.000-.099	.529
Moderate Persistent n = 196	7.63 <i>p</i> = .47 (ns)	8	1.00	.000	.000-.081	.446
Severe Persistent n = 132	8.18 <i>p</i> = .41 (ns)	8	.998	.013	.000-.103	.462

*CI is the .90 confidence interval.

Structural Regression and Mediational Analyses

Structural Model

A structural regression model was constructed based on the acceptable measurement model evaluated earlier. Structural regression is the process in which relationships among latent constructs and observed variables are tested. For this study, three relationships were examined through three regressions, as specified in Figure 11. Specifically, analyses investigated how well the data fit a model in which familism predicted balanced integration, balanced integration predicted morbidity, and familism predicted morbidity.

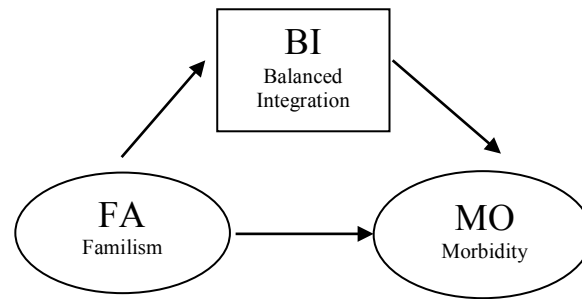


Figure 11. Primary structural regression model.

Table 13

Goodness-of-Fit Indexes for Primary Structural Regression Model

Goodness-of-Fit Index	Value
χ^2	15.244, $p = .228$
Degrees of Freedom	12
CFI	.994
RMSEA	.021
RMSEA Confidence Interval	.000-.048
WRMR	.586

The model was over-identified. The model converged and terminated normally using WLSMV as the estimator. Fit indexes are presented in Table 13. These results revealed that the chi-square was not significant ($\chi^2 = 15.24$, $df = 12$, $p = .23$, *ns*), indicating a good fit. In further support of a good model fit, descriptive fit statistics (CFI, RMSEA, and WRMR) were also within suggested cut-off guidelines. Though requested, *Mplus* produced no modification indices.

With a model with acceptable fit, parameter estimates were then evaluated. This step of the analyses investigated relationships among the latent constructs of familism and morbidity and the observed continuous variable, balanced integration. Results are presented in Table 14. The parameter estimates indicated that balanced integration was significantly related to the two latent constructs of familism and morbidity. Familism had a significant positive association with balanced integration ($b = .297$, $SE = .173$, $\beta = .106$, $p = .042$), which suggests that as familism increases, so does the ability of a family to balance asthma management tasks with the day-to-day tasks and stressors of family responsibilities. Balanced integration negatively predicted morbidity ($b = -.067$, $SE = .023$, $\beta = -0.151$, $p < .001$), suggesting that as the ability of a family to balance asthma management tasks with other daily family tasks and activities increases, morbidity as indicated by health service utilization decreases. The relationship between familism and morbidity was not significant.

A secondary model was evaluated for a subset of the sample and is graphically presented in Figure 12. This subset consisted only of families who endorsed the use of alternative caregivers in child rearing ($n = 178$). For this model, management by alternate caregivers was included instead of balanced integration. The model converged and terminated normally using WLSMV as the estimator. Goodness-of-fit indexes, presented in Table 15, indicated acceptable fit ($\chi^2 = 15.69$, $df = 12$, $p = .21$, *ns*) and were supported by descriptive indexes of RMSEA, CFI, and WRMR. An examination of parameter estimates indicated that for families who endorsed use of other caregivers,

Table 14

Results From Primary Structural Regression

Latent/Indicator	Unstandardized Estimates	SE	Z	Standardized Estimates	Bootstrapping BC 95% CI
Morbidity					
ON Familism	0.123	0.096	1.285	0.100	
ON Balanced Integration	-0.067*	0.022	-2.949	-0.151*	
Balanced Integration					
ON Familism	0.297*	0.160	1.856	0.106*	
Total Indirect Effect	-0.020	0.014	-1.411	-0.016	-0.073 to 0.005

*One-tailed significance ($z = 1.645$).

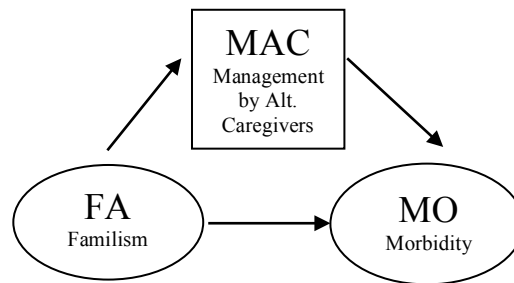


Figure 12. Secondary structural regression model.

asthma management by alternate caregivers or morbidity did not significantly relate to familism. Results of this secondary analysis are presented in Table 16.

Mediation

The current study proposed balanced integration and management by alternative caregivers as mediators in the relationship between familism and morbidity. According

Table 15

Goodness-of-Fit Indexes for Secondary Structural Regression Model

Goodness-of-Fit Index	Value
χ^2	15.689, $p = .206$
Degrees of freedom	12
CFI	.97
RMSEA	.042
RMSEA Confidence Interval	.000-.092
WRMR	.594

Table 16

Results From Secondary Structural Regression

Latent/Indicator	Unstandardized Estimates	SE	Z	Standardized Estimates	Bootstrapping BC 95% CI
Morbidity					
ON Familism	0.238	0.448	0.532	0.167	
ON Management by Alternate Caregivers	0.058	0.042	1.385	0.167	
Management by Alt. Caregivers					
ON Familism	0.531	0.709	0.749	0.133	
Total Indirect Effect	0.031	0.064	0.476	0.021	-0.038 to 0.362

*One-tailed significance ($z = 1.645$).

to Baron and Kenny (1986), prerequisite conditions to a mediational analysis include significant relationships between predictors (X), mediators (M), and dependent (Y) variables (i.e., $X \rightarrow M$, $M \rightarrow Y$, and $X \rightarrow Y$). However, statistical researchers in structural equation modeling have more recently asserted that not only is a significant $X \rightarrow Y$

relationship not a necessary prerequisite to a meditational analysis, all steps examining for significant relationships can be collapsed to one analysis (Rucker, Preacher, Tormala & Petty, 2011; Zhao, Lynch, & Chen, 2010). Specifically, when using *Mplus*, the bootstrap test of the indirect effect as utilized by Preacher and Hayes (2008) can be employed. Bootstrapping, a statistical procedure involving sampling with replacement, helps deal with the challenge of a non-normal distribution for the total indirect effect in a finite sample. Preacher and Hayes (2008) asserted that this technique is “the most powerful and reasonable method of obtaining confidence limits for specific indirect effects under most conditions” (p. 886). In other words, this method provides a more accurate estimation of confidence intervals that helps establish whether the indirect effect is significantly different from zero.

Results of the primary model (Familism → Balanced Integration → Morbidity) indicated that the indirect effect was not significant ($b = -0.020$, $SE = .014$, *ns*); thus, the mediation was not supported. In the secondary model (Familism → Management by Alternate Caregivers → Morbidity), no significant predictive relationships were found. As would be expected from these results, the indirect effect was also not significant ($b = .031$, $SE = .064$, *ns*), which suggests that the hypothesized mediation model was not supported. BC 95% confidence intervals are reported in Table 14 for the primary meditational model and in Table 16 for the secondary meditational model.

CHAPTER V

DISCUSSION AND CONCLUSIONS

As emphasized by Engel (1977), the course of a disease is impacted by many factors. He suggested more sophisticated conceptualizations than the medical model. An essential premise of the BPS approach is that the human experience of asthma is impacted not only by biological variables, such as severity, but also by psychosocial variables and bidirectionality in relationships. The intent of the current study was to investigate relationships among biological, psychosocial, and asthma outcomes within a family context in a Latino population. Biological variables included in the present study were asthma severity level and age. Psychosocial variables included were gender, poverty level, location of residence, and ethnicity. The Latino cultural value of familism was constructed as a latent variable using family practices of social networking and reported levels of family cohesion. To capture the reciprocal relationships asserted by a biopsychosocial approach, a measure of the family's ability to balance the tasks of asthma management with the daily demands, needs, and stressors of the family was included. Since involvement by extended family and family friends in child rearing is a prevalent practice in the Latino culture, a measure of involvement by extended family and friends in asthma management was also investigated. The current study sought to contribute to the emerging literature linking cultural values and family practices to outcomes in pediatric asthma. This study is one of the first studies in this area that

included a specific cultural value, such as familism, and examined balanced integration to demonstrate a biopsychosocial conceptualization.

Discussion

Ten hypotheses were generated and grouped under the seven research questions. A discussion and corresponding conclusions of the current study's findings are presented in the following section in the context of each research question. The last three research questions, for which structural equation modeling was used to investigate relationships between latent variables, are discussed together.

Research Question 1

Research Question 1 asked the following: How do mediator variables of balanced integration and management by alternate caregivers and observed variables of familism and morbidity relate to demographic child-specific variables (poverty level, age, asthma severity level)? Hypothesis 1, which predicted significant associations among familism indicator variables (family cohesion, social networking–contact, and social networking–reliance) and significant associations among morbidity indicator variables (number of emergency room visits, outpatient visits, and hospitalizations), was supported. Although the correlations were weak relationships for familism indicator variables, the strongest association was between social network–contact and social network–reliance. As the frequency of families contacting family friends and extended family members increased, so did the behavior of relying much more on family and friends. These items were asked in the context of general assistance and support and not asthma specific. However, research literature has shown support for family behaviors and practices serving as

protective factors in pediatric asthma (Fiese & Everhart, 2006; Markson & Fiese, 2000), which is consistent with a BPS approach to conceptualizing the dynamics of pediatric asthma. Contacting and relying on family and friends and may diffuse stress as well as provide extra hands in managing tasks of child rearing, which can include caring for the health of a child.

Stronger relationships were found for morbidity variables, with the highest relationship between number of times hospitalized and number of emergency room visits. The moderate positive relationship between hospitalizations and emergency room visits helps highlight that access to the emergency room for asthma care increases with hospitalizations to treat asthma. It is not uncommon that an emergency room visit for a significant asthma event leads to hospitalization until the child's status is stable. Current pediatric asthma research in Latino families suggests that Latino families are more likely to utilize acute urgent services rather than preventive doctor visits (Berg et al., 2004; Kruse et al., 2007). Several of the BPS-based conceptualization models earlier presented contain health care access or morbidity as an aspect of the model. Particularly with the Latino population, a shift toward preventive management is needed. This shift in adhering to prescribed daily management as well as proper rescue strategies can shift the behavioral practice from urgent care and emergency room utilization toward regular preventive outpatient doctor visits.

Hypothesis 2 investigated the direction of the relationship of familism variables and morbidity variables with child age and asthma severity level. For age, the hypothesis of negative relationships with familism variables and positive relationships

with morbidity variables was not supported. An inverse relationship between age and outpatient doctor visits was the only significant relationship, suggesting that as a child gets older, outpatient doctor visits decrease. This makes sense in the context that the literature reflects a developmental nature to asthma care management and that parents may be transferring care to children before a child is prepared. Independence from parents is a developmental task of older children, and perhaps an older child who has not mastered asthma management care is less reliable in reporting to parents that a doctor visit may be warranted. Pradel et al. (2001) found that though some differences in regard to asthma management self-care existed between different ages, overall, all children still relied on adults to seek medical assistance. This is in line with the BPS aspect that though there are individual child variables at play in asthma management, the family plays a role in disease processes.

In regard to asthma severity level, Hypothesis 2 was partially supported. Balanced integration had a significant positive relationship with asthma severity level. Although significant, this relationship was so weak that the relationship was almost negligible for interpretive purposes. For familism variables, only the negative relationship between asthma severity and family cohesion was significant, suggesting that as severity increases, family cohesion decreases. The amount of involvement by different family members in managing more severe asthma may detract from other relationships in the family and eroding familial relationships. Miller and Wood's (1991) conceptual model identified the family as either an important support source or, for a family with maladaptive interactions, a source of stress that can negatively impact

asthma trajectory. The BPS approach should consider the bi-directionality of impact between family functioning and disease severity.

Relationships of asthma severity to morbidity variables were all significant and positive. As hypothesized, as asthma severity level increases, so does the number of hospitalizations, doctor visits, and emergency room visits. This relationship may seem intuitive, but it is empirically supported in the current literature as well as by the findings of the current study. Research has shown that regardless of ethnicity, children accessing care in urgent care have similar levels of severe respiratory distress (Boudreaux et al., 2003). These correlations provide representation of the interdependent layers of the BPS framework of biological aspects of a child and social community services.

Hypothesis 3 examined the strength of significant relationships of binary child variables such as sex, poverty level, ethnicity (Rhode Island Latino versus Rhode Island non-Latino White), and location of residence (mainland Puerto Rican families versus island Puerto Rican families) with familism and morbidity variables. Hypothesis 3 asserted that significant relationships would be moderate in strength (.3 to .5), which was only found for ethnicity and balanced integration, location of residence and balanced integration, and location of residence and emergency room visits. These relationships among psychosocial variables reflect the multidimensional framework of components that are related to asthma processes. Balanced integration, for purposes of this study, captured a family dynamic of balancing disease management with daily family tasks and stresses. Moderate association with the psychosocial variables of ethnicity and location of residence provided a motivation to examine group differences (Research Question 2).

Results are consistent with recent Latino pediatric asthma research literature indicating that contexts associated with where a family lives and ethnic minority status are strongly related to access and use of health services (Canino et al., 2012; Jandasek et al., 2011; Ortega, Koinis-Mitchell, & Gergen, 2010).

Research Question 2

Research Question 2 asked the following: What significant differences exist for mediator variables of balanced integration and management by alternate caregivers and observed variables of familism and morbidity when comparing by location of residence (mainland versus island) and by ethnicity (Latino versus non-Latino White)? Hypothesis 4 predicted that significant group differences would be found in variables of interest with Latino families reporting higher levels of observed familism variables, observed morbidity variables, and management by alternative caregivers and lower levels of balanced integration. For this analysis, only Latino families and non-Latino White families from Rhode Island were included. Hypothesis 4 was partially supported such that Latino families reported higher outpatient visits, emergency room visits, and hospitalizations and lower levels of balanced integration compared to non-Latino White families. These results are consistent with current literature on health disparities in pediatric asthma indicating that Latino families have worse outcomes and experience greater difficulties in managing asthma, which can be due to stressors that include acculturation, differences in service access, and poverty (Canino et al., 2006; Everhart et al., 2011; Jandasek et al., 2011; Koinis-Mitchell et al., 2010; Lara et al., 2006). Higher levels of ethnic identity have been found to be associated with lower levels of asthma-

related emergency room visits (Koinis-Mitchell et al., 2012), and thus future investigations in pediatric asthma should consider including this cultural variable, which may be influenced by location of residence, generation, and acculturation.

Interestingly, non-Latino White families reported higher levels of family cohesion, which was not hypothesized. However, Schwartz (2007) found that familism operated similarly amongst different ethnicity groups, and Latino families adhering to high familism practices may be impacted for various reasons. Given that this analysis compared Latinos and non-Latino White families living in mainland U.S., these findings must be considered in the context of Latino families living in the continental U.S. with a minority status. Family cohesion can be affected by acculturation, intergenerational differences and changes in strength in cultural values, and cultural practices in succeeding generations of Latinos in American society (Koinis-Mitchell et al., 2011). Cortes (1995) found a diminishing adherence to familism with generation, age of migration, and increase in education for Puerto Rican families that migrated to mainland United States. A family had 3.16 higher odds of relying on its social network if the family was Latino. Again, a Latino family with minority status in the U.S. may be more pressed to depend on family friends and extended family members in order to navigate the social community of the U.S. In this study, Latino families and non-Latino White families did not differ on how much they contacted their social network or used alternate caregivers in asthma management.

Hypothesis 5 predicted significant group differences between mainland and island Puerto Rican families with island Puerto Rican families reporting higher levels of

observed familism variables, observed morbidity variables, and management by alternative caregivers and lower levels of balanced integration. For this analysis, only Puerto Rican families were included to reduce confounding effects that could be introduced by a different ethnicity group. As with the previous analysis comparing Latino families and non-Latino White families, the hypothesis was partially supported. As hypothesized, island Puerto Rican families had significantly higher levels of family cohesion, higher emergency room utilization, and lower levels of balanced integration. Only Puerto Rican families were included in this comparison so that cultural beliefs and cultural practices between groups were more similar than different. Previous research supports that Puerto Rican families, which includes families residing in mainland U.S., have high utilization rates of the emergency room as a primary source of care. The current study found that island Puerto Rican families for usual care use the emergency room significantly more. As previously discussed, health care systems may be a contributing factor. Although universal care provides access to care, wait time for service can be considered unreasonable for families that feel urgency to treat asthma symptoms. This finding highlights that although there may be similar cultural values and cultural practices between mainland and island Puerto Rican families, there may exist unique factors in Puerto Rico that further drive higher acute care use to manage asthma. With the BPS framework in mind, differences in location of residence may be considered as the interrelationships between social context (e.g., poverty, health care system, acculturation) and physical context (e.g., environmental allergens, neighborhood environment, family housing). Counter to Hypothesis 5, mainland Puerto Rican families

had higher odds of contacting and relying on their social network as well as involving alternate caregivers in asthma management. As with the previous group comparison, these findings can be considered within the context of Puerto Rican families living in the continental United States with a minority status. Koinis-Mitchell et al. (2011) have found that in families with children with asthma, acculturative stress was significantly higher for caregivers born in Puerto Rico but who currently resided in mainland U.S. Mainland and island Puerto Rican families did not significantly differ on the remaining observed familism variables and observed morbidity variables.

Research Question 3

Research Question 3 asked the following: To what extent do the data fit the latent variables of familism and pediatric asthma morbidity? Per Hypothesis 6, results of a confirmatory factor analysis indicated that a measurement model for the latent variables, familism and morbidity, was identified and estimated within acceptable cut-off goodness-of-fit criteria as hypothesized. All familism indicator variables and morbidity variables were significant. Examining standardized coefficients, reliance on social network was the weakest factor loading for familism, and outpatient visits was the weakest factor loading for morbidity. Although *Mplus* identified no modifications, these results do not exclude the possibility of other indicators for each of the latent constructs. Of the variables available in the data obtained from the RIPRAC research lab, results suggest that family cohesion, contact with social network, and reliance on social network function as adequate indicators for familism. Similarly, hospitalizations, emergency

room visits, and outpatient visits are adequate indicators for measuring morbidity in this population.

Research Question 4

Research Question 4 asked the following: To what extent does this measurement model operate equivalently across groups in child-specific variables of asthma severity and ethnicity? Hypothesis 7 asserted that regardless of asthma severity level and ethnicity group, these indicators would measure equivalently to load onto familism and morbidity. The measurement model as proposed measured equivocally for each multiple group analysis, both by severity level and ethnicity group. It should be noted that further invariance testing could be accomplished by comparing increasingly stricter models (e.g., strong/scalar, strict factorial invariance), but the purposes of these invariance tests were beyond the scope of the current study. Current analyses of the measurement model determined configural invariance, or that the factor structure (form) was identical across groups, and metric invariance, which indicated that factor loadings were measuring similarly across groups. Morbidity, as conceptualized, has been utilized in health psychology without specification of a specific population and can be expected to measure similarly in multiple group analyses. The more interesting finding is that familism was found invariant, particularly in multiple group analyses by ethnicity. This supports the idea that familism is a cultural value not exclusive to the Latino population (Mindel, 1980; Schwartz, 2007) and that is practiced and held at differing degrees by different ethnic groups.

Research Questions 5-7

Research Questions 5 through 7 were as follows:

- Research Question 5: To what extent does the cultural value of familism predict pediatric asthma?
- Research Question 6: To what extent does balanced integration mediate the relationship between familism and asthma morbidity?
- Research Question 7: For families reporting participation of alternate caregivers in asthma management, to what extent does the family variable of management by alternate caregivers mediate the relationship between familism and pediatric asthma morbidity?

Mplus software afforded the opportunity to investigate relationships between the latent factors simultaneously in structural equation modeling. The final three research questions pertained to SEM analyses and examined the relationship between the latent factors of familism and morbidity and potential mediating relationships. Results of structural analyses did not find support for a significant direct relationship between familism and morbidity nor significant meditational relationships as hypothesized (Hypotheses 8-10). This can be due in part to design-related weaknesses of the study, such as pulling dichotomous items from different measures from a study that was not specifically designed to investigate the current research questions or using a sample size that was marginally adequate for analyses.

Although primary structural regression and meditational hypotheses were not supported in SEM analyses, other significant relationships found during analyses need to

be discussed. Although it could not be determined that familism was associated with morbidity through the proposed mediator, balanced integration, the individual significant relationships of familism and morbidity to balanced integration are valuable. This is consistent with one of the primary findings from a study by Koinis-Mitchell et al. (2012) that indicated that family connectedness functioned as a protective factor. This was demonstrated by the association of higher levels family connectedness with lower levels of reported functional limitations due to asthma, which is an aspect of morbidity.

Koinis-Mitchell et al. suggested that asthma management might be improved through family connections, particularly in the face of day-to-day stressors. The current study also found that increased familism predicted higher levels of balanced integration, which is consistent with research literature supporting that a more cohesive family unit and utilization of social support could alleviate stressors and aid in child rearing, including health management (Gustafsson et al., 2002; Markson & Fiese, 2000; McQuaid et al., 2007).

Garro (2011) found that Latino parents were likely to better cope with the stress and difficulty of managing their child's asthma by focusing on family integration with an optimistic attitude and seeking out more information to understand the medical situation. The current study similarly found that balanced integration inversely predicted morbidity, which also corresponds to research literature suggesting that as a family is better able to balance asthma management tasks with other needs of family daily functioning, morbidity improves (McQuaid et al., 2005; Walker et al., 2009).

Conclusions

A majority of correlational hypotheses were supported suggesting a relationship between balanced integration and management by alternate caregivers. Interestingly, higher levels of balanced integration and higher levels of family cohesion were associated with lower levels of asthma severity. This supports emerging research suggesting family variables as protective factors in pediatric asthma. This study included variables in multiple layers crucial cultural disparity research, such as ethnicity and location of residence. Findings included expected moderate associations between ethnicity and balanced integration as well as between location of residence and balanced integration. These findings indicate involvement of psychosocial variables and support Engel (1977) in his argument that improvement in disease can be accomplished by addressing more than biological factors.

Group comparison analyses regarding significantly higher use of emergency room in Puerto Rico is consistent with literature. Previous studies have found that one possibility exists in differences in healthcare systems. Although universal care in Puerto Rico addresses difficulties in health care access, one critique of this model of service delivery is that there is often long waits for outpatient appointments and immediate care at an emergency room is a more convenient choice. One of the current study's finding of particular significance is that Puerto Rican families, when compared to non-Latino White families, endorsed lower levels of balanced integration. Even more interesting is when comparing the Puerto Rican families by where they lived, those families on the island indicated lower levels of the ability to balance managing asthma with daily

stressors and family responsibilities. Not only are these findings consistent with literature demonstrating greater difficulties with asthma management for Latino families, these findings suggest there are more specific variables that may come into play for Puerto Rican families living on the island that make it difficult to effectively handle both daily family responsibilities and the tasks of asthma management. Differences in cultural beliefs relating to causes of illness, methods of treatment, and basic understanding of disease processes, which can greatly impact how a family prioritizes and manages asthma.

Unexpected findings that Puerto Rican families living in mainland U.S. are those more likely to be in contact and rely on their social network as well as more likely involve others in managing their child's asthma suggests that immigration and acculturation factors may be contributing factors. Stressors and needs may vary between the two locations. Life in the U.S. presents with a different cost of living that requires parents to work longer hours and depend on others to help with child-rearing. As a minority within a different culture, Latino may be more pressed to involve others in order to function successfully in mainstream culture. Because mainland Latino families are more apt to utilize the support of others and involve others in asthma care, there is some level of protection that increases balanced integration when compared to island Latino families.

This study's unexpected finding that non-Latino White families reported significantly higher levels of family cohesion. This may imply that family cohesion is a relevant factor for all families and not only Latino families. Therefore, interventions

geared towards a family approach would be beneficial not only for Latino families, but all families dealing with pediatric asthma management. Another implication is that perhaps there is a shift in cultural family practices for Latino families as families immigrate and acculturate to mainstream U.S. There may be a diffusion of family cohesion the longer a Latino family is in the U.S. or a diffusion of cultural practices and beliefs with each succeeding generation. Families who already have difficulty balancing asthma management and stressors from daily family responsibilities are additionally stressed by the demands of acculturation. Family processes and asthma management are at risk for a loss in priority for a family dealing with acculturative stress.

Lastly, SEM analyses did not support the hypothesized direct structural regressions between familism and morbidity. However, significant relationships with mediator variables, balanced integration, suggest that there may be more indirect paths that may be involved. The model presented in this study is simple in the context that cultural values, such as *familismo* and *respeto*, are still abstract constructs for which no one has established a widely accepted operationalization. However, findings support that higher levels of familism, a cultural value related to family processes, significantly predicted higher levels of balanced integration. This study also found that higher levels of balanced integration predicted lower levels of asthma morbidity.

Altogether these findings have implications for clinical practices at different levels of intervention. Service providers may be encouraged to provide more than basic biological education about asthma. Information and service delivery reflecting the

medical model should be altered to fit with a biopsychosocial approach. A biopsychosocial approach may increase treatment acceptability and invite Latino families to be collaborative rather than unquestioning recipient of information. Interventions that address family relationships and emphasize support as well as target how a family can more effectively balance asthma management with daily stressors and other family responsibilities may be more beneficial and better received. In other words, interventions designed with the intent of bolstering familism and culturally tailored for increased treatment acceptability may improve asthma morbidity.

Limitations

Although there are many strengths to the current study, such as a large total sample with negligible amounts of missing data, thereby enabling structural equation modeling with *Mplus* software, there are several study limitations. First, the originating study from which the data were derived was not specifically designed to address the research questions of the current study. As such, pulling dichotomous items from various measures was likely less powerful than selecting instruments and designing a research study to include established measures of familism. Related to this research design limitation, this study utilized a captured data set. Original data and possession of original measures were not available and thus possibly restricted further examination of actual item responses. This potential limits interpretation of FAMSS scales. Second, other studies have included quality-of-life aspects, such as missed school days, in measuring morbidity; however, those aspects are lacking in the current study. Sample size may be a third limitation. The total sample for SEM analyses is minimally adequate

on the rule of thumb of 10 participants per estimated parameter (Schreiber, Stage, King, Nora, & Barlow, 2012), and subgroups in some analyses in this study were less than optimal. Given the emphasis on within-group differences in the Latino population, another limitation is that this study specifically included only Puerto Rican and Dominican families, and some analyses included only Puerto Rican families; thus, generalizability to other Latino subgroups is limited.

Lastly, families were drawn from a specific region of the United States. Latino families living in the United States may have varying experiences of acculturation depending on where they live. Additionally, there are distinct differences in pediatric asthma between urban and rural families. This distinction was not made in the current study.

Future Directions

The present study provided support for important implications regarding family cultural constructs related to pediatric asthma. Support for a direct relationship between familism and morbidity as defined by the current study was lacking; however, small statistically significant predictive relationships were found between familism and balanced integration as well as balanced integration and morbidity, as hypothesized. In addition to results of bivariate analyses suggesting associations between child variables, disease variables, and psychosocial variables, these findings support a preliminary basis for further empirical endeavors utilizing a biopsychosocial framework toward establishing family cultural factors as relevant in improving pediatric asthma morbidity.

Based on findings that are suggestive that other factors, such as acculturative stress or impacts from immigration, may be relevant, future studies can continue identifying unique stresses associated with Puerto Rican families. Puerto Rico may have these differences from other Latino subgroups because of its unique relationship with the United States and therefore a difference in acculturation processes. The BPS conceptualization suggests that further contextual factors should be recognized that potentially impacts asthma management and morbidity. Future studies should also examine include rural and urban living, which may have illuminated differences in mainland and island locations in the current study.

Zayas and Palleja (1988) discussed improvement of services with Puerto Rican families by embracing cultural values and weaving natural cultural behaviors into family and parent training. Other cultural values not included in this study, such as *personalismo*, *simpatía*, and *respeto*, are impactful values affecting parenting practices, relationships, and family processes should be considered in future studies. Investigating cultural values that are related to parenting, family relationships, and support, as well as variables such as acculturation, intergenerational retention, or dispersment of cultural family practices, appear relevant in pediatric asthma. The current study has provided support for cultural family values and their association to asthma morbidity. Future studies could be designed to further pursue the research questions investigated in this current study.

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VITA

Name: Marissa Imee Mendoza-Burcham

Address: Department of Educational Psychology
College of Education and Human Development
Texas A&M University
704 Harrington Tower, MS 4225
College Station, TX 77843-4225

Email Address: mendoza.burcham@gmail.com

Education: B.A., Environmental Analysis & Design, University of California
Irvine, 1998
M.A., Psychology, McNeese State University, 2007
Ph.D., School Psychology, Texas A&M University, 2012