# DEPRESSION, ANXIETY, AND HEALTH-RELATED QUALITY OF LIFE IN ADOLESCENTS AND YOUNG ADULTS WITH ALLERGIES AND ASTHMA

By

ELIZABETH S. MOLZON

Bachelor of Arts in Psychology and Education

Bucknell University

Lewisburg, Pennsylvania

2008

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
MASTER OF SCIENCE
December, 2011

DEPRESSION, ANXIETY, AND HEALTH-RELATED QUALITY OF LIFE IN ADOLESCENTS AND YOUNG ADULTS WITH ALLERGIES AND ASTHMA

Thesis Approved:

Larry L. Mullins, Ph.D.

Thesis Adviser

John M. Chaney, Ph.D.

Demond M. Grant, Ph.D.

Sheryl A. Tucker, Ph.D.

Dean of the Graduate College

TABLE OF CONTENTS

Chapter Page

LIST OF TABLES

Table Page

LIST OF FIGURES

Figure Page

# CHAPTER I

## INTRODUCTION

Asthma and allergies represent two of the most prevalent chronic illnesses in the US, affecting 23 million individuals and 40-50 million individuals, respectively (Pleis, Ward, & Lucas, 2010; NIAID, 2003). Although these diseases are often recognized as non-life threatening (Rolland, 1987), both asthma and allergies have significant implications for the social, emotional, occupational, and physical functioning of individuals with these diseases. Currently, much of the research regarding each of these diseases focuses primarily on younger children (Akinbami, Moorman, Garbe, & Sondik, 2009; Teufel et al, 1999), and the research regarding allergies focuses on specific subgroups (i.e. food allergies) and not the broader disease itself (Teufel, et al., 1999). Furthermore, very little research has examined the specific psychosocial functioning of adolescents and young adults (AYAs) with chronic illnesses such as asthma (Perez-Yarza, 1996).

At the same time, research has shown that both children and adults with asthma and with allergies have pejorative psychosocial outcomes in comparison to healthy controls (e.g., Adams et al, 2004; Cuffel et al, 1999; Gillaspy, Hoff, Mullins, Van Pelt, & Chaney, 2002). Specifically, researchers have found that children and adults with asthma have increased prevalence rates of depressive and anxiety symptoms (e.g., Adams et al,

2004; Gillaspy et al, 2002), and that children and adults with asthma have lower health-related quality of life (HRQOL) than healthy controls (e.g., Adams et al, 2004; Fedele et al, 2009). Similarly, researchers have found that children and adults with allergies have increased depressive and anxiety symptoms in comparison to healthy controls (e.g., Cuffel et al, 1999; Kagan et al, 1991). As well, that children and adults with allergies have lower HRQOL than health controls (e.g., Metzler et al, 1997). Noticeably, research examining psychosocial functioning in individuals with allergies is quite limited.

The current study expanded upon the existing literature by examining the rates of psychological distress, specifically, depressive and anxiety symptoms, as well as the emotional and physical quality of life between AYAs with allergies, AYAs with asthma, and healthy AYAs. The following aims guided this research:

Aim 1: To examine the rates of psychological distress, specifically depressive symptoms and anxiety symptoms, between AYAs with allergies, with asthma, and healthy controls.

Aim 2: To examine emotional and physical quality of life between AYAs with allergies, with asthma, and healthy controls.

With regard to Aim 1, it was hypothesized that AYAs with asthma and AYAs with allergies would have higher levels of anxiety and depressive symptoms than healthy AYAs, while there would be no difference between anxiety and depressive symptoms between AYAs with asthma and AYAs with allergies.

With regard to Aim 2, it was hypothesized that AYAs with asthma and AYAs with allergies would report lower physical and emotional quality of life than healthy

AYAs, while there would be no difference between physical and emotional quality of life between AYAs with asthma and AYAs with allergies.

# CHAPTER II

# REVIEW OF LITERATURE

## Chapter Overview

This chapter examines the literature pertinent for the current study, which is divided into five sections. The first section focuses on a description of asthma, including information on the etiology, prevalence, mortality, morbidity, healthcare utilization, and treatment of the disease. The second section focuses on the psychosocial outcomes of individuals with asthma, specifically anxiety, depression, and health-related quality of life. The third section focuses on a description of allergies including information on the etiology, prevalence, mortality, morbidity, healthcare utilization, and treatment of the disease. The next section focuses on the psychosocial outcomes of individuals with allergies, specifically anxiety, depression, and health-related quality of life. The fifth section provides a brief overview of Rolland's family systems illness model and its applicability to understanding individuals with asthma and allergies.

## Asthma: Description of the Disease

### Nature and Etiology of Asthma

Asthma is characterized by chronic inflammation, narrowing, and hypersensitivity of the bronchial tubes (Adams, 2007). The narrowing of the bronchial tubes prevents

airflow to the lungs; however, with treatment this narrowing can usually be reversed (NIH, 2007). The hypersensitivity or hyperirritability of the bronchial tubes can influence and trigger asthma attacks in individuals (Adams, 2007). During an asthma attack, inflammation and narrowing of the bronchial tubes occurs, as well as excessive secretion of mucus, both of which prevent airflow and without treatment, suffocation can occur (Adams, 2007).

Overall, the etiology and subsequent development of asthma can be attributed to the interaction of genetics, environment, immunity, and allergies (NIH, 2007). To date, over ten different genes have been described as influencing asthma; however, because of the complexity of mechanisms involved, little is understood about the true influence of genetics on the disease (Adams, 2007). Researchers have also suggested that imbalanced levels of immune lymphocytes, Th1 and Th2 cytokine, specifically the overexpression of Th2, may support the development of asthma in individuals (NIH, 2007). Allergic diseases also influence the development of asthma, as allergic reactions can cause inflammation in the lungs and obstruct airflow (Adams, 2007). Environmental factors such as, exposure to smoke, diet, occupation, and air pollution have also been shown to increase the risk of developing asthma (NIH, 2007). To better understand the disease, asthma is categorized as being extrinsic or intrinsic. Extrinsic asthma develops mostly during childhood and is triggered by allergens and environmental factors, while intrinsic asthma develops mostly during adulthood and is often triggered by immunity factors and infections (Adams, 2007). This classification is relatively antiquated; however, it can help individuals with asthma and health care professionals determine the optimal treatment that fits the manifestation of the disease (Adams, 2007).

Prevalence, Mortality, Morbidity

Across the United States, asthma is extremely common, affecting approximately 23 million individuals (Pleis, Ward, & Lucas, 2010). Asthma prevalence rates can vary as a function of age, sex, race, and social-economic status (SES). Although prevalence rates for children are higher than adults, approximately 16 million adults currently have a diagnosis of asthma (Moorman et al, 2007). In adults with asthma, females (8.1%) have higher rates than males (6.2%), African Americans (9.2%) have slightly higher rates than Caucasians (6.9%), and individuals below the poverty level (10.3%) have higher rates than individuals above the poverty line (7.9%; Moorman et al, 2007; Pleis & Lethbridge-Cejku, 2007). Comparatively, asthma is the most common chronic illness of children, with a prevalence rate of 7.1 million children (10.0%) currently having asthma (Bloom, Cohen, & Freeman, 2010). In contrast with adults, boys (17%) are more likely than girls (10%) to have ever had an asthma diagnosis (Bloom et al, 2010) and American Indian and African American children are more likely to have asthma than Caucasian children (Akinbamia et al, 2009). In total, approximately 12 million individuals reported asthma attacks in 2006, with 7.5 million (3.6%) occurring in adults and 4.1 million (5.6%) occurring in children (Moorman et al, 2007).

The mortality rate for asthma is relatively low. Over a three year period (2001-2003), 4210 deaths occurred due to asthma, with less than 5% occurring in children (Moorman et al, 2007). The majority of the deaths occurred in females (64%) and in adults over the age of 65 (50%; Moorman et al, 2007). Although the mortality of asthma is relatively low, for both children and adults, the morbidity of the disease indicates the need to further understand the nature of asthma and the impact it has on individuals.

Health Care Utilization

In 2008, over 18 billion dollars was spent on expenses related to the treatment of asthma in adults (Sullivan et al., 2011). Each adult with asthma spent approximately $2000 on medical expenses specifically due to the disease (Sullivan et al., 2011). Of this total, 28% was spent on prescription medicines, 19% on inpatient hospitalization, and 19% on home health care expenditures (Sullivan, 2011). Adults with asthma also had increased emergency room visits and over twice the number of prescription medications than individuals without asthma (Sullivan et al, 2011). Furthermore, the health care utilization for children increased the total amount of money spent related to the disease, as approximately 8 billion dollars was spent on expenses associated with asthma in children in 2006 (Soni, 2009a).

However, the utilization of health care resources is not equitably divided across individuals with the disease. Although asthma has higher prevalence rates among older children (11-17 years old), younger children (0-11 years old) demonstrate evidence of higher utilization of overall health care resources (Akinbamia et al, 2009). For children and adults, asthma ranks as the second and fourth most costly chronic illness respectively, thus the level of health care utilization is quite high for individuals with asthma (Soni, 2009a; Soni, 2009b).

Treatment of Asthma

The treatment of asthma usually involves several medications to control and prevent symptoms; as such, there are both quick and long term relief medications (Weiss et al, 2006). Quick relief medications are intended to relieve asthma attacks while, long term relief medications are used to prevent and reduce the severity of asthma attacks and

symptoms (Weiss et al, 2006). Across all of the treatment options, there are large individual differences for the effectiveness of medications, and often tailored treatment plans are created to manage symptoms (Douglass, 2002).

Quick relief medications are most often used in those individuals with mild asthma and are combined with preventative medications for individuals with moderate to severe asthma. The most common quick relief medications are bronchodilators or $beta_2$-agonists (Weiss et al, 2006), with short-acting $beta_2$-agonists demonstrating the most effective treatment across the majority of individuals (NIH, 2007). These medications work by activating mechanisms in the smooth muscle that will allow the airways to relax (Weiss et al, 2006). As quick relievers, these medications are mostly inhaled and should be used for acute attacks, not for continued management of the disease (NIH, 2007).

In contrast, long term relief medications are used to help prevent and control asthma systems in individuals with moderate to severe asthma, and as such, should be used regularly (NIH, 2007). There are several long term medications (e.g., corticosteroids, cromolyn sodium, nedocromil sodium, and immunomodulators); however, the most effective medication, for most individuals, is inhaled corticosteroids (NIH, 2007). Inhaled steroids work directly on the inflamed airways and have less side effects than other medications; however, oral steroids can be stronger for individuals with severe symptoms, but these medications have increased detrimental effects (e.g., hair growth, weight gain) (Adams, 2007). In general, long term relief medications are preventative and need to be used regularly and consistently to provide protection from asthma attacks (Adams, 2007).

With the use of treatment plans, individuals with asthma can ideally be able to control and manage their symptoms. It is important for individuals with asthma to understand the environmental triggers (e.g., animals, dust, pollen, smoke) that may influence their asthma and to adhere to the medication regimen to best control and prevent asthma attacks (Adams, 2007). The following section examines the psychosocial functioning of individuals with asthma.

## Asthma: Psychosocial Outcomes

### Asthma and Depression

Depression is defined as a negative mood state characterized by a cluster of symptoms, including feelings of sadness or emptiness, loss of interest in activities, loss of energy, feelings of worthlessness as well as behavioral symptoms such as weight change, difficulty sleeping, and increased movement (DSM-IV TR, 2000). For a number of years, researchers have sought to examine the relationship between asthma and depression and/or depressive symptomatology.

Although the current literature is mixed, research has indicated an increased likelihood of depressive symptoms in children with asthma (Bennett, 1994; Bloomberg & Chen, 2005; Gillaspy et al, 2002; Padur et al, 1995) and in adults with asthma (Adams et al, 2004; McCauley, Katon, Russo, Richardson, & Lozano, 2007). Research has also demonstrated that children with asthma have significantly more depressive symptoms compared to children with other chronic illnesses, and also to children with no chronic illness (Padur et al, 1995). Similarly, in a study of high-risk adolescents, Gillaspy and colleagues (2002) found that adolescents with asthma had significantly increased depressive symptomatology compared to adolescents without asthma. Further research

with adult populations has again corroborated the findings with children and adolescents, with Adams and colleagues (2004) finding that adults with asthma evidence higher rates of depressive symptoms than adults without asthma. However, other researchers have found contradictory results, such that children and adolescents with asthma are no different from healthy children with regard to depressive symptomatology (Vila, Nollet-Clemencon, de Blic, Mouren-Simeoni, & Scheinmann, 2000).

Across the research literature, there is some variability as to whether the severity of asthma impacts the prevalence of depression or depressive symptoms in individuals with asthma. McCauley and colleagues (2007) found that depressive symptoms were related to impairment in psychosocial and asthma-related functioning in adolescents with asthma, but the severity of asthma was not related to the depressive or anxious symptoms. In contrast, other researchers have found that the severity of asthma was significantly related to the increased prevalence of depression or anxiety disorders in children and adolescents with asthma (Blackman & Gurka, 2007), while other researchers have linked depressive symptoms with perceived high-severity asthma, rather than objectified high-severity asthma (Janson-Bjerklie, Ferketich, Benner, & Becker, 1992). Overall, the research examining the illness severity and the influence on depressive symptoms is variable, perhaps due to differing methods of measuring the severity of asthma symptoms or the use of objective versus subjective reporting of severity in individuals with asthma.

Depressive symptoms may influence the treatment and management of asthma symptoms and healthcare utilization in individuals with the disease. In this vein, researchers have found that in adults with asthma, the presence of depressive symptoms reduces the compliance and control of the treatment for the disease (Bosley, Fosbury, &

Cochrane, 1995; Strine et al, 2008) and that children with asthma and a comorbid depressive disorder have increased healthcare utilization compared to children with asthma but without depressive disorder (Richardson et al, 2006). Additionally, researchers have found that depressive symptoms may influence the cognitive functioning of individuals with asthma (DiMatteo et al, 2000; Opolski & Wilson, 2005). However, other researchers have concluded that the depressive symptoms may not account for the total cognitive impairment observed in individuals with asthma (Chaney et al/, 1999). Thus, depressive symptomatology may negatively influence the management and control of the symptoms, as well as healthcare utilization in individuals with asthma.

Overall, the current research suggests that individuals with asthma have increased prevalence of depression and depressive symptoms compared to individuals without asthma, and these depressive symptoms may increase difficulties adhering to treatment plans for control of the disease. As well, the severity of the disease may influence the prevalence of depression or depressive symptoms. In the following section, the literature examining the prevalence of anxiety symptoms and disorders within individuals with asthma is discussed.

Asthma and Anxiety

Anxiety disorders can cause individuals to be fearful and uncertain in specific situations, when exposed to specific stimuli, or without triggers (DSM-IV TR, 2000). The symptoms can range from psychological symptoms such as, fear or worry, to somatic symptoms such as, racing heart or sweating; overall, these symptoms can be debilitating and fearful for individuals (DSM-IV TR, 2000). Similar to depression, researchers have

sought to elucidate the relationship between anxiety and asthma. Collectively, the current literature indicates an increased likelihood of anxious symptoms in children with asthma (Bennett, 1994; Bloomberg & Chen, 2005; Katon et al, 2007; Gillaspy et al, 2002) and in adults with asthma (Adams et al, 2004; Fernandes et al, 2010; McCauley et al, 2007). Specifically, researchers have examined the prevalence of anxiety and depression in youth with and without asthma and found that youth with asthma have an increased likelihood of having either an anxiety or depressive disorder than healthy youth (Katon et al., 2007). Although researchers have shown elevated rates of anxiety disorders in children with asthma, it appears that these rates can vary (Ortega, Huertas, Canino, Ramirez, & Rubio-Stipec, 2002; Wamboldt et al, 1996; Vila et al, 2000). Katon and colleagues (2004) concluded that approximately a third of children with asthma meet criteria for an anxiety disorder, with adults showing lower prevalence rates of anxiety disorder, comparatively. Adams and colleagues (2004) found that adults with asthma, similarly to children with asthma, have more anxious symptoms than healthy controls.

The presence of anxiety symptomatology may also influence aspects such as healthcare utilization in individuals with asthma. Researchers have found that the prevalence of anxiety symptoms in adults with asthma has also been associated with decreased control of asthma symptoms and increased health care utilization (Fernandes et al, 2010; Strine, Mokdad, Balluz, Berry, & Gonzalez, 2008), such that individuals with higher levels of anxiety symptoms have increased urgent and routine medical visits due to asthma related health concerns (Fernandes et al, 2010). Thus, anxiety symptoms may increase healthcare utilization in individuals with asthma.

Importantly, research is inconsistent regarding whether the prevalence of anxiety disorders can influence the severity of symptoms in individuals with asthma. McCauley and colleagues (2007) found that anxiety and depressive symptoms were not associated with asthma severity as measured by markers of high medical risk including, an oral prescription for asthma symptoms, more than one emergency room visit due to asthma related problems, or four or more physician visits for asthma management. In contrast, other researchers measured severity by the number of asthma attacks, medication usage, and hospitalizations due to asthma and found that asthma severity does influences depressive and anxious symptoms in individuals with asthma (Silverglade, Tosi, Wise, & D'Costa, 1994). Differing methodology for measuring severity may explain some of the variability researchers have found regarding the influence of asthma severity on anxiety and depressive symptoms in individuals with asthma.

Similar to the depression literature, research suggests that individuals with asthma have an increased likelihood of anxiety symptoms or disorders. In the following section, the literature examining quality of life in individuals with asthma is reviewed.

Asthma and Quality of Life

To understand broader impact of asthma on individuals daily functioning, quality of life (QOL) has been examined. QOL is a global construct that examines individuals' expectations and goals in relation to culture and belief systems (WHO, 1993). The construct of health-related quality of life (HRQOL) further examines how illnesses and diseases influence the emotional, physical, and social functioning of individuals (Ware & Sherbourne, 1992).

In this vein, researchers have examined HRQOL in individuals with asthma compared to individuals without asthma. Researchers demonstrated that adolescents and adults with asthma had significantly lower HRQOL scores when compared to adolescents and adults without asthma (Adams et al, 2004; Fedele et al, 2009; Schmier, Chan, & Leidy, 1998). However, within the research examining HRQOL, not all researchers confirm deficits across all domains of HRQOL (Adams et al, 2004; Fedele et al, 2009). Additionally, researchers have found that anxiety and depressive symptoms contributed to HRQOL (Hommell et al, 2002), and that individuals with asthma who had a lifetime diagnosis of depression or anxiety had lower HRQOL scores than individuals with asthma without a diagnosis of depression or anxiety symptoms (Stine et al, 2008).

In addition to decreased HRQOL, both children and adults with asthma appear to have specific impairment in academic or occupational functioning due to asthma, domains of functioning typically conceptualized as comprising HRQOL. Blackman and Gurka (2007) found that children with asthma missed over 10 more days of school than children without asthma. As well, the self-reported severity of symptoms impacted absenteeism as a greater percentage of children with severe asthma missed over 10 days in the last year than those children with mild and moderate asthma (Blackman & Gurka, 2007). Carpentier and colleagues (2007) found that college students with asthma missed more days of school or work than college students without asthma, further corroborating these results. For adults and children in the United States, approximately 14.41 million workdays and 3.68 million school days are missed due to asthma each year (Barnett & Nurmagambetov, 2011). This data clearly shows the interference of asthma on academic, occupational, and daily functioning.

Overall, researchers have found diminished levels of HRQOL in children and adults with asthma; although, there is some variability across the individual HRQOL domains affected. The burden of this disease in individuals can also be seen by the impact on occupational and academic absenteeism.

In the next section, we examine the nature of allergies, specifically, the etiology, prevalence, mortality, morbidity, healthcare utilization, and treatment.

## Allergy: Description of the Disease

### Nature and Etiology of Allergies

An allergic response occurs when an individual's immune system reacts to an innocuous substance (e.g., animals, food, environment, medicines, and pollens) and produces an antibody immunoglobulin E (IgE; National Institute of Allergy and Infectious Diseases [NIAID], 2003). Every substance has a unique IgE antibody and when the antibody comes into contact with the corresponding substance, chemicals such as histamine, cytokines, and leukotrienes are released (NIAID, 2003). These chemicals initiate body systems to respond, causing symptoms including hives, atopic dermatitis, airway constriction, sneezing, and nasal congestion (NIAID, 2003). The symptoms are often multi-systematic, affecting respiratory (i.e., nose, throat, chest, eyes, and ears), gastrointestinal (i.e., mouth, stomach), genitourinary, and skin systems (Zellerbach, 2000).

Allergies can be categorized by several specific diseases including allergic rhinitis, food allergy, drug allergy, and contact dermatitis (Zellerbach, 2000). Allergic rhinitis is the most common allergic disease and is characterized by the typically experienced symptoms of nasal congestion, sneezing, and headaches (Zellerbach, 2000).

The common triggers for allergic rhinitis are household dust, pollen, molds, and animal dander (Zellerbach, 2000). Additionally, allergic rhinitis can be categorized as seasonal, perennial, or episodic (McCrory, et al., 2003; Zellerbach, 2000). Seasonal allergies occur during distinctive seasons; triggers could include pollens, grasses, or fertilizers (Zellerbach, 2000). Perennial allergies occur year-round and can often be triggered by molds, dust, or animal dander, while episodic allergies occur randomly (e.g., insect stings) (Zellerbach, 2000). Food allergies occur when a food substance triggers the allergic response; common food triggers include peanuts, tree nuts, shellfish, sugar, milk, eggs, and wheat (Neugut, Ghatak, & Miller, 2001; Zellerbach, 2000). Drug allergies occur when a medication incites the allergic response; common drug allergies are to antibiotics and dye used for medical imaging (Neugut, et al., 2001). Allergic contact dermatitis is where the skin develops a rash because of contact with a substance; common substances that trigger contact dermatitis include latex, beauty products, and the *Rhus* plant family (Zellerbach, 2000).

Prevalence, Mortality, Morbidity

Across the United States, allergic diseases are extremely common, affecting between 40 and 50 million individuals (NIAID, 2003). The prevalence of allergies can vary on age, sex, and race; with prevalence rates for children being higher than adults, females being higher than males, and Asians being lower than other races (Pleis & Lethbridge-Cejku, 2007; Pleis, Ward, & Lucas, 2010).

Allergic rhinitis is the most common allergic disease, affecting 10 to 30 percent of the adult population and up to 40 percent of the pediatric population (McCrory, et al., 2003). In 2009, the prevalence rate for adults with allergic rhinitis was 17.7 million

adults (7.8%; Pleis et al., 2010). Comparatively, 7.2 million children (9.8%) have allergic rhinitis, 3.8 million children (5.2%) have food allergies, and 8.9 million children (12%) have skin allergies (Bloom, Cohen, & Freeman, 2010). Because of the considerable prevalence rate of allergic diseases, allergies constitute the sixth largest chronic illness in the United States (McCrory, et al., 2003).

The mortality rate for allergies is not collected by the federal government in national health studies; however, there are some mortality estimates for specific allergic diseases. In the United States each year, food allergies cause approximately 100 deaths, drug allergies cause approximately 1300 deaths, and insect stings cause approximately 40-100 deaths (Neugut, et al., 2001). Together, these allergic diseases kill approximately .002% of the population in the United States each year (Neugut, et al., 2001). Although the mortality of allergic diseases is relatively low, the prevalence of allergies and associated morbidity indicates the need to further understand the nature of these diseases and the subsequent impact they have on individuals.

Health Care Utilization

In 2005, over 11.2 billion dollars was spent on expenses related to the treatment of allergic rhinitis, *excluding* money spent on over-the-counter medications (Soni, 2008). Of this total, over half (58.7%) was spent on prescription medicines and approximately a third (35.9%) was spent on out-patient doctor's visits (Soni, 2008). In addition to prescription medicines, over-the-counter medications are used by over half of allergy sufferers, and thus the true cost of allergic rhinitis is even higher (HealthStar Communications, Inc., Schulman, Ronca, & Bucuvalas, Inc., 2006). There are also indirect costs of allergic rhinitis such as emergency room visits; although, the incidence

rates for allergic disease emergency room visits are quite low with approximately 7900 total visits in 1995 (Klein & Yocum, 1995). These costs demonstrate mostly how allergic rhinitis impacts health care utilization; however, additional allergic diseases differ in treatments and add to the utilization of health care.

Treatment of Allergies

The treatment of allergies depends on the specific disease (e.g., allergic rhinitis, contact dermatitis); however, there are three main avenues for treatment: environmental control, immunotherapy, and pharmacotherapy (Berger, 2003; Zellerbach, 2000). Environmental control occurs when the substance that causes the reaction is avoided (NIAID, 2003). This treatment method works best for allergens that can readily be avoided, such as specific foods, medications, animals, and plants. However, it can be hard for some individuals with allergic rhinitis to determine the specific trigger and eliminate the substance which may be commonly occurring such as pollen, mold, and dust (Naclerio, 1991; Stempel & Woolf, 2002). To limit exposure to pollens and mold, the individual with these allergies can wear a mask or reduce outdoor activities when the pollen levels are high (NIAID, 2003).

Immunotherapy attempts to reduce allergic reactions in individuals by receiving injections of the substance to which they are allergic (NIAID, 2003; Zellerbach, 2000). The injections occur at least weekly at the beginning of treatment and gradually decrease over a three to five year period (NIAID, 2003; Zellberbach, 2000). The purpose of the injections is to increase the antibody IgG (a protective antibody), which will build up tolerance and reduce the reaction when the substance is presented (Naclerio, 1991; Zellerbach, 2000). This treatment method is most effective with allergies that do not

respond to medication or that involve substances that cannot be avoided (Berger, 2003; Naclerio, 1991). One concern with this treatment is the necessary adherence to the injection protocol over an extended period of time (Berger, 2003).

Pharmacotherapy is the use of medications to control the symptoms associated with allergies. These medications can include antihistamines, decongestants, and corticosteroids (Berger, 2003; Stempel & Woolf, 2002). Antihistamines counter the body system's response to the allergen, preventing the symptoms from occurring (NIAID, 2003). Antihistamines have advanced considerably from the first formulas, and now are used to control symptoms for 24 hours and prevent drowsiness (Stempel & Woolf, 2002). Decongestants, which limit and prevent blood flow to the nasal passages, are often combined with antihistamines to provide relief to congestion and nasal symptoms of allergy sufferers (Naclerio, 1991; Stempel & Woolf, 2002). Both antihistamines and decongestants are mostly used with individuals with allergic rhinitis; however, corticosteroids can also be used for individuals with allergic rhinitis and contact dermatitis (Zellerbach, 2000). Corticosteroids can take several forms, including nasal sprays, topical creams, and pills; each method preferable depending on the allergic disease (Zellerbach, 2000). The treatment of allergies is a complex process that can involve multiple attempts to find the combination of medication or avoidance of triggers to control symptoms. The next section examines the psychosocial functioning in individuals with allergies.

## Allergy: Psychosocial Outcomes

### Allergies and Depression

In adults, depression is a negative mood state characterized by a cluster of symptoms including feelings of sadness or emptiness, loss of interest in activities, loss of energy, feelings of worthlessness as well as behavioral symptoms such as weight change, difficulty sleeping, and increased movement (DSM-IV TR, 2000). Although the current literature is limited, research has indicated an increased likelihood of depressive symptoms in children with allergies (Bell, 1992; Patten et al., 2009) and in adults with allergies (e.g. Bell, 1991; Marshall et al., 2002).

Specifically, higher rates of depressive symptoms have been found in both children and adults with allergies compared to healthy controls (Bell, 1992). Further, Patten and Williams (2007) found higher prevalence of self-reported depressive symptoms in adults with allergies with both food and non-food allergies showing significant differences from the healthy controls. Such findings suggest that psychosocial concerns may exist for individuals who experience multiple types of allergies. Cuffel and colleagues (1999) also found that individuals with allergies had higher rates of depression than individuals without allergies. They examined individuals who had depression as defined by an ICD-code diagnosis of major depression, dysthymia, or a diagnosis of brief depressive reaction, or, had filled two or more prescription claims for an anti-depressant, and, whether or not these individuals also had been diagnosed with allergies as defined by the individual filling two or more prescriptions for allergy medications. By examining the patient records the researchers were able to objectively discern the presence of depression or allergies. Interestingly, Goodwin and colleagues (2006) found that depression was associated with increased incidence of allergies in adult females, but did not replicate this finding in males.

Researchers have further examined the rate of depressive symptomatology within individuals with seasonal allergies in relation to the pollen season. Marshall and colleagues (2002) found that during the pollen season, adults with allergies had higher levels of fatigue, lower motivation levels, and lower positive affect than they had during the non-pollen season. Related, researchers have demonstrated increased suicidal ideation in adults with self-reported seasonal allergies compared to healthy adults (Messias et al., 2010). Interestingly, Marshall (1993) looked at problem-solving, psychomotor speed, attention, memory, and mood in individuals with allergies compared to individuals with no chronic illnesses, testing participants in and out of pollen season. Their findings suggest that the individuals with allergies demonstrated decreased abilities in memory, problem solving, psychomotor speed as well as lower mood levels during pollen season compared to their performance out of the pollen season (Marshall, 1993).

Overall, the current research suggests that individuals with allergies are indeed experiencing higher levels of depressive symptoms compared to individuals without allergies, and that individuals with allergies have increases in depressive symptomatology during the pollen season. In the following section, the literature examining the prevalence of anxiety symptomatology in individuals with allergies is reviewed.

Allergies and Anxiety

For a number of years, researchers have sought to examine the prevalence of anxiety symptoms in individuals with allergies. Researchers tend to examine the construct of anxiety differently; however, many characterize anxiety as an affective state involving excessive worries and behavioral symptoms such as difficultly sleeping, tension, restless, or fatigue (Buske-Kirschbaum et al., 2008; DSM IV TR, 2000), while

others look at specific anxiety disorders (Kovalenko et al, 2001; Patten & Williams, 2007). Some of the first studies discerning the relationship between anxiety and allergies examined shyness, and found that individuals with high levels of shyness and introversion had an increased precedence of hay fever than less shy individuals (Bell, 1990). Continuing from this research, other researchers looked at anxiety and its relationship to allergies (e.g., Buske-Kirschbaum et al., 2008; Cuffel et al., 1999; Kagan et al., 1991).

The literature suggests that both children with allergies (Kagan et al, 1991) and adults with allergies (Buske-Kirschbaum et al., 2008) exhibit higher levels of anxiety and anxiety symptoms than healthy controls. Buske-Kirschbaum and colleagues (2008) found that adults with two specific allergy subtypes (i.e., atopic dermatitis and seasonal allergic rhinitis) had significantly higher levels of anxiety and stress vulnerability compared to healthy controls. As well, Cuffel and colleagues (1999) examined the relationship between anxiety and allergies and found that in both children and adults the prevalence rates of an anxiety disorder (an ICD-9 code of panic disorder, generalized anxiety disorder, simple phobia, social phobia, obsessive-compulsive disorder, posttraumatic stress disorder, agoraphobia, or other phobia) was higher than healthy controls. Additional research has examined the relationship between allergic diseases and specific anxiety disorder. In this vein, Kovalenko and colleagues (2001) looked at the prevalence of anxiety disorders in children with allergies and found an association between children with allergies and panic disorder, such that children with allergies had higher rates of panic disorder. Similarly, Patten and Williams (2007) found that adults

with non-food allergies have higher prevalence of panic disorder and social phobia than healthy controls.

Although adult research is sparse, researchers have begun to elucidate the relationship between allergies and anxiety disorders. This literature indeed suggests that children and adults with allergies have an increased prevalence for anxiety disorders and anxiety symptoms comparative to healthy controls. In the following section, the literature on HRQOL in individuals with allergies is reviewed.

Allergies and Quality of Life

To better understand how allergies impact individual's daily lives, QOL has also been examined. As noted previously, QOL is a broad construct examining an individual's goals, expectations, and position in life in relation to culture and beliefs (WHO, 1993). HRQOL is a further extension of QOL, examining the influence of illnesses and diseases as they affect the emotional, physical, and social functioning of an individual (Ware & Sherbourne, 1992).

Consequently, researchers have examined the difference between healthy controls and individuals with allergies to understand the impact the disease has on HRQOL. Researchers have found that individuals with allergies have significantly lower HRQOL in comparison to healthy controls (Bousquet et al, 1994; Metzler et al, 1997). Additionally, in an interesting allergen exposure task, where adults with allergies were exposed to specific allergic triggers, Ellis and colleagues (1999) found that participants had lower HRQOL during the allergen task than before. In addition, Schatz (2007) looked at the HRQOL of adolescents and adults and found that individuals with allergies rated their symptoms as more severe than physician's ratings, and, those individuals with

more symptomatic days had lower HRQOL. This would imply that objective measures (physician report) of allergy severity may not truly reveal the impact of the disease on every individual; however, the patient reported severity (number of symptomatic days) may indeed relate to HRQOL.

In addition to decreased levels of HRQOL, research has examined the impact of allergies on work/school performance and attendance, aspects typically measured by HRQOL domains. In the Allergies in America survey, researchers found that 85% of surveyed individuals indicated allergies affected their lives; overall, allergies interfered with productivity at work in over half of the participants (HealthStar Communications, Schulman, Ronca, & Bucuvalas Inc., 2006). The adults also indicated that, on average, their productivity at work decreased by 23% when their symptoms were severe (HealthStar Communications et al, 2006). Lamb and colleagues (2006) calculated the total loss of productivity in 2006 due to allergies by incorporating the days of work missed and unproductive work time and found that $593 was lost per individual due to allergic diseases. These findings are further corroborated by Wallace and colleagues (2008), who found that over 2 million school days and 3.5 million workdays are missed annually due to allergic rhinitis. This data clearly shows the impact of the disease on individuals' day to day functioning, and the various aspects of their lives the disease can affect.

Other researchers have examined HRQOL in individuals with allergies in comparison with other chronic diseases. Jolicoeur and colleagues (1994) examined impairment and quality of life in college students with allergies and with asthma, finding that students with allergies displayed greater impairment in their daily activities and

academic functioning than college students with asthma or those with both asthma and allergies. These findings suggest the importance of understanding the implications of allergies on the HRQOL of individuals with the disease.

Overall the literature demonstrates reduced levels of HRQOL in children and adults with allergies, with the burden of the disease exemplified by the interference with productivity and absenteeism at work or school. The following section examines a model that can help understand the psychosocial functioning of individuals with allergies and with asthma.

## Rolland's Family Systems – Illness Model

Rolland's family systems illness (FSI) model may be used to help explain the psychosocial functioning in individuals with asthma and with allergies. This model classifies chronic illnesses based on the psychosocial typology of illness, developmental time phases of the illness, and family system variables (Rolland, 1987). The model further conceptualizes the typology of chronic illnesses into four categories, onset, course, outcome, and incapacitation (Rolland, 1987). Onset of the disease is categorized by acute or gradual, while the course of the disease is progressive, constant, or relapsing. The outcome of the disease can be no effect, shortened life span, or death, while incapacitation is either present or absent (Rolland, 1987). By classifying chronic illnesses in this manner, the model aims to better understand the relationship between the illness and psychosocial functioning. Besides these categories, the model also looks at the development and phases of the illness: crisis, chronic, and terminal (Rolland, 1987). These time phases were developed to better understand the implications of the chronic illness for the individual. The crisis phase describes when the individual becomes

oriented to the diagnosis of illness and begins to adjust to this change. The chronic phase is the period of time between the initial adjustment to the illness and the progression to the terminal phase, where the individual maintains functioning in spite of the chronic illness. The last phase or terminal phase is when the individual begins to prepare for death. As an individual is diagnosed with an illness, the model incorporates these phases into understanding the psychosocial functioning of the affected individual. Lastly, the model includes aspects of how family dynamics and family involvement impact the psychosocial adjustment of the individual with the illness and the family unit such as culture, family development, and belief systems (Rolland, 1987.)

Figure 1. Rolland's Family Systems – Illness Model

| | | INCAPACITATING | | NONINCAPACITATING | |
|---|---|---|---|---|---|
| | | ACUTE | GRADUAL | ACUTE | GRADUAL |
| FATAL | PROGRESSIVE | | Lung cancer with central nervous system metastases<br>AIDS<br>Bone marrow failure<br>Amyotrophic lateral sclerosis | Acute leukemia<br>Pancreatic cancer<br>Metastatic breast cancer<br>Malignant melanoma<br>Lung cancer<br>Liver cancer | Cystic fibrosis* |
| | RELAPSING | | | Incurable cancers in remission | |
| POSSIBLY FATAL SHORTENED LIFE SPAN | PROGRESSIVE | | Emphysema<br>Alzheimer's disease<br>Multiinfarct dementia<br>Multiple sclerosis (late)<br>Chronic alcoholism<br>Huntington's chorea<br>Scleroderma | | Juvenile diabetes*<br>Malignant hypertension<br>Insulin-dependent adult-onset diabetes |
| | RELAPSING | Angina | Early multiple sclerosis<br>Episodic alcoholism | Sickle cell disease*<br>Hemophilia* | Systemic lupus erythematosus* |
| | CONSTANT | Stroke<br>Moderate/severe myocardial infarction | Phenylketonuria and other congenital errors of metabolism | Mild myocardial infarction<br>Cardiac arrhythmia | Hemodialysis-treated renal failure<br>Hodgkin's disease |
| NON FATAL | PROGRESSIVE | | Parkinson's disease<br>Rheumatoid arthritis<br>Osteoarthritis | | Noninsulin-dependent adult-onset diabetes |
| | RELAPSING | Lumbosacral disc disorder | | Kidney stones<br>Gout<br>Migraine<br>Seasonal allergy<br>Asthma<br>Epilepsy | Peptic ulcer<br>Ulcerative colitis<br>Chronic bronchitis<br>Irritable bowel syndrome<br>Psoriasis |
| | CONSTANT | Congenital malformations<br>Spinal cord injury<br>Acute blindness<br>Acute deafness<br>Survived severe trauma and burns<br>Posthypoxic syndrome | Nonprogressive mental retardation<br>Cerebral palsy | Benign arrhythmia<br>Congenital heart disease | Malabsorption syndromes<br>Hyper/hypothyroidism<br>Pernicious anemia<br>Controlled hypertension<br>Controlled glaucoma |

Figure 1. Classification of chronic illnesses by psychosocial typology From: Rolland, J.S. (1987).

The FSI model has been used with chronic illnesses to explain how disease characteristics can present differing constraints on individuals and family, and how these constraints may produce variability in the psychosocial functioning of the individuals and families affected by the chronic illness (Andrews, 2009; Hullmann, 2010). As but one example, in a study examining psychosocial functioning in adolescent cancer survivors, Rait and colleagues (1992) found that the family involvement and cohesion impacted the future functioning of the cancer survivor, thus, showing the influence of the family on the psychosocial adjustment of the individual with a chronic illness.

Furthermore, this typology of illnesses helps clarify the relationship between different chronic illnesses and the psychosocial functioning of individuals with these illnesses. Within this model, allergies and asthma fall within the same grouping, with both diseases having acute onset, episodic course, non-fatal outcome, and are non-incapacitating (Rolland, 1987). This model could help explain the psychosocial adjustment in individuals with allergies and with asthma, such that individuals with asthma and with allergies present analogous psychosocial functioning.

## Chapter Summary

In summary, both asthma and allergies are highly prevalent chronic illnesses, with millions of individuals in the United States affected. Although the mortality from both diseases is low, the high levels of morbidity further underscore the need to understand these diseases. Previous researchers have examined some of the psychosocial effects of the diseases independently and found that individuals have increased depressive and anxiety symptoms and lower HRQOL than healthy controls (e.g. Adams et al, 2004;

Cuffel et al, 1999). However, the relationship between individuals with asthma and with allergies and the impact of psychosocial functioning in comparison to healthy controls is still relatively indistinct.

# CHAPTER III

## THE PRESENT STUDY

The previous literature demonstrates evidence of negative psychosocial outcomes in a consistent subset of individuals with asthma and with allergies. These pejorative outcomes include increased depressive and anxiety symptoms as well as lower HRQOL in individuals with asthma and with allergies. Although anxiety and depressive symptoms in individuals with asthma and with allergies have been previously examined in preliminary studies (e.g. Adams et al, 2004; Cuffel et al, 1999; Kagan et al, 1991), often the symptoms were studied as a single construct, thus clouding the relationship between the chronic illness and specific psychosocial construct. Additionally, much of the HRQOL literature in individuals with allergies examines children with specific allergens, or on the implications of medication usage on asthma or allergy symptoms. Furthermore, the adolescent and young adult (AYA) population is understudied in chronic illnesses, as research mostly focuses on either younger children or older adults with chronic illnesses.

Although researchers have provided preliminary work on the psychological aspects affecting individuals with asthma and with allergies, their research has rarely examined the relationship between asthma and allergies and the psychological impacts of these chronic illnesses in relation to healthy controls. Using Rolland's typology for

chronic illnesses, individuals with asthma and with allergies should express analogous negative psychosocial outcomes. Thus, the current study expanded upon the current research to understand the psychosocial functioning of AYAs with asthma and AYAs with allergies in comparison with healthy AYAs.

The following aims and hypotheses guided this research:

Aim 1: To examine the rates of psychological distress, specifically depressive symptoms and anxiety symptoms, between AYAs with allergies, with asthma, and healthy controls.

Hypothesis 1: It was hypothesized that AYAs with asthma and AYAs with allergies would have higher levels of anxiety symptoms than the healthy controls.

Hypothesis 2: It was hypothesized that AYAs with asthma and AYAs with allergies would have higher levels of depressive symptoms than the healthy controls.

Hypothesis 3: It was hypothesized that there would be no difference between the levels of anxiety and depressive symptoms in AYAs with allergies or asthma.

Aim 2: To examine emotional and physical quality of life between AYAs with allergies, with asthma, and healthy controls.

Hypothesis 4: It was hypothesized that AYAs with asthma and AYAs with allergies would report lower physical and emotional quality of life than the healthy controls.

Hypothesis 5: It was hypothesized that there would be no difference between the emotional or physical quality of life in AYAs with allergies or asthma.

To test these hypotheses, de-identified, archival data from a large sample of AYAs with allergies, with asthma, and with no chronic illnesses was examined. Each participant completed a demographic form in addition to measures of anxiety symptomatology, depressive symptomatology, and health-related quality of life. The following chapter expands upon the method, participants, and procedure.

# CHAPTER IV

# METHODOLOGY

## Participants

Adolescents and young adults (AYAs) diagnosed with either allergies (*N* = 120*)*, asthma (*N* = 120*)*, or no chronic illness (*N* = 120*)* were recruited from two larger ongoing studies examining the psychosocial functioning of college students with chronic health conditions. Informed consent and the study protocol were explained and obtained prior to beginning any procedures. The participants were matched on age, sex, and ethnicity following data collection. When an exact match on age was not found, a participant with the closest age was chosen as the match. As such, nonsignificant variability was observed in the age of the participants across samples. AYAs with allergies ranged from 18-25 years old (*M* = 19.59, *SD* = 1.59*)*, as did AYAs with asthma (*M* = 19.59, *SD* = 1.43*)*, and healthy AYAs ranged from 18 to 29 years old (*M* = 19.57, *SD* = 1.55*)*. The majority of participants were female (58.3%) and most self-identified as Caucasian (74.2%). Participants also self-identified as African American (6.7%), Native American (11.7%), Multiracial (4.2%), Hispanic (1.7%),, and Other (1.7%). The ethnic breakdown of the current sample is consistent with the ethnic distribution of the university in which this study was conducted.

## Measures

Demographic Questionnaire.

A demographic questionnaire was completed and provided information regarding the participant's age, sex, ethnicity, education level, and illness information (illness type, age of onset, self-report severity, and treatment methods).

Center for Epidemiologic Studies Depression Scale (CES-D). The CES-D is a 20-item self-report measure developed to assess depressive symptoms (Radloff, 1977). For each item, the participant designates whether he or she has experienced the symptom within the last week. Each of the items is ranked on a 4-point Likert scale ranging from occurring 'rarely or none of the time' to 'most or all of the time'. Responses from all 20 items were combined to calculate a total score; this total score was used to determine level of depressive symptomatology. Total scores on the CES-D range from 0 – 60, with higher scores representing greater levels of depression, and scores above 16 demonstrating a clinically significant level of distress. A high level (.85-.90) of internal consistency reliability has been demonstrated with the CES-D (Radloff, 1971). Cronbach's alpha for the CES-D total score for the current sample was .908.

Zung Self-Rating Anxiety Scale (SAS). The SAS is a 20-item self-report measure developed to assess anxiety symptoms (Zung, 1971). For each item, the participant indicates whether he or she has experienced the symptom within the last week. Each of the items is ranked on a 4-part Likert scale ranging from occurring 'none or a little of the time' to 'most of the time'. Responses from all 20 items were combined to calculate a total score; this total score was used to determine the level of anxiety symptomatology each participant exhibits. Scores on the SAS range from 20 – 80, with 20 – 44 signifying normal anxiety levels, 45 – 59 signifying mild to moderate anxiety levels, 60 – 74

signifying severe anxiety levels, and 75 – 80 signifying extreme anxiety levels. A high level (.71) of internal consistency reliability has been demonstrated with the SAS (Zung, 1971). Cronbach's alpha for the SAS total score for the current sample was .860.

SF-36 Health Survey Questionnaire (SF-36). The SF-36 is a widely utilized 36-item self-report measure of health-related quality of life (HRQOL) and general health status. This measure assesses health status across eight domains: physical functioning, role limitations due to physical health, bodily pain, general health perceptions, vitality, social functioning, role limitation due to emotional problems, and mental health. Scores from the SF-36 range from 0 (poorest health status) to 100 (best health status). The questionnaire yields a score for each domain, including a Physical Component Summary Score (PCS), a Mental Component Summary Score (MCS), and an overall score encompassing all eight domains. The PCS is comprised of physical functioning, role-physical, bodily pain, and general health domains. The MCS is comprised of vitality, social functioning, role-emotional, and mental health domains. Both the PCS and MCS were used in this study to determine the quality of life for each participant. A high level (.91) of internal consistency reliability has been demonstrated within the SF-36 (Bousquet, et al., 1994). Cronbach's alpha for the SF-36 summary score for the current sample was .880.

## Procedure

The participants were recruited from an online participant pool for undergraduate students at a large Midwestern university. Participant self-identified themselves as having asthma, allergies, or no chronic illnesses. The participants with asthma were recruited online, and then came to the laboratory to complete the study measures as part

of a larger study examining psychosocial adjustment in college students with chronic illnesses. Those participants with allergies and no chronic illnesses were both be recruited online and completed the study measures online as part of a larger study examining psychosocial adjustment in college students with and without allergies. Although the data collection method varies as the asthma participants completed the measure in person while the allergy and healthy participants completed the measures online, research has shown that web-based surveys are compatible and consistent with results from in-person surveys (Buchanan & Smith, 1999; Gosling, Vazire, Srivastave, & John, 2004). Both studies were IRB- approved, and all the participants received research credit for an undergraduate class for participating in the study.

# CHAPTER V

# RESULTS

## *Preliminary Analyses*

Descriptive information (i.e., range, mean, and standard deviation) for the variables of interest can be found in Table 1. After examining the distribution of the data for each of the variables of interest, the data were within the parameters established by Tabachnick and Fidell for both skewness and kurtosis (2007). Additionally, a series of bivariate correlations was conducted to determine the relationship between demographic variables (i.e., age, sex, and ethnicity) and outcome variables (i.e., CES-D Total Score, SAS Total Score, and SF-36 PCS and MCS); results are depicted in Table 2. Because of the significant correlation identified between SAS and CES-D total scores to both the SF-36 MCS and SF-36 PCS, the SAS and CES-D total scores were used as covariates in the analyses of SF-36 MCS and SF-36 PCS. In the following ANOVA analyses, the Welch procedure was used if the data violated the homogeneity of variances assumption.

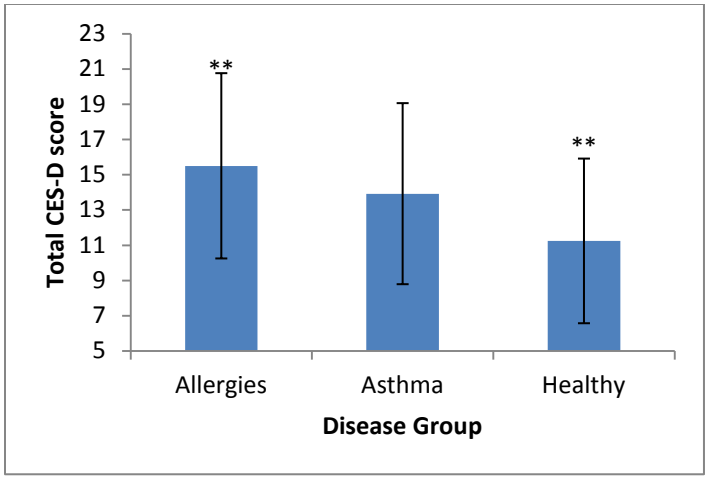
An ANOVA (Analysis of Variance; allergies vs. asthma vs. healthy) was conducted to examine differences among the disease groups for clinical cutoff scores for anxiety and depressive symptoms. The percentages and number of participants reporting clinically significant levels of depression and anxiety can be found in Table 3. A clinical cutoff score of 16 or greater (Radloff, 1977) was used to determine clinically significant

depressive symptoms, while a clinical cutoff score of 45 or greater (Zung, 1971) was used to determine clinically significant anxiety symptoms. Results revealed significant differences between the groups for the CES-D total score, $F(2, 237.02) = 5.156$, $p = .006$, such that the number of AYAs with allergies reporting depressive symptoms in the clinical range was significantly greater than the number of healthy AYAs. The number of AYAs with asthma did not differ significantly from AYAs with allergies or healthy AYAs on depressive symptoms. For the SAS total score, the results revealed significant differences between the groups, $F(2, 212.36) = 10.876$, $p < .001$, with post hoc comparisons indicating that the number of AYAs with allergies reporting anxious symptoms in the clinical range was significantly greater than the number of healthy AYAs and greater than the number of AYAs with asthma. The number of AYAs with asthma did not differ significantly from the healthy AYAs on anxious symptoms.

*Primary Analyses*

To address aim 1 and test the hypotheses that AYAs with asthma and AYAs with allergies have higher levels of anxiety and depressive symptoms than healthy controls, and that AYAs with asthma and AYAs with allergies do not differ on anxiety or depressive symptoms, two one-way ANOVAs (Analysis of Variance; allergies vs. asthma vs. healthy) were conducted across the disease groups using total scores on the CES-D and SAS. For depressive symptoms, results revealed significant differences between the groups, $F(2, 357) = 5.504$, $p = .004$, *partial* $\eta^2 = .030$, *observed power* = .853. Tukey's post hoc comparisons indicated that AYAs with allergies had significantly higher levels of depressive symptoms than healthy AYAs. AYAs with asthma did not differ significantly from AYAs with allergies, or healthy AYAs, see figure 2.

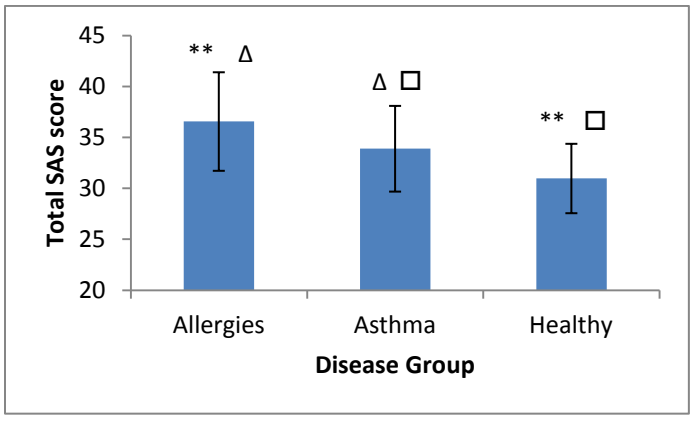
Figure 2. Total depression score across disease group




*Note*. CES-D = Center for Epidemiologic Studies Depression Scale. ** $p < .01$

For anxiety symptoms, a Welch test was used to adjust for violation of the homogeneity of variance. The results revealed significant differences between the groups, $F(2, 233.02) = 14.041$, $p < .001$, *partial* $\eta^2 = .070$, *observed power* = .996. Tukey's post hoc comparisons indicated that AYAs with allergies had significantly higher levels of anxiety symptoms than healthy AYAs, and AYAs with allergies had significantly higher levels of anxiety symptoms then AYAs with asthma. Additionally, AYAs with asthma had significantly higher levels of anxiety symptoms than healthy AYAs, see figure 3.

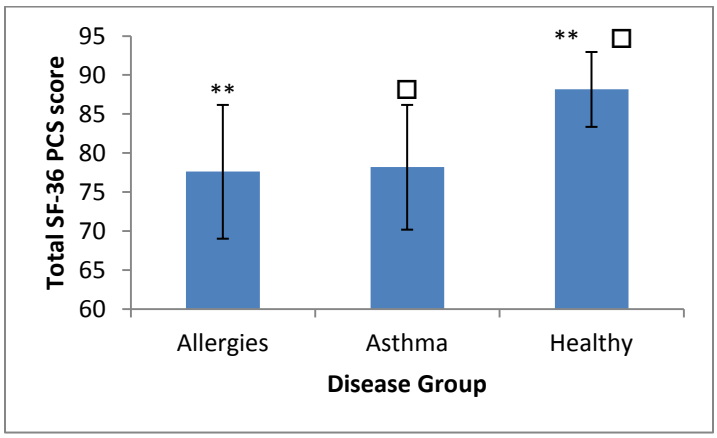
Figure 3. Total anxiety score across disease group




*Note:* SAS = Zung Self-Rating Anxiety Scale. ** $p < .01$, Δ $p < .05$, □ $p < .05$

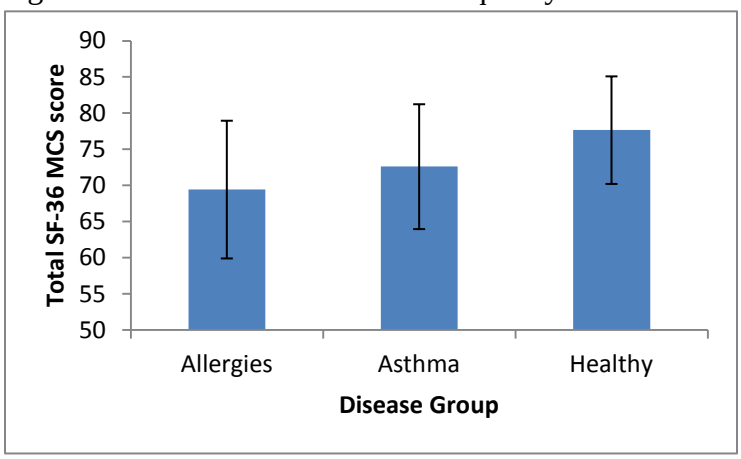
To address aim 2 and test the hypotheses that AYAs with asthma and AYAs with allergies have lower levels of mental and physical HRQOL than healthy controls, and that AYAs with asthma and AYAs with allergies do not differ on mental or physical HRQOL, two one-way ANCOVAs (Analysis of Covariance; allergies vs. asthma vs. healthy) were conducted across the disease groups on the SF-36 MCS and SF-36 PCS, which were used to assess mental and physical HRQOL, respectively, see figures 4 and 5.

Figure 4. Total physical health-related quality of life across disease group




*Note:* SF-36 PCS = SF-36 Health Survey Questionnaire Physical Component Summary Score. ** $p < .01$. □ $p < .01$

Figure 5.Total mental health-related quality of life across disease group




*Note:* SF-36 MCS = SF-36 Health Survey Questionnaire Mental Component Summary Score.

The total depressive and anxiety scores were used as covariates in each of the analyses after bivariate correlations revealed significant correlations to the SF-36 MCS and SF-36 PCS, respectably. For mental HRQOL, results revealed that the covariate, total depressive symptoms, was significantly related to the mental HRQOL, $F(1, 355) = 102.104$, $p < .001$, *partial* $\eta^2 = .223$, *observed power* = 1.0. Total anxiety symptoms were also significantly related to mental HRQOL, $F(1, 355) = 29.797$, $p < .001$, *partial* $\eta^2 = .077$, *observed power* = 1.0. There was no significant effect of disease group on mental HRQOL after controlling for depressive and anxiety symptoms, $p > .05$. For physical HRQOL, results revealed that the covariate, total depressive symptoms was not significantly related to the mental HRQOL, $p > .05$; however, total anxiety symptoms was significantly related to mental HRQOL, $F(1, 355) = 77.549$, $p < .001$, *partial* $\eta^2 = .179$, *observed power* = 1.0. There was also a significant effect of disease group on physical HRQOL after controlling for depressive and anxiety symptoms, $F(2, 355) = 10.457$, $p < .001$, *partial* $\eta^2 = .056$, *observed power* = .988. Using Bonferroni's adjustments, healthy AYAs had significantly higher physical HRQOL than AYAs with asthma, $p < .001$, and healthy AYAs had significantly higher physical HRQOL then AYAs with allergies, $p = .008$. AYAs with allergies did not statistically differ from AYAs with asthma on physical HRQOL, $p > .05$.

*Exploratory Analyses*

Previous studies have utilized the subscales for the SF-36 to better understand specific differences between the various domains (Ware & Sherbourne, 1992). Thus, to better elucidate how AYAs with asthma, with allergies, and healthy AYAs differed on each of the SF-36 subscales, exploratory one-way ANOVAs were conducted. Results

indicated a significant difference between the illness groups on the subscale of physical functioning, $F(2,150.73) = 9.35$, $p < .000$, such that AYAs with allergies ($M = 86.28$, $SD = 23.47$) and AYAs with asthma (M= 83.86, SD = 16.11) were experiencing poorer physical functioning than healthy AYAs ($M = 94.04$, $SD = 14.30$), AYAs with asthma did not differ from AYAs with allergies on physical functioning. Results indicated a significant difference between the illness groups on the subscale of role physical, $F(2,151.34) = 5.82$, $p = .004$, such that AYAs with allergies ($M = 79.81$, $SD = 24.07$) were experiencing poorer role physical than healthy AYAs ($M = 90.71$, $SD = 16.54$), AYAs with asthma did not differ from AYAs with allergies or healthy AYAs. Additionally, the results indicated a significant difference between the illness groups on the subscale of social functioning, $F(2,153.57) = 3.59$, $p = .03$, such that AYAs with allergies ($M = 77.53$, $SD = 23.80$) were experiencing poorer social functioning than AYAs with asthma ($M = 86.23$, $SD = 17.40$); healthy AYAs ($M = 84.81$, $SD = 20.28$) did not differ from AYAs with allergies or with asthma on social functioning. The results indicated a significant difference between the illness groups on the subscale of bodily pain, $F(2,145.71) = 11.85$, $p < .000$, such that AYAs with allergies ($M = 77.53$, $SD = 20.83$) and AYAs with asthma (M= 81.90, SD = 17.90) reported higher levels of bodily pain than healthy AYAs ($M = 89.43$, $SD = 11.52$); AYAs with asthma did not differ from AYAs with allergies on the subscale of bodily pain. Lastly, the results indicated a significant difference between the illness groups on the subscale of general health, $F(2,150.83) = 9.48$, $p < .000$, such that AYAs with allergies ($M = 67.67$, $SD = 21.06$) and AYAs with asthma (M= 66.49, SD = 21.90) were experiencing poorer general health than healthy AYAs ($M = 77.53$, $SD = 14.95$), while, AYAs with asthma did not differ from

AYAs with allergies on general health. There were no significant differences between the disease groups on the SF-36 subscales of mental health, vitality, or role emotional.

# CHAPTER V

# DISCUSSION

The current study sought to elucidate the differences in anxiety symptoms, depressive symptoms, and HRQOL in adolescents and young adults (AYAs) with allergies, AYAs with asthma, and healthy AYAs. It was hypothesized that AYAs with allergies and AYAs with asthma would exhibit higher levels of depressive and anxiety symptoms than healthy AYAs, and that AYAs with allergies and AYAs with asthma would exhibit poorer HRQOL than healthy AYAs. Our results partially supported these hypotheses, such that AYAs with allergies demonstrated higher levels of depressive symptoms than healthy AYAs, and AYAs with allergies having higher levels of anxiety symptoms than AYAs with asthma and healthy AYAs. AYAs with asthma had higher anxiety symptoms than healthy AYAs, while AYAs with allergies and AYAs with asthma demonstrated poorer physical HRQOL than healthy AYAs after controlling for anxiety and depressive symptoms. Collectively, these results suggest that AYAs with allergies are indeed experiencing psychosocial concerns on par with or even greater than AYAs with asthma. An examination of the means revealed that AYAs with allergies are actually experiencing greater anxiety and depressive symptoms as well as poorer mental and physical HRQOL than AYAs with asthma; however, statistical differences were only observed on anxiety symptoms.

Consistent with previous research (Fernandes et al, 2010; Gillaspy et al, 2002; Katon et al, 2007; Buske-Kirschbaum et al, 2008; Cuffel et al, 1999), AYAs with asthma and AYAs with allergies displayed higher levels of anxiety symptoms than the healthy controls. Notably, AYAs with allergies also displayed higher levels of anxiety symptoms than AYAs with asthma. Although speculative, this finding suggests that AYAs with allergies may be having increased difficultly managing aspects of their disease. In other words, these symptoms may be consequences of the symptoms allergies reflect increasing apprehension, worry, and dysporhia. Notably, treatment action plans are often developed for individuals with asthma; however, no such plans exist to help individuals with allergies plan and strategize the treatment of their symptoms (Douglass et al, 2002). Furthermore, many allergy sufferers believe they have to endure their symptoms, and that treatment options are only palliative in nature (Zellerbach, 2000).

The current findings are consistent with previous research, such that AYAs with allergies may be at risk for higher depressive symptoms in comparison to their healthy counterparts (Patten & Williams, 2007). However, inconsistent with previous research (Gillaspy et al, 2002; Seigel et al, 1990), AYAs with asthma did not demonstrate higher levels of depressive symptomatology than their healthy peers. Although speculative, perhaps the uncertainty of asthma symptoms may be more likely to lead to worry and anxiety symptoms as opposes to depressive symptoms. It may also be that the AYAs with asthma in this study largely evidenced only mild disease, and as a result, may not have experienced accompanying depressive symptoms related to disease severity.

Previous research has also found that AYAs with allergies and AYAs with asthma have lower mental and physical HRQOL (Adam et al, 2004; Schemier, Chan, & Leidy,

1998); however, many of these studies failed to control for anxiety and depressive symptoms. For mental HRQOL, we found that both anxiety and depression symptoms to be significantly related to each other; however, after controlling for anxiety and depressive symptoms, we did not find any group difference on mental HRQOL between AYAs with asthma, AYAs with allergies, and healthy AYAs. This suggests that the disease group differences in mental HRQOL may indeed be accounted by the differences in anxiety and depressive symptoms.

For physical HRQOL, we found that AYAs with allergies and AYAs with asthma have lower levels of physical HRQOL than their healthy counterparts after controlling for anxiety and depressive symptoms. This is consistent with previous research that shows individuals with asthma and individuals with allergies have poorer HRQOL than healthy controls (Bousquet, Bullinger et al, 1994, Bousquet, Knani et al, 1994). This also suggests that AYAs with asthma and AYAs with allergies may indeed be experiencing more difficulties with work, school, and daily activities, independent of any anxiety or depressive symptoms they may have. This finding underscores the burden of allergies and asthma on those individuals with these diseases (Nathan, 2007; Schatz, 2007; Barnett & Nurmagambetov, 2011).

Interestingly, the exploratory analyses showed that AYAs with allergies reported lower levels of social functioning than AYAs with asthma, but both AYAs with allergies and with asthma did not differ from healthy AYAs suggesting that AYAs with allergies are having greater difficulties with social functioning than AYAs with asthma. Again, while speculative, these results that AYAs with allergies have increased difficulties, especially with social functioning in comparison to AYAs with asthma. For the subscales

of physical functioning, role physical, bodily pain, and general health, AYAs with asthma and AYAs with allergies had significantly worse functioning than healthy AYAs which is consistent with previous research (Bousquet, Bullinger et al, 1994, Bousquet, Knani et al, 1994). The subscales of role emotional, vitality, mental health, and health transition did not differ across the illness groups, perhaps suggesting these aspects of HRQOL are more consistent across disease groups.

Important to note, high percentages of AYAs met the suggested clinical cutoffs based on their reported anxiety and depressive symptoms, especially AYAs with allergies, as 42.5 and 21.7 percent met the cutoffs for depressive and anxiety symptoms, respectively. This suggests that although we utilized a nonclinical population, AYAs are indeed having significant difficulties and that the psychosocial adjustment of AYAs with allergies and asthma should be assessed periodically as they transition to adulthood. Since the majority of AYAs treated for allergies and asthma are seen at primary care physicians or university health care settings, the healthcare professionals at these locations should assess for anxiety and depressive symptoms, as well as any other health-related concerns. Those individuals who are at risk for developing pejorative psychosocial adjustment outcomes may benefit from cognitive behavioral interventions to address their negative thoughts and behaviors.

There are several limitations to the current study. First the participants were recruited from a large Midwestern university, and as a non-clinical population, may not be representative of individuals with more severe symptoms. Despite the non-clinical nature of this population, there were high numbers of AYAs meeting clinical cutoffs for anxiety and depression. Next, the AYAs with asthma completed the study measures in

person, while the AYAs with allergies and healthy AYAs completed the study measures online. However, researchers have found that information collected online is of similar quality to information collected in person (Gosling, Vazire, Srivastava, & John, 2004). The asthma and allergies diagnoses were also self-reported and not confirmed with a physician report. Additionally, the psychosocial functioning was assessed using self-report measures, so the results may reflect shared method variance. Finally, the AYAs with allergies denied any history of asthma; however, the AYAs with asthma were not questioned regarding their allergy status.

Overall, the current study builds upon past research examining the impact of anxiety symptoms, depressive symptoms, and HRQOL of individuals with allergies and asthma. The results of the study fail to confirm Rolland's model that AYAs with allergies and asthma have similar psychosocial functioning. Perhaps medical advancements with the treatment of asthma over the last several decades have changed the characteristics and the disease is no longer comparable on onset, course, outcome, and incapacitation to allergies. The results from this study suggest a need for a revision to this model incorporating updated medical treatment advances since the model was developed. The current study adds to the literature in examining the relationship between AYAs with allergies and with asthma, specifically addressing the psychosocial functioning of young adults, an understudied population in chronic illness literature (Pai & Schwartz, 2011).

Future studies may benefit from examining cognitive appraisal variables, such as illness intrusiveness and illness uncertainty, which may impact the psychosocial functioning of AYAs with chronic illnesses (Fedele et al, 2009, Hommel, 2003). Additional studies may also want to examine the impact of illness severity in the

development of psychosocial functioning as past research suggests that illness severity may contribute to anxiety symptoms (Hommel et al, 2003). Finally, longitudinal examination of the relationship between severity, disease, and psychosocial functioning may be important for the development of specific interventions for individuals with allergies and asthma.

# REFERENCES


Adams, F. V. (2007). *The asthma sourcebook* (3rd ed.). New York: McGraw-Hill.

Adams, R. J., Wilson, D. H., Taylor, A. W., Daly, A., Tursan d'Espaignet, E., Dal Grande, E., & Ruffin, R. E. (2004). Psychological factors and asthma quality of life: a population based study. *Thorax, 59*(11), 930-935. doi:10.1136/thx.2003.010256.

Akinbami, L. J., Moorman, J. E., Garbe, P. L., & Sondik, E. J. (2009). Status of Childhood Asthma in the United States, 1980-2007. *Pediatrics, 123,* S131-S145. doi:10.1542/peds.2008-2233C.

American Psychiatric Association., & American Psychiatric Association. Task Force on DSM-IV. (2000). *Diagnostic and statistical manual of mental disorders : DSM-IV-TR* (4th ed.). Washington, DC: American Psychiatric Association.

Andrews, N. R., Chaney, J. M., Mullins, L. L., Wagner, J. L., Hommel, K. A., & Jarvis, J. N. (2009). The differential effect of child age on the illness intrusiveness--parent distress relationship in juvenile rheumatic disease. *Rehabilation Psychology, 54*(1), 45-50. doi:10.1037/a0014443.

Barnett, S. B., & Nurmagambetov, T. A. (2011). Costs of asthma in the United States: 2002-2007. *Journal of Allergy and Clinical Immunology, 127*(1), 145-152. doi:10.1016/j.jaci.2010.10.020.

Bell, I. R. (1992). Allergens, physical irritants, depression, and shyness. *Journal of Applied Developmental Psychology, 13,* 125-133. doi:10.1016/0193-3973(92)90022-A.

Bell, I. R., Jasnoski, M. L., Kagan, J., & King, D. S. (1990). Is allergic rhinitis more frequent in young adults with extreme shyness? A preliminary survey. *Psychosomatic Medicine, 52*(5), 517-525.

Bell, I. R., Jasnoski, M. L., Kagan, J., & King, D. S. (1991). Depression and allergies - survey of a nonclinical population. *Psychotherapy and Psychosomatics, 55*(1), 24-31.

Bennett, D. S. (1994). Depression among children with chronic medical problems: a meta-analysis. *Journal of Pediatric Psychology, 19*(2), 149-169. doi:10.1093/jpepsy/19.2.149.

Berger, W. E. (2003). Overview of allergic rhinitis. *Annals of Allergy, Asthma, and Immunology, 90*(6 Suppl 3), 7-12. doi:10.1016/S1081-1206(10)61653-5.

Blackman, J. A., & Gurka, M. J. (2007). Developmental and behavioral comorbidities of asthma in children. *Journal of Developmental and Behavioral Pediatrics, 28*(2), 92-99. doi:10.1097/01.DBP.0000267557.80834.e5.

Bloom, B., Cohen, R. A., & Freeman, G. (2010). Summary health statistics for U.S. children: National Health Interview Survey, 2009. *Vital Health Statatics 10*(247), 1-149.

Bloomberg, G. R., & Chen, E. (2005). The relationship of psychologic stress with childhood asthma. *Immunology and Allergy Clinics of North America, 25*(1), 83-105. doi:10.1016/j.iac.2004.09.001.

Bosley, C. M., Fosbury, J. A., & Cochrane, G. M. (1995). The psychological factors associated with poor compliance with treatment in asthma. *European Respiratory Journal, 8*(6), 899-904.

Bousquet, J., Bullinger, M., Fayol, C., Marquis, P., Valentin, B., & Burtin, B. (1994). Assessment of Quality-of-Life in Patients with Perennial Allergic Rhinitis with the French Version of the Sf-36 Health-Status Questionnaire. *Journal of Allergy and Clinical Immunology, 94*(2), 182-188. doi:10.1016/0091-6749(94)90038-8.

Bousquet, J., Knani, J., Dhivert, H., Richard, A., Chicoye, A., Ware, J. E., & Michel, F. B. (1994). Quality-of-Life in Asthma .1. Internal Consistency and Validity of the Sf-36 Questionnaire. *American Journal of Respiratory and Critical Care Medicine, 149*(2), 371-375.

Buchanan, T., & Smith, J. L. (1999). Using the Internet for psychological research: personality testing on the World Wide Web. *British Journal of Psychology, 90 ( Pt 1)*, 125-144. doi:10.1348/000712699161189.

Buske-Kirschbaum, A., Ebrecht, M., Kern, S., Gierens, A., & Hellhammer, D. H. (2008). Personality characteristics in chronic and non-chronic allergic conditions. *Brain Behavior and Immunity, 22*(5), 762-768. doi: 10.1016/j.bbi.2007.12.002

Carpentier, M. Y., Mullins, L. L., & Van Pelt, J. C. (2007). Psychological, academic, and work functioning in college students with childhood-onset asthma. *Journal of Asthma, 44*(2), 119-124. doi:10.1080/02770900601182418.

Chaney, J. M., Mullins, L. L., Uretsky, D. L., Pace, T. M., Werden, D., & Hartman, V. L. (1999). An experimental examination of learned helplessness in older adolescents

and young adults with long-standing asthma. *Journal of Pediatric Psychology, 24*(3), 259-270. doi:10.1093/jpepsy/24.3.259.

Cuffel, B., Wamboldt, M., Borish, L., Kennedy, S., & Crystal-Peters, J. (1999). Economic consequences of comorbid depression, anxiety, and allergic rhinitis. *Psychosomatics, 40*(6), 491-496.

DiMatteo, M. R., Lepper, H. S., & Croghan, T. W. (2000). Depression is a risk factor for noncompliance with medical treatment: meta-analysis of the effects of anxiety and depression on patient adherence. *Archives of Internal Medicine, 160*(14), 2101-2107. doi:10.1001/archinte.160.14.2101.

Douglass, J., Aroni, R., Goeman, D., Stewart, K., Sawyer, S., Thien, F., & Abramson, M. (2002). A qualitative study of action plans for asthma. *British Medical Journal, 324*(7344), 1003-1005. doi:10.1136/bmj.324.7344.1003.

Ellis, A. K., Day, J. H., & Lundie, M. J. (1999). Impact on quality of life during an allergen challenge research trial. *Annals of Allergy Asthma & Immunology, 83*(1), 33-39. doi:10.1016/S1081-1206(10)63510-7.

Fedele, D. A., Mullins, L. L., Eddington, A. R., Ryan, J. L., Junghans, A. N., & Hullmann, S. E. (2009). Health-related Quality of Life in College Students with and without Childhood-Onset Asthma. *Journal of Asthma, 46*(8), 835-840. doi: 10.3109/02770900903184229

Fernandes, L., Fonseca, J., Martins, S., Delgado, L., Pereira, A. C., Vaz, M., & Branco, G. (2010). Association of Anxiety With Asthma: Subjective and Objective Outcome Measures. *Psychosomatics, 51*(1), 39-46. doi:10.1176/appi.psy.51.1.39.

Gillaspy, S. R., Hoff, A. L., Mullins, L. L., Van Pelt, J. C., & Chaney, J. M. (2002).

Psychological distress in high-risk youth with asthma. *Journal of Pediatric Psychology, 27*(4), 363-371. doi:10.1093/jpepsy/27.4.363.

Goodwin, R. D., Castro, M., & Kovacs, M. (2006). Major depression and allergy: does neuroticism explain the relationship? *Psychosomatic Medicine, 68*(1), 94-98. doi: 10.1097/01.psy.0000195797.78162.f4

Gosling, S. D., Vazire, S., Srivastava, S., & John, O. P. (2004). Should we trust web-based studies? A comparative analysis of six preconceptions about internet questionnaires. *American Psychologist, 59*(2), 93-104. doi:10.1037/0003-066X.59.2.93.

HealthStarCommunications Inc., Schulman, Ronca, & Inc. (2006). *Allergies in America: A landmark survey of nasal allergy suffers: Adult*. Florham Park, NJ: Altana Pharma US.

Hommel, K. A., Chaney, J. M., Wagner, J. L., & McLaughlin, M. S. (2002). Asthma-specific quality of life in older adolescents and young adults with long-standing asthma: The role of anxiety and depression. *Journal of Clinical Psychology in Medical Settings, 9*(3), 185-192. doi:10.1023/A:1016066709714.

Hommel, K.A., Chaney, J.M., Wagner, J.L., White, M.M., Hoff, A.L., Mullins, L.L. (2003). Anxiety and depression in older adolescents with long-standing asthma: the role of illness uncertainty. *Childrens Health Care*, 32,51-63. doi:10.1207/S15326888CHC3201_4.

Hullmann, S. E., Wolfe-Christensen, C., Ryan, J. L., Fedele, D. A., Rambo, P. L., Chaney, J. M., & Mullins, L. L. (2010). Parental overprotection, perceived child

vulnerability, and parenting stress: a cross-illness comparison. *Journal of Clinical Psychology in Medical Settings, 17*(4), 357-365. doi: 10.1007/s10880-010-9213-4

Janson-Bjerklie, S., Ferketich, S., Benner, P., & Becker, G. (1992). Clinical markers of asthma severity and risk: importance of subjective as well as objective factors. *Heart Lung*, *21*(3), 265-272.

Jolicoeur, L. M., Boyer, J. G., Reeder, C. E., & Turner, J. (1994). Influence of asthma or allergies on the utilization of health care resources and quality of life of college students. *Journal of Asthma*, *31*(4), 251-267. doi:10.3109/02770909409089473.

Kagan, J., Snidman, N., Julia-Sellers, M., & Johnson, M. O. (1991). Temperament and allergic symptoms. *Psychosomatic Medicine, 53*(3), 332-340.

Katon, W., Lozano, P., Russo, J., McCauley, E., Richardson, L., & Bush, T. (2007). The prevalence of DSM-IV anxiety and depressive disorders in youth with asthma compared with controls. *Journal of Adolescent Health, 41*(5), 455-463. doi: 10.1016/j.jadohealth.2007.05.023

Katon, W. J., Richardson, L., Lozano, P., & McCauley, E. (2004). The relationship of asthma and anxiety disorders. *Psychosomatic Medicine*, *66*(3), 349-355. doi:10.1097/01.psy.0000126202.89941.ea.

Klein, J. S., & Yocum, M. W. (1995). Underreporting of Anaphylaxis in a Community Emergency Room. *Journal of Allergy and Clinical Immunology*, *95*(2), 637-638. doi:10.1016/S0091-6749(95)70329-2.

Kovalenko, P. A., Hoven, C. W., Wu, P., Wicks, J., Mandell, D. J., & Tiet, Q. (2001). Association between allergy and anxiety disorders in youth. *Australian and New*

*Zealand Journal of Psychiatry, 35*(6), 815-821. doi:10.1046/j.1440-1614.2001.00961.x.

Lamb, C. E., Ratner, P. H., Johnson, C. E., Ambegaonkar, A. J., Joshi, A. V., Day, D., . . . Eng, B. (2006). Economic impact of workplace productivity losses due to allergic rhinitis compared with select medical conditions in the United States from an employer perspective. *Current Medical Ressearch Opinion, 22*(6), 1203-1210. doi: 10.1185/030079906X112552

Marshall, P. S., & Colon, E. A. (1993). Effects of allergy season on mood and cognitive function. *Annals of Allergy, 71*(3), 251-258.

Marshall, P. S., O'Hara, C., & Steinberg, P. (2002). Effects of seasonal allergic rhinitis on fatigue levels and mood. *Psychosomatic Medicine, 64*(4), 684-691. doi: 10.1097/01.psy.0000021944.35402.44

McCauley, E., Katon, W., Russo, J., Richardson, L., & Lozano, P. (2007). Impact of anxiety and depression on functional impairment in adolescents with asthma. *General Hospital Psychiatry, 29*(3), 214-222. doi: 10.1016/j.genhosppsych.2007.02.003

McCrory, D. C., Williams, J. W., Dolor, R. J., Gray, R. N., Kolimaga, J. T., Reed, S., . . . Witsell, D. L. (2003). Management of allergic rhinitis in the working-age population. *Evidence Report & Technology Assessment (Summ)*(67), 1-4.

Meltzer, E. O., Nathan, R. A., Selner, J. C., & Storms, W. (1997). Quality of life and rhinitic symptoms: Results of a nationwide survey with the SF-36 and ROLO questionnaires. *Journal of Allergy and Clinical Immunology, 99*(6), S815-S819. doi:10.1016/S0091-6749(97)80041-3.

Messias, E., Clarke, D. E., & Goodwin, R. D. (2010). Seasonal allergies and suicidality: results from the National Comorbidity Survey Replication. *Acta Psychiatrica Scandinavica, 122*(2), 139-142. doi: 10.1111/j.1600-0447.2009.01518.x.

Moorman, J. E., Rudd, R. A., Johnson, C. A., King, M., Minor, P., Bailey, C., . . . Akinbami, L. J. (2007). National surveillance for asthma--United States, 1980-2004. *MMWR Surveilancel Summaries, 56*(8), 1-54.

Naclerio, R. M. (1991). Allergic rhinitis. *New England Journal of Medicine, 325*(12), 860-869. doi: 10.1056/NEJM199109193251206

Nathan, R.A. (2007). The burden of allergic rhinitis. *Allergy and Asthma Proceedings, 28,* 3-9.

Neugut, A. I., Ghatak, A. T., & Miller, R. L. (2001). Anaphylaxis in the United States: an investigation into its epidemiology. *Archives of Internal Medicine, 161*(1), 15-21. doi:10.1001/archinte.161.1.15.

NIAID. (2003). Airborne Allergens: Something in the air. NIH Publication No. 03-7045.

NIH. (2007). Expert Panel Report 3 (EPR-3): Guidelines for the diagnosis and management of asthma-summary report 2007. *Journal of Allergy & Clinical Immunology, 120*(5 Suppl), S94-138. doi: 10.1016/j.jaci.2007.09.043

Opolski, M., & Wilson, I. (2005). Asthma and depression: a pragmatic review of the literature and recommendations for future research. *Clinical Practice & Epidemiology in Mental Health, 1,* 18. doi: 10.1186/1745-0179-1-18

Ortega, A. N., Huertas, S. E., Canino, G., Ramirez, R., & Rubio-Stipec, M. (2002). Childhood asthma, chronic illness, and psychiatric disorders. *Journal of Nervous and Mental Disease, 190*(5), 275-281. doi:10.1097/00005053-200205000-00001.

Padur, J. S., Rapoff, M. A., Houston, B. K., Barnard, M., Danovsky, M., Olson, N. Y., . . . Lieberman, B. (1995). Psychosocial adjustment and the role of functional status for children with asthma. *Journal of Asthma, 32*(5), 345-353. doi:10.3109/02770909509082759.

Pai, A. & Schwartz, L. (2011). Introduction to the special section: Health care transitions of adoelscents and young adults with pediatric chronic conditions. *Journal of Pediatric Psychology, 36*(2), 129-133. doi:10.1093/jpepsy/jsq100.

Patten, S. B., Williams, J. V., Lavorato, D. H., & Eliasziw, M. (2009). Allergies and major depression: A longitudinal community study. *Biopsychosocial Medicine, 3*, 3. doi: 10.1186/1751-0759-3-3

Patten, S. B., & Williams, J. V. A. (2007). Self-reported allergies and their relationship to several axis I disorders in a community sample. *International Journal of Psychiatry in Medicine, 37*(1), 11-22. doi:10.2190/L811-0738-10NG-7157.

Perez-Yarza, E. G. (1996). Adolescent asthma. Introduction. *Thorax, 51 Suppl 1*, S1. doi:10.1136/thx.51.Suppl_1.S1.

Pleis, J. R., & Lethbridge-Cejku, M. (2007). Summary health statistics for U.S. adults: National Health Interview Survey, 2006. *Vital Health Statistics 10*(235), 1-153.

Pleis, J. R., Ward, B. W., & Lucas, J. W. (2010). Summary health statistics for U.S. adults: National Health Interview Survey, 2009. *Vital Health Statistics 10*(249), 1-259.

Radloff, L. S. (1977). Depressed woman: Study in social relationships. *Sex Roles, 3*(4), 405-407. doi:10.1007/BF00289563.

Rait, D. S., Ostroff, J. S., Smith, K., Cella, D. F., Tan, C., & Lesko, L. M. (1992). Lives in a balance: Perceived family functioning and the psychosocial adjustment of adolescent cancer survivors. *Family Process, 31*(4), 383-397. doi:10.1111/j.1545-5300.1992.00383.x.

Richardson, L. P., Lozano, P., Russo, J., McCauley, E., Bush, T., & Katon, W. (2006). Asthma symptom burden: Relationship to asthma severity and anxiety and depression symptoms. *Pediatrics, 118*(3), 1042-1051. doi: 10.1542/peds.2006-0249

Rolland, J. S. (1987). Chronic illness and the life cycle: A conceptual framework. *Family Process, 26*(2), 203-221. doi:10.1111/j.1545-5300.1987.00203.x.

Roy K.M., Wu, Y.P., & Roberts, M.C. (2009) Allergic reactions in children: Implications for pediatric psychology. In Roberts M.C. & Steele R.G., (eds.) *Handbook of Pediatric Psychology* (4th ed). New York, NY: Guilford ,755-762.

Schatz, M. (2007). A survey of the burden of allergic rhinitis in the USA. *Allergy, 62*, 9-16. doi:10.1111/j.1398-9995.2007.01548.x.

Schmier, J. K., Chan, K. S., & Leidy, N. K. (1998). The impact of asthma on health-related quality of life. *Journal of Asthma, 35*(7), 585-597. doi:10.3109/02770909809048961.

Seigel, W.M., Golden, N.H., Gough, J.W., Lashley, M.S., & Sacker, I.M. (1990). Depression, self-esteem, and life events in adolescents with chronic diseases.*Journal of Adolesecent Health, 11*, 501-504.

Silverglade, L., Tosi, D. J., Wise, P. S., & D'Costa, A. (1994). Irrational beliefs and emotionality in adolescents with and without bronchial asthma. *Journal of General Psychology, 121*(3), 199-207. doi:10.1080/00221309.1994.9921196.

Soni, A. (2008). Allergic rhinitis: Trends in use and expenditures, 2000 and 2005. Statistical Breief #204. Agency for Healthcare Research and Quality, Rockville, MD.

Soni, A. (2009a). *The five most costly conditions, 1996 and 2006: Estimates for the U.S. civilian noninstitutionalized population*. Statistical Brief #248. Agency for Healthcare Research and Quality, Rockville, MD.

Soni, A. (2009b). *The five most costly children's conditions, 2006: Estimates for the U.S. civilian noninstitutionalized children, Ages 0–17*. Statistical Brief # 242. Agency for Healthcare Research and Quality, Rockville, MD.

Stempel, D. A., & Woolf, R. (2002). The cost of treating allergic rhinitis. *Current Allergy & Asthma Reports, 2*(3), 223-230. doi:10.1007/s11882-002-0023-0.

Strine, T. W., Mokdad, A. H., Balluz, L. S., Berry, J. T., & Gonzalez, O. (2008). Impact of depression and anxiety on quality of life, health behaviors, and asthma control among adults in the United States with asthma, 2006. *Journal of Asthma, 45*(2), 123-133. doi: 10.1080/02770900701840238

Study protocol for the World Health Organization project to develop a Quality of Life assessment instrument (WHOQOL). (1993). *Quality of Life Research, 2*(2), 153-159. doi:10.1016/0010-7824(93)90090-T.

Sullivan, P. W., Ghushchyan, V. H., Slejko, J. F., Belozeroff, V., Globe, D. R., & Lin, S. L. (2011). The burden of adult asthma in the United States: evidence from the

Medical Expenditure Panel Survey. *Journal of Allergy & Clinical Immunology, 127*(2), 363-369 e361-363. doi:10.1016/j.jaci.2010.10.042

Tabachnick, B.G. & Fidell, L.S. (2007). *Using Multivariate Statisitcs* (Fifth Edition). Boston: Pearson/Allyn & Bacon.

Teufel, M., Biedermann, T., Rapps, N., Hausteiner, C., Henningsen, P., Enck, P., & Zipfel, S. (2007). Psychological burden of food allergy. *World Journal of Gastroenterology, 13*(25), 3456-3465.

Vila, G., Nollet-Clemencon, C., de Blic, J., Mouren-Simeoni, M. C., & Scheinmann, P. (2000). Prevalence of DSM IV anxiety and affective disorders in a pediatric population of asthmatic children and adolescents. *Journal of Affective Disorders, 58*(3), 223-231. doi:10.1016/S0165-0327(99)00110-X.

Wallace, D. V., Dykewicz, M. S., Bernstein, D. I., Blessing-Moore, J., Cox, L., Khan, D. A., . . . Tilles, S. A. (2008). The diagnosis and management of rhinitis: an updated practice parameter. *Journal of Allergy & Clinical Immunology, 122*(2 Suppl), S1-84. doi: 10.1016/j.jaci.2008.06.003

Wamboldt, M. Z., Hewitt, J. K., Schmitz, S., Wamboldt, F. S., Rasanen, M., Koskenvuo, M., . . . Kaprio, J. (2000). Familial association between allergic disorders and depression in adult Finnish twins. *American Journal of Medical Genetics, 96*(2), 146-153. doi:10.1002/(SICI)1096-8628(20000403)96:2<146::AID-AJMG4>3.0.CO;2-J.

Ware, J. E., Jr., & Sherbourne, C. D. (1992). The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Medical Care, 30*(6), 473-483. doi:10.1097/00005650-199206000-00002.

Weiss, K. B., Gergen, P. J., & Hodgson, T. A. (1992). An economic evaluation of asthma in the United States. *New England Journal of Medicine, 326*(13), 862-866. doi: 10.1056/NEJM199203263261304

WHO. (1993). Study protocol for the World Health Organization project to develop a Quality of Life assessment instrument. *Quality of Life Research 2*(2), 153-159. doi: 10.1007/BF00435734.

Zellerbach, M. (2000). *The allergy sourcebook : everything you need to know* (Newly rev. 3rd ed.). Los Angeles: Lowell House.

Zung, W. W. (1971). A rating instrument for anxiety disorders. *Psychosomatics, 12*(6), 371-379. doi:10.1002/1097-4679(197104)27:2<247::AID-JCLP2270270230>3.0.CO;2-6.

# APPPENDICES

.

## Appendix A

## MEASURES

Demographic Form - Asthma

Demographic Form – Allergies

Center for Epidemiologic Studies Depression Scale (CES-D)

Zung Self-Rating Anxiety Scale (SAS)

SF-36 Health Survey

**Demographic Information – Asthma**

Participant #:_____

BACKGROUND INFORMATION

1. Age: _____

2. Sex: M F
   1 2

3. Race
   1 African-American
   2 Native American/American-Indian
   3 Caucasian
   4 Hispanic
   5 Asian
   6 Biracial, please specify: _____
   7 Other, please specify: _____

4. Highest Level of Education Obtained:
   1 Middle School
   2 High School
   3 College (please indicate highest year completed)
      a. Freshman
      b. Sophomore
      c. Junior
      d. Senior
   4 College Degree
   5 Post-Graduate Degree

4a. What is your current (or intended) major? _____

4c. What is the highest math class you have taken?

1. Applications of Modern Mathematics (1493)
2. College Algebra (1513)
3. Trigonometry (1613)
4. Calculus (2103, 2123, 2133, 2144)
5. Calculus II or III (2153 or 2163)
6. 3000s level Math course
7. 4000s level Math course
8. Other, please specify:_____

4d. What grades do you usually receive in math?

As (100-90) Bs (89-80) Cs (79-70) Ds (69-60) Fs (59 or below) Not Sure

5. Marital Status: 1 Never Married
   2 Married

3 Divorced
4 Cohabitating/Living with Partner
5 Widowed
6 Other, please specify: _____

6. If married, spouse's occupation: _____

7. Parent's occupation: Father:_____ Mother: _____

8. Parent's highest level of education obtained:
Father: _____ Mother: _____

9. Do you live with your parents even part-time (including weekends or summers)? _____

10. Are you currently taking any psychoactive medication (e.g., antidepressants, anti-anxiety)?

| YES | NO |
|---|---|
| 1 | 2 |

11. Have you ever been treated by a physician for a medical condition for more than three consecutive months in any given year? (For example: May, June, and July, 1999)

| YES | NO |
|---|---|
| 1 | 2 |

12. Have you ever been hospitalized continuously for a medical condition for more than one month?

| YES | NO |
|---|---|
| 1 | 2 |

13. In the last hour, have you consumed any caffeine?

| YES | NO |
|---|---|
| 1 | 2 |

14. In the last hour, have you eaten a meal?

| YES | NO |
|---|---|
| 1 | 2 |

15. In the last hour, have you taken any medication?

| YES | NO |
|---|---|
| 1 | 2 |

If yes, what was the medication? _____

16. In the last hour, have you slept or taken a nap?

YES NO
1 2

17. Do you have a chronic illness?

YES NO
1 2

**IF NO, PLEASE ANSWER 17B AND THEN NOTIFY THE EXPERIMENTER. THANK YOU. IF YES, PLEASE GO ON TO QUESTION 18.**

17B. Please estimate the number of school and/or work days you missed during the last academic year (2008-2009) *for medical reasons*. (If you are a freshman in college and you were in high school during the 2008-2009 academic year, please refer to your senior year of high school. If you were not in school during the 2008-2009 academic year, please list days missed from work only.)

SCHOOL: _____

WORK: _____

18. Do you have asthma?

YES NO
1 2

If you have another chronic illness in addition to asthma, please specify the type or types of condition(s):_____

19. Have you or another family member ever received any type of psychological counseling or therapy?

YES NO
1 2

If yes, was your counseling related to your asthma?

YES NO
1 2

20. Are you currently taking any medications for your asthma?

YES NO
1 2

If yes, please specify the type of medication(s) and how frequently you take the medication(s):

Type Frequency

a. _____ _____

Is this medication an inhaler? YES or NO

Does this medication include steroids (i.e., corticosteroid or glucocorticoid)? YES or NO

or Not sure

Type Frequency
b. _____ _____
Is this medication an inhaler? YES or NO
Does this medication include steroids (i.e., corticosteroid or glucocorticoid)? YES or NO
or Not sure

Type Frequency
c. _____ _____

Is this medication an inhaler? YES or NO
Does this medication include steroids (i.e., corticosteroid or glucocorticoid)? YES or NO
or Not sure

21. At what age did you have your first asthma attack? _____

22. At what age were you diagnosed with asthma? _____
23. Are you presently receiving any medical treatment from a physician for your asthma?

| YES | NO |
|---|---|
| 1 | 2 |

If yes, please indicate the number of visits to your physician in the past 6 months. _____
24. Do you have asthma attacks only during a certain season (SEASONAL) or all-year round (PERENNIAL)?

| SEASONAL | PERENNIAL |
|---|---|
| 1 | 2 |

25. How **severe** do you think your asthma has been in the past year?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Mild | | Moderate | | Severe | | Respiratory Failure |

**Mild** = 1 or 2 attacks per week; as many as two episodes of nighttime cough a month; good exercise tolerance; no symptoms between attacks; bronchospasm responds to bronchodilator.

**Moderate** = More than 2 attacks per week; symptoms between attacks; symptoms affect sleep, activity level, or work performance; bronchospasm responds to bronchodilator; reduced exercise tolerance; coughing; chest tightness, wheezing; seeking emergency room treatment more than three times per year.

**Severe** = Daily wheezing; sudden, severe attacks; limited exercise tolerance and activity level; sleep is disrupted; bronchospasm does not always respond to bronchodilator; poor work attendance; mild tachycardia (excessively rapid heartbeat); tachypnea (excessively rapid

breathing); difficulty speaking in complete sentences; seeking emergency care more than 3 times per year.

**Respiratory Failure** = Increased tachycardia (excessively rapid heartbeat); tachypnea (excessively rapid breathing); wheezing; reduced, poor air exchange; uses accessory muscles (e.g., arms) to sit up, with perspiration; confusion; lethargy; altered consciousness.

26. How **<u>controllable</u>** do you think your asthma is?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Entirely Uncontrollable | | Somewhat Controllable | | Mostly Controllable | | Entirely Controllable |

27. Please estimate the number of school and/or work days you missed during the last academic year (e.g., 2008-2009) *as a result of your asthma or asthma-related symptoms*. (If you are a freshman in college and you were in high school during the 2008-2009 academic year, please refer to your senior year of high school. If you were not in school during the 2008-2009 academic year, please list days from work only.)

SCHOOL: _____
WORK: _____

28. Please estimate the number of school and/or work days you missed during the last academic year (2008-2009) *for medical reasons other than asthma*. (If you are a freshman in college and you were in high school during the 2008-2009 academic year, please refer to your senior year of high school. If you were not in school during the 2008-2009 academic year, please list days from work only.)

SCHOOL: _____
WORK: _____

29. During the 2008-2009 academic year, did you ever attend class when you had asthma symptoms?

| YES | NO |
|---|---|
| 1 | 2 |

If yes, please estimate the number of days you did attend class when you had asthma symptoms.
_____

If yes, please circle the number that indicates how much the asthma symptoms interfered with your normal daily class routine (i.e., taking notes, taking an exam, participating in a laboratory).

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| No Interference | | Mild Interference | | Moderate Interference | | Interfered a Great Deal |

30. During the 2008-2009 academic year, did you ever attend work when you had asthma symptoms?

| YES | NO |
|---|---|
| 1 | 2 |

If yes, please estimate the number of days you did attend work when you had asthma symptoms.

If yes, please circle the number that indicates how much the asthma symptoms interfered with your normal work routine (i.e., getting to work on time; completing job tasks efficiently).

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| No Interference | | Mild Interference | | Moderate Interference | | Interfered a Great Deal |

31. During the 2008-2009 academic year, do you feel that your asthma interfered with your social life?

| YES | NO |
|---|---|
| 1 | 2 |

If yes, please circle the number that indicates how much your asthma symptoms interfered with your social life.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| No Interference | | Mild Interference | | Moderate Interference | | Interfered a Great Deal |

**Do not fill out below this line**

_____

Interrupted Demographic Form to take T3 (form took longer than 15 minutes) (yes or no):

_____

Finished Demographic Form before T3 (yes or no): _____

**Demographic Form - Allergies**

**Do you have allergies?**

_____ Yes _____ No

**Have you also been diagnosed with asthma?**

_____ Yes _____ No

**What are you allergic to? Please mark all that apply.**

Environmental Allergens (i.e., pollen, dust, mold, grass, etc.):

____ No _____ Yes, please specify: _____

Animals (i.e., animal dander, animal saliva, insect bites, etc.):

____ No _____ Yes, please specify: _____

Food Allergens (i.e., milk, eggs, peanuts, tree nuts, fish, shellfish, soy, wheat, etc.):

____ No _____ Yes, please specify: _____

Other Allergens (i.e., latex, metals, penicillin, etc.):

____ No _____ Yes, please specify: _____

**How were you diagnosed with allergies?**

_____ reaction to allergen _____ skin prick test _____ allergen patch test

_____ blood test _____ oral challenge test

_____ other, please describe: _____

**Have you ever suffered from an allergy attack that required you to go to the doctor or hospital?**

_____ Yes _____ No

**What are you currently doing to treat your allergies? Please mark all that apply.**

_____ topical cream/ointment _____ antihistamine _____ decongestant

_____ EpiPen _____ avoid allergen _____ other, please describe: _____

_____

**How severe have your allergies been over the past 12 months?**

No reaction Mild Moderate Severe Extremely severe

**Do you suffer from seasonal allergies?**

_____ Yes _____ No

**If you marked "Yes", which season is worst for your allergies?**

Winter Spring Summer Fall

**During the worst 1-month period in the 12 months, how often did you suffer from an allergic reaction?**

Every day

4-7 days a week

1-3 days a week

1-5 days a month

Never

**In the past 12 months, how many times did you see your physician for your allergies?**

___ 0 times

___ 1-2 times

___ 3-5 times

___ 5-10 times

___ More than 10 times

**Demographic Information**

Age: _____

Gender:

_____ Male _____ Female

Ethnicity:

_____ Caucasian _____ African American _____ Hispanic _____ Asian

_____ Native American _____ Multi-racial _____ Other

Sexual Orientation:

_____ Heterosexual _____ Homosexual _____ Bisexual _____ Other

Highest Level of Education Obtained:

6 Middle School
7 High School
8 College (please indicate highest year completed)
   a. Freshman
   b. Sophomore
   c. Junior
   d. Senior
9 College Degree
10 Post-Graduate Degree

What is your current (or intended) major? _____

Marital Status:
1 Never Married
7 Married
8 Divorced
9 Cohabitating/Living with Partner
10 Widowed
11 Other, please specify: _____

Hometown: _____

Number of years living in Stillwater, OK: _____

**CES-D**

Below is a list of the ways you might have felt or behaved. Please tell me how often you have felt this way in the past week.

DURING THE PAST WEEK

| Rarely or none of the time (less than 1 day) | Some or a little of the time (1 – 2 days) | Occasionally or a moderate amount of time (3 – 4 days) | Most or all of the time (5 – 7 days) |
|---|---|---|---|
| **0** | **1** | **2** | **3** |

_____ 1. I was bothered by things that usually don't bother me.

_____ 2. I did not feel like eating; my appetite was poor.

_____ 3. I felt that I could not shake off the blues even with help from my family or friends.

_____ 4. I felt I was just as good as other people.

_____ 5. I had trouble keeping my mind on what I was doing.

_____ 6. I felt depressed.

_____ 7. I felt that everything I did was an effort.

_____ 8. I felt hopeful about the future.

_____ 9. I thought my life had been a failure.

_____ 10. I felt fearful.

_____ 11. My sleep was restless.

_____ 12. I was happy.

_____ 13. I talked less than usual.

_____ 14. I felt lonely.

_____ 15. People were unfriendly.

DURING THE PAST WEEK

| Rarely or none of the time (less than 1 day) | Some or a little of the time (1 – 2 days) | Occasionally or a moderate amount of time (3 – 4 days) | Most or all of the time (5 – 7 days) |
|---|---|---|---|
| **0** | **1** | **2** | **3** |

_____ 16. I enjoyed life.

_____ 17. I had crying spells.

_____ 18. I felt sad.

_____ 19. I felt that people dislike me.

_____ 20. I could not get “going.”

**SAS**

**Instructions:** Based on how you felt in the last week, reply to the following questions using one of the four replies below.

| None or a little of the time | Some of the time | A large part of the time | Most of the time |
|---|---|---|---|
| **1** | **2** | **3** | **4** |

_____ 1. I feel more nervous and anxious than usual.

_____ 2. I feel afraid for no reason at all.

_____ 3. I get upset easily or feel panicky.

_____ 4. I fell like I'm falling apart and going to pieces

_____ 5. I feel that everything is all right and nothing bad will happen

_____ 6. My arms and legs shake and tremble.

_____ 7. I am bothered by headaches, neck, and back pains.

_____ 8. I feel weak and get tired easily.

_____ 9. I feel calm and can sit still easily.

_____ 10. I can feel my heart beating fast.

| None or a little of the time | Some of the time | A large part of the time | Most of the time |
|---|---|---|---|

| 1 | 2 | 3 | 4 |
|---|---|---|---|

_____ 11. I am bothered by dizzy spells.

_____ 12. I have fainting spells or feel like it.

_____ 13. I can breathe in and out easily.

_____ 14. I get feelings of numbness and tingling in my fingers and toes.

_____ 15. I am bothered by stomach aches or indigestion.

_____ 16. I have to empty my bladder often.

_____ 17. My hands are usually warm and dry.

_____ 18. My face gets hot and blushes.

_____ 19. I fall asleep easily and get a good night’s rest.

_____ 20. I have nightmares.

## Your Health and Well-Being

**This survey asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities.** ***Thank you for completing this survey!***

**For each of the following questions, please mark an ☒ in the one box that best describes your answer.**

**1. In general, would you say your health is:**

| Excellent | Very good | Good | Fair | Poor |
|---|---|---|---|---|
| ▼ | ▼ | ▼ | ▼ | ▼ |
| ☐1 | ☐2 | ☐3 | ☐4 | ☐5 |

**2. <u>Compared to one year ago</u>, how would you rate your health in general <u>now</u>?**

| Much better now than one year ago | Somewhat better now than one year ago | About the same as one year ago | Somewhat worse now than one year ago | Much worse now than one year ago |
|---|---|---|---|---|
| ▼ | ▼ | ▼ | ▼ | ▼ |
| ☐1 | ☐2 | ☐3 | ☐4 | ☐5 |

**3. The following questions are about activities you might do during a typical day. Does <u>your health now limit you</u> in these activities? If so, how much?**

| Yes, limited a lot | Yes, limited a little | No, not limited at all |
|---|---|---|

a <u>Vigorous activities</u>, such as running, lifting heavy objects, participating in strenuous sports ..... ☐1 ..... ☐2 ..... ☐3

b <u>Moderate activities</u>, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf ..... ☐1 ..... ☐2 ..... ☐3

c Lifting or carrying groceries ..... ☐1 ..... ☐2 ..... ☐3

d Climbing <u>several</u> flights of stairs ..... ☐1 ..... ☐2 ..... ☐3

e Climbing <u>one</u> flight of stairs ..... ☐1 ..... ☐2 ..... ☐3

f Bending, kneeling, or stooping ..... ☐1 ..... ☐2 ..... ☐3

g Walking <u>more than a mile</u> ..... ☐1 ..... ☐2 ..... ☐3

h Walking several hundred yards .....☐1..... ☐2 ..... ☐3

i Walking one hundred yards.....☐1..... ☐2 ..... ☐3

j Bathing or dressing yourself .....☐1..... ☐2 ..... ☐3

**During the <u>past 4 weeks</u>, how much of the time have you had any of the following problems with your work or other regular daily activities <u>as a result of your physical health</u>?**

| | All of the time | Most of the time | Some of the time | A little of the time | None of the time |
|---|---|---|---|---|---|
| a Cut down on the <u>amount of time</u> you spent on work or other activities | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 |
| b <u>Accomplished less</u> than you would like | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 |
| c Were limited in the <u>kind</u> of work or other activities | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 |
| d Had <u>difficulty</u> performing the work or other activities (for example, it took extra effort) | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 |

**4. During the <u>past 4 weeks</u>, how much of the time have you had any of the following problems with your work or other regular daily activities <u>as a result of any emotional problems</u> (such as feeling depressed or anxious)?**

| | All of the time | Most of the time | Some of the time | A little of the time | None of the time |
|---|---|---|---|---|---|
| a Cut down on the <u>amount of time</u> you spent on work or other activities | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 |
| b <u>Accomplished less</u> than you would like | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 |

c Did work or other activities less carefully

than usual..... ☐1 ..... ☐2 ..... ☐3 .....☐4 .....☐5

**6. During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?**

| Not at all | Slightly | Moderately | Quite a bit | Extremely |
|---|---|---|---|---|
| ▼ | ▼ | ▼ | ▼ | ▼ |
| ☐1 | ☐2 | ☐3 | ☐4 | ☐5 |

**7. How much bodily pain have you had during the past 4 weeks**?

| None | Very mild | Mild | Moderate | Severe | Very Severe |
|---|---|---|---|---|---|
| ▼ | ▼ | ▼ | ▼ | ▼ | ▼ |
| ☐1 | ☐2 | ☐3 | ☐4 | ☐5 | ☐6 |

**8. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?**

| Not at all | A little bit | Moderately | Quite a bit | Extremely |
|---|---|---|---|---|
| ▼ | ▼ | ▼ | ▼ | ▼ |
| ☐1 | ☐2 | ☐3 | ☐4 | ☐5 |

**9. These questions are about how you feel and how things have been with you <u>during the past 4 weeks</u>. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the <u>past 4 weeks</u>...**

| | All of the time | Most of the time | Some of the time | A little of the time | None of the time |
|---|---|---|---|---|---|
| | ▼ | ▼ | ▼ | ▼ | ▼ |
| b Have you been very nervous? | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 |
| c Have you felt so down in the dumps that nothing could cheer you up? | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 |
| d Have you felt calm and peaceful? | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 |
| e Did you have a lot of energy? | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 |
| f Have you felt downhearted and depressed? | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 |
| g Did you feel worn out? | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 |
| h Have you been happy? | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 |
| i Did you feel tired? | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 |

**10. During the <u>past 4 weeks</u>, how much of the time has your <u>physical health or emotional problems</u> interfered with your social activities (like visiting friends, relatives, etc.)?**

| All of the Time | Most of the time | Some of the Time | A little of the time | None of the time |
|---|---|---|---|---|
| ▼ | ▼ | ▼ | ▼ | ▼ |

☐1 ☐2 ☐3 ☐4 ☐5

**11. How TRUE or FALSE is <u>each</u> of the following statements for you?**

| | Definitely true | Mostly true | Don't know | Mostly false | Definitely false |
|---|---|---|---|---|---|
| a I seem to get sick a little easier than other people | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 |
| b I am as healthy as anybody I know | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 |
| c I expect my health to get worse | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 |
| d My health is excellent | ☐1 | ☐2 | ☐3 | ☐4 | ☐5 |

***THANK YOU FOR COMPLETING THESE QUESTIONS!***

# Appendix B

# TABLES

Table 1

*Variables of Interest by Disease Group*

| | Allergies (*N* = 120) | | Asthma (*N* = 120) | | Healthy (*N* = 120) | |
|---|---|---|---|---|---|---|
| | Range | *M (SD)* | Range | *M* (*SD*) | Range | *M (SD)* |
| CES-D | 0-49 | 15.50 (10.51) | 0-50 | 13.92 (10.27) | 0-47 | 11.24 (9.34) |
| SAS | 21-68 | 36.56 (9.67) | 21-63 | 33.89 (8.41) | 20-58 | 30.97 (6.81) |
| SF-36 PCS | 39.06-100 | 77.61 (17.15) | 25.00-100.00 | 78.19 (15.99) | 40.00-100.00 | 88.17 (9.60) |
| SF-36 MCS | 16.56-98.44 | 69.44 (19.05) | 18.23-100.00 | 72.61 (17.27) | 8.33-100.00 | 77.66 (14.88) |

*Note*. CES-D = Center for Epidemiologic Studies Depression Scale; SAS = Zung Self-Rating Anxiety Scale; SF-36 PCS = SF-36 Health Survey Questionnaire Physical Component Summary Score; SF-36 MCS = SF-36 Health Survey Questionnaire Mental Component Summary Score.

Table 2

*Bivariate Correlations*

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 1. Age | -- | -.095 | -.015 | .009 | -.058 | -.100 |
| 2. Sex | | -- | .227** | .152** | -.173** | -.202** |
| 3. SAS | | | -- | .794** | -.727** | -.597** |
| 4. CES-D | | | | -- | -.774** | -.448** |
| 5. SF-36 MCS | | | | | -- | .652** |
| 6. SF-36 PCS | | | | | | -- |

*Note.* SAS = Zung Self-Rating Anxiety Scale; CES-D = Center for Epidemiologic Studies Depression Scale; SF-36 MCS = SF-36 Health Survey Questionnaire Mental Component Summary Score; SF-36 PCS = SF-36 Health Survey Questionnaire Physical Component Summary Score. ** $p < .01$.

Table 3

*Clinical Cutoff Scores by Disease Group*

| | | Allergies (*N* = 120) | Asthma (*N* = 120) | Healthy (*N* = 120) |
|---|---|---|---|---|
| | Clinical Cutoff Score | Number in Clinical Range (%) | Number in Clinical Range (%) | Number in Clinical Range (%) |
| CES-D | 16 | 51 (42.5) | 37 (30.8) | 28 (23.3) |
| SAS | 45 | 26 (21.7) | 13 (10.8) | 4 (3.3) |

*Note*. CES-D = Center for Epidemiologic Studies Depression Scale; SAS = Zung Self-Rating Anxiety Scale.

## Oklahoma State University Institutional Review Board

| | |
|---|---|
| Date: | Wednesday, August 11, 2010 |
| IRB Application No | AS1077 |
| Proposal Title: | Psychosocial Adjustment and Social Relationships of College Students with and without Allergies |
| Reviewed and Processed as: | Exempt |

**Status Recommended by Reviewer(s): Approved Protocol Expires: 8/10/2011**

Principal Investigator(s):


Stephanie Hullmann
116 North Murray
Stillwater, OK 74078

Larry L. Mullins
116 North Murray
Stillwater, OK 74078


---

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

☒ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Beth McTernan in 219 Cordell North (phone: 405-744-5700, beth.mcternan@okstate.edu).

Sincerely,

Shelia Kennison, Chair
Institutional Review Board

## Oklahoma State University Institutional Review Board

| | | | |
|---|---|---|---|
| Date | Wednesday, September 22, 2010 | **Protocol Expires:** | **9/2/2011** |
| IRB Application | AS0856 | | |
| Proposal Title: | Examining Social Relationships, Uncertainty, Intrusiveness, Cortisol, and Stress in College Students With and Without Chronic Illnesses | | |
| Reviewed and Processed as: | Expedited<br>**Modification** | | |

Status Recommended by Reviewer(s) **Approved**

Principal Investigator(s) :


Angelica R. Eddington
116 North Murray
Stillwater, OK 74078

Larry L. Mullins
116 North Murray
Stillwater, OK 74078


---

The requested modification to this IRB protocol has been approved. Please note that the original expiration date of the protocol has not changed. The IRB office MUST be notified in writing when a project is complete. All approved projects are subject to monitoring by the IRB

☒ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

Signature : Shelia M. Kennison

Shelia Kennison, Chair, OSU Institutional Review Board

Wednesday, September 22, 2010
Date

## Oklahoma State University Institutional Review Board

| | | | |
|---|---|---|---|
| Date | Friday, February 05, 2010 | **Protocol Expires:** | **8/20/2010** |
| IRB Application | AS0856 | | |
| Proposal Title: | Examining Social Relationships, Uncertainty, Intrusiveness, Cortisol, and Stress in College Students With and Without Chronic Illnesses | | |
| Reviewed and Processed as: | Expedited<br>**Modification** | | |

Status Recommended by Reviewer(s) **Approved**

Principal Investigator(s) :


Angelica R. Eddington
104 North Murray
Stillwater, OK 74078

Larry L. Mullins
116 North Murray
Stillwater, OK 74078


The requested modification to this IRB protocol has been approved. Please note that the original expiration date of the protocol has not changed. The IRB office MUST be notified in writing when a project is complete. All approved projects are subject to monitoring by the IRB

☒ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

Signature :

Shelia Kennison, Chair, OSU Institutional Review Board

Friday, February 05, 2010
Date

VITA

Elizabeth S. Molzon

Candidate for the Degree of

Master of Science

Thesis: DEPRESSION, ANXIETY, AND HEALTH-RELATED QUALITY OF LIFE IN ADOLESCENTS AND YOUNG ADULTS WITH ALLERGIES AND ASTHMA

Major Field: Psychology

Biographical:

Education: Graduated from Saratoga High School, Saratoga, California in 2004; received Bachelor of Arts degree in Psychology and Education from Bucknell University, Lewisburg, Pennsylvania in May 2008; completed the requirements for the Master of Science in Psychology at Oklahoma State University, Stillwater, Oklahoma in December, 2011.

Experience: Graduate research assistant to Larry L. Mullins, Ph.D., Pediatric Healthy Psychology Lab, Department of psychology, Oklahoma State University, August 2010-present; Clinical practicum experience though the Oklahoma State University Psychology Services Center, August 2010-present; Instructor of laboratory component of Quantitative Methods in Psychology, August 2010-May 2011, Instructor of Introductory Psychology, August 2011-December 2011.

Professional Memberships: American Psychological Association, Student Affiliate, Division 54 (Pediatric Psychology) and Division 53 (Clinical Child and Adolescent Psychology)

Name: Elizabeth S. Molzon Date of Degree: December, 2011

Institution: Oklahoma State University Location: Stillwater, Oklahoma

Title of Study: DEPRESSION, ANXIETY, AND HEALTH-RELATED QUALITY OF LIFE IN ADOLESCENTS AND YOUNG ADULTS WITH ALLERGIES AND ASTHMA

Pages in Study: 91 Candidate for the Degree of Master of Science

Major Field: Psychology

Scope and Method of Study: The purpose of the current study was to assess the relationships between depressive symptoms, anxious symptoms, and health-related quality of life (HRQOL) in adolescents and young adults (AYAs) with allergies, asthma, and healthy controls. Participants were undergraduate students aged 18-29 with self-reported allergies (*N=120*), asthma (*N=120*), and with no history of a chronic illness (*N=120*). Participants completed a demographic form, the Center for Epidemiological Studies Depression Scale (CES-D), the Zung Self-Rating Anxiety Scale (SAS), and the SF-36 Healthy Survey Questionnaire. The participants were recruited from an online participant pool for undergraduate students.

Findings and Conclusions: The results revealed that both AYAs with allergies and asthma are experiencing poorer psychosocial functioning than their healthy peers. AYAs with allergies demonstrated higher levels of depressive symptoms than healthy AYAs, and AYAs with allergies demonstrated higher levels of anxious symptoms than AYAs with asthma and healthy AYAs. AYAs with asthma demonstrated higher levels of anxious symptoms than healthy AYAs. Both AYAs with asthma and allergies demonstrated poorer physical HRQOL than healthy AYAs after controlling for anxious and depressive symptoms. After controlling for anxious and depressive symptoms, the disease groups did not differ on mental HRQOL. Overall, these results suggest that both AYAs with asthma and allergies are experiencing poorer psychosocial functioning, and although, often considered a relatively benign illness, allergies may be an important population to study within chronic illnesses.

ADVISER'S APPROVAL: Larry L. Mullins, Ph.D.