

DEPRESSION AND RELIGIOUS COPING  
AMONG YOUTH WITH ASTHMA:  
A LONGITUDINAL EXAMINATION

By

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Abstract: Youth with asthma are at an increased risk for depressive symptoms. Religious coping has been linked to decreased psychological difficulties among several pediatric populations. There is limited data on the stability of depression and religious coping among youth with asthma; further, no studies have examined the longitudinal relations between depression and religious coping among youth with asthma across multiple developmental periods. The present study aimed to identify the following among youth with asthma: 1) the stability of depression and religious coping across adolescence and into adulthood 2) identify the longitudinal associations between depression and religious coping across multiple developmental periods. Youth from the National Longitudinal Study of Adolescent to Adult Health (Add Health) who reported having asthma (N = 998) were included in the present study. Depressive symptoms were measured using a 9-item version of the CES-D. Religious coping was measured using a sum score created from four items that assessed religious affiliation, frequency of church attendance, frequency of prayer, and importance of religion. Data from four assessment waves were utilized (Wave 1=1994-1995; Wave 2=1996; Wave 3=2001; Wave 4=2008). Aims were examined using an autoregressive cross-lagged path model. The autoregressive paths demonstrated moderate stability across time for depression ( $\beta$  range .33 - .6) and religious coping ( $\beta$  range .26 - .73). Use of religious coping during W3 was associated with decreased depressive symptoms in W4 ( $\beta = .13$ ,  $p < .001$ , CI .05 - .20, SE = .04). Interestingly, use of religious coping in W2 was predictive of increased depression in W4 ( $\beta = -0.17$ ,  $p < .001$ , CI -.25 - -.09, SE = .04). Depressive symptoms and religious coping were stable across time for youth with asthma; suggesting the need for early assessment and intervention. The way religious coping relates to depression appears to vary by developmental period: Higher religious coping in adolescence was associated with *increased* depressive symptoms in adulthood (W4), however, increased religious coping in young adulthood (W3) was associated with *decreased* depressive symptoms in adulthood (W4). Results highlight the need for more research on how religious coping may impact depressive symptomatology across each developmental period.

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## CHAPTER I

### INTRODUCTION

Asthma is the most prevalent chronic medical condition among children and adolescents, currently estimated to impact at least 6 million children (Global Initiative For Asthma (GINA), 2018; National Institutes of Health (NIH), National Institutes of Health, & National Institutes of Health (NIH), 2007). Asthma is a chronic inflammatory disease of the airways that is characterized by inflammation and variable obstruction of the small airways. Asthma disproportionately affects children of lower socioeconomic statuses, minority races, and those who face additional stressors, such as neighborhood stress and those who live in urban areas (Acosta-Pé rez et al., 2012; Brunner, Schreiner, Sood, & Jacobs, 2014; Carter-Pokras & Gergen, 1993; Gergen, Mullally, & Evans, 1988; Hughes, Matsui, Tschudy, Pollack, & Keet, 2017; Keet et al., 2015; The Centers for Disease Control and Prevention, 2018; Utidjian et al., 2017).

Overall, youth with asthma are at an increased risk for a variety of mental health problems compared to youth without asthma. Compared to youth without asthma, youth with asthma experience higher rates of externalizing behavior difficulties (Blackman & Gurka, 2007; Desai et al., 2017; Grizenko, Osmanliu, Fortier, & Jooper, 2015; McQuaid, Kopel, & Nassau, 2001) and more frequently engage in risky and deleterious health behaviors



(Bender, 2006; Bush et al., 2007; Centers for Disease Control and Prevention (CDC), 2013; Fedele et al., 2012; Reid, Forrest, & Porter, 2018). Youth with asthma also have higher rates of internalizing disorders (Alati et al., 2005; Delmas et al., 2011; Dudeney, Sharpe, Jaffe, Jones, & Hunt, 2017; Gillaspay, Hoff, Mullins, Van Pelt, & Chaney, 2002; Goodwin, Pine, & Hoven, 2003; Hasler et al., 2005; McQuaid et al., 2001; Opolski & Wilson, 2005; Ortega et al., 2003; Ortega, McQuaid, Canino, Goodwin, & Fritz, 2004; Ortega & Rosenheck, 2002) and decreased health-related quality of life compared to youth without asthma (Cui, Zack, & Zahran, 2015; Ford et al., 2003; Hommel, Chaney, Wagner, & McLaughlin, 2002; Kalyva, Eiser, & Papathanasiou, 2016). Overall, youth with asthma exhibit poorer psychological functioning compared to their healthy peers, however, there is a paucity of longitudinal research on depressive symptoms among youth asthma.

### **Depressive Symptoms among Youth with Asthma**

Children with asthma are more likely to develop internalizing problems, such as depressive symptoms, compared to their healthy peers (Ahmadiashar et al., 2016; Gillaspay et al., 2002; Katon et al., 2007; Lahaye, Luminet, Van Broeck, & Bodart, 2011; Meuret, Ehrenreich, Pincus, & Ritz, 2006; Padur et al., 1995; Waxmonsky et al., 2006). Approximately one in four youth with asthma experience symptoms of depression, suggesting that asthma is a risk factor for developing depressive symptoms (Lu et al., 2012). Although most research supports this finding, Vila and colleagues (2000) found no differences in depression among those with asthma compared to healthy peers (Vila, Nollet-Clemençon, De Blic, Mouren-Simeoni, & Scheinmann, 2000). However, the authors note that the psychometric properties of the measures used may have limited their findings, thereby underestimating the number of affective disorders among the study population. Research has identified multiple predictors of meeting diagnostic criteria for depressive disorders among adolescents with asthma, including being female, having parents with lower education levels, living in a household with a lower income level, and being on Medicaid (Katon et al., 2007).

There is limited research examining the longitudinal relationships between asthma and depression. The longitudinal studies that have been completed have largely focused on investigating 1) if depression is predictive of later health outcomes and 2) the temporal precedence between asthma and depression. Data indicate that depressive symptoms among youth with asthma are predictive of later increased asthma morbidity, systematic inflammation, and healthcare utilization (Shanahan, Copeland, Worthman, Angold, & Costello, 2013; Weil et al., 1999). The studies examining temporal precedence found that asthma precedes the development of internalizing disorders (Alati et al., 2005; Feldman, Ortega, McQuaid, & Canino, 2006). Overall, these results indicate that youth with asthma are at risk for the development of depressive symptoms across time, and depression is associated with subsequent health risks. There is a gap in the literature regarding if depressive symptoms are stable across time for youth with asthma.

Overall, longitudinal studies conducted among the general population demonstrate that depressive symptoms appear to be highly stable over the course of many years (Lovibond, Reports, & Lovibond, 1998; Merikangas et al., 2003; Nivard et al., 2015). In general, depression is less stable among younger children but appears to become more stable from adolescence to adulthood (Cole et al., 1998; Lovibond et al., 1998; Merikangas et al., 2003). To date, there is only one study examining the stability of depressive symptoms among youth with asthma (Ramos Olazagasti, Shrout, Yoshikawa, Bird, & Canino, 2012), and no studies have examined the long-term stability of depression across more than one developmental period (e.g., adolescence to young adulthood). The dearth of longitudinal studies evaluating the stability of depression among youth with asthma is a critical gap in the literature given the data indicating that depressive symptoms are associated with concurrent and later psychological and health difficulties.

In the one study on the stability of depressive symptoms among youth with asthma, Ramos Olazagasti and colleagues (2012) examined the longitudinal relationship between asthma and depression among a large sample of Puerto Rican children ( $M_{age} = 11.57$ ) residing in New York (N = 598) and Puerto Rico (N = 673). Caregivers reported on their child's asthma and

depression status yearly over the duration of three years. Cross-sectional analyses indicated that youth with asthma were more likely to report higher levels of depression compared to those without asthma; asthma severity was not related to the increased risk for depression. Among youth living in New York, asthma was positively related to depression. Among Puerto Rican natives, there was no association between asthma status and depressive symptoms. Across time, there was a significant increase in depressive symptoms for youth with asthma in New York; however, there was no significant change in depression for youth with asthma who resided in Puerto Rico. Additionally, this study examined if there were differences in the change of depression across time between youth with and without asthma across both sites. Among those with asthma living in New York, there was an increase in risk for depression, but the risk remained stable over three years. For those living in Puerto Rico, changes in depression were not related to asthma status.

These findings support previously reported literature regarding youth with both asthma and depression: individuals with asthma are more likely to report depressive symptoms compared to youth without asthma. Novel longitudinal findings indicate that youth with asthma are more likely to experience depressive symptoms if they are living in a community where they are part of the minority population (e.g. Puerto Rican children living in New York) compared to those who are considered to be majority in the ethnic community (e.g. Puerto Rican children residing in Puerto Rico). To date, this is the only study that examines the stability of depression among youth with asthma (Ramos Olazagasti et al., 2012). The findings of this study are important given Puerto Rican youth's increased risk for asthma, however, the generalizability of the findings to other populations is limited. Future studies should examine the longitudinal relations between asthma and depressive symptoms among more nationally representative samples of youth to increase the generalizability of results. Further, given the increased risk of depressive symptoms during adolescence (Angold & Costello, 2009), it is important to investigate depression across adolescence and young adulthood. Studies examining depression across multiple developmental

periods would allow for stronger conclusions regarding the development and stability of depression across time.

The present study will expand upon the limited longitudinal research on asthma and depression by 1) using a nationally representative sample of children with asthma and 2) by examining the stability of depressive symptoms across adolescence and adulthood. Understanding the stability of depression among this vulnerable population can help identify key periods for monitoring and intervening with youth with asthma. Given the increased risk for developing depression and other internalizing disorders among youth with asthma, it is also important to explore the influence of potential resiliency factors or coping strategies that may reduce internalizing disorders among these youth. Religious coping has been shown to act as a protective factor against mental health concerns such as internalizing disorders among children with chronic medical conditions. Thus, the proposed study will also explore the longitudinal associations between depressive symptoms and religious coping among youth with asthma. This will be the first study to examine the longitudinal relationship between depression and religious coping among youth with asthma.

### **Religious Coping**

Religious coping has been shown to act as a protective factor against mental health concerns such as internalizing disorders among children with chronic medical conditions. A large body of literature suggests that many individuals turn to religion and spirituality when faced with stressful life events (Bonelli, Dew, Koenig, Rosmarin, & Vasegh, 2012; Gonçalves, Lucchetti, Menezes, & Vallada, 2015; Phillips, Chamberlain, & Goreczny, 2014; Reynolds, Mrug, & Guion, 2013). Almost 70% of Americans consider themselves to be religious and almost 80% of individuals consider themselves to uphold beliefs of spirituality (World Values Survey Association, 2014). The more formal, institutionalized, outward expression of beliefs can be thought of as religiosity, while spirituality is the internal expression of beliefs and connectedness (George, Larson, Koenig, & McCullough, 2000; Koenig, McCullough, & Larson, 2001).

According to the 2015 World Values Survey, religion and spirituality are utilized during stressful times for a variety of individuals, this coping strategy is most commonly referred to as religious coping (World Values Survey Association, 2014).

Religious coping is defined as the use of cognitive or behavioral techniques based in one's religion or spirituality when faced with stressful events (Pargament, Koenig, & Perez, 2000). Religious coping can be further broken down into positive religious coping and negative religious coping (Pargament et al., 2000). Positive religious coping is defined as partnering with God and finding and seeking strength from God (Pargament et al., 2000) and is associated with positive outcomes, such as decreased depressive symptoms and better physical health (Ano & Vasconcelles, 2005; Bonelli et al., 2012). Negative religious coping includes behaviors or thoughts such as blaming God, feeling abandoned by God, or fearing that God is angry with you (Pargament et al., 2000). This type of coping is related to more negative outcomes (Pargament et al., 2000), such as increased anxiety, depression, burden, and hopelessness (Ano & Vasconcelles, 2005; Hebert, Zdaniuk, Schulz, & Scheier, 2009). The use of negative religious coping techniques (e.g. feeling guilty and not living up to the high standards of their religious beliefs) may lead to social isolation from the religious community and more depressive symptoms (Bonelli et al., 2012). Much of the existing research has focused on the positive religious coping, with less research on negative religious coping strategies. Religious coping has been predominately studied among adults with chronic medical conditions (Holland et al., 1999; Keefe et al., 2001; Pargament, Koenig, Tarakeshwar, & Hahn, 2004; Siegel & Schrimshaw, 2002). Overall, the use of positive religious coping among adults with chronic medical conditions has been associated with positive physical and mental health outcomes.

**Religious coping among youth with chronic medical conditions.** Among children with chronic medical conditions, there is a smaller, but growing, literature focused on religious coping. A recent meta-synthesis evaluated twenty studies that examined child-reported spirituality among youth with a variety of chronic medical conditions (Damsma Bakker, van Leeuwen, & Roodbol,

2018). The studies were mixed in regard to methodology and the review included both quantitative and qualitative work and cross-sectional and longitudinal studies. The results showed that youth with chronic medical conditions used religious coping in a number of ways, and the use of positive religious coping was positively related to health care and mental health outcomes, such as increased quality of life, increased adherence, better healthcare utilization, and better pain management (Damsma Bakker et al., 2018). Across studies, youth reported that they used negative religious coping less often; the most commonly reported negative coping technique was questioning (e.g., contemplating God's love or his plan for them or questioning what they had done to deserve their medical condition). Damsma Bakker and colleagues (2018) did not report on the outcomes associated with the use of negative coping techniques.

A relevant study that was not included in this meta-synthesis examined the longitudinal relationships between religious coping, depression, and conduct problems among youth with either diabetes or cystic fibrosis (Reynolds, Mrug, Hensler, Guion, & Madan-Swain, 2014). The results indicated that 1) these constructs remained moderately stable across time and that 2) higher baseline positive religious coping was associated with fewer conduct problems, lower depression, and less negative religious coping at follow-up (Reynolds et al., 2014). This was the first study to examine the stability of depression and religious coping among a population of youth with chronic medical conditions and highlighted the importance of investigating positive religious coping. Future research should examine the longitudinal stability of and relations between these constructs within additional populations of youth with chronic health conditions given that positive religious coping was associated with fewer depressive symptoms later in time.

**Religious coping among youth with asthma.** Despite the fact that asthma is the most common chronic medical condition in childhood, there is limited research on religious coping among youth with asthma. Three studies have examined religious coping among youth with asthma; two of these examined the longitudinal associations between religious coping and depression among youth with asthma. These studies are detailed below.

Benore and colleagues (2008) examined the longitudinal associations between religious coping and adjustment after hospitalization among a predominately African American sample of youth with asthma (N = 87). Youth and their caregivers reported on religious coping and various psychosocial adjustment outcomes, including depression, at baseline and one-month follow-up from hospitalization. Youth with asthma reported more frequent use of positive religious coping than negative religious coping. After controlling for several demographic and disease-related variables (age, gender, religious importance, perceived overall health, asthma control, challenge of asthma), religious coping predicted a significant amount of variance in adjustment at both baseline and one-month follow-up. Specifically, more baseline negative religious coping was associated with greater baseline depression, but not predictive of depression at one-month follow-up; however, baseline negative religious coping was predictive of other psychosocial outcomes at one-month follow-up (e.g. anxiety). There was no relationship between baseline positive religious coping and depression at baseline or follow-up. A second regression model was used to assess the relationship between religious coping strategies and adjustment outcomes above and beyond secular coping strategies: Negative religious coping remained a significant predictor of greater depression for youth with asthma at baseline. Again, neither negative nor positive religious coping was predictive of depression at follow-up.

The findings from Benore et al. (2008) mirror earlier reported findings among youth with chronic medical conditions (Damsma Bakker et al., 2018), such that positive religious coping was utilized more frequently than negative religious coping. This study found that negative religious coping was associated with greater depression among youth with asthma at baseline, but not at follow-up. Contrary to previous findings among individuals with and without a chronic medical condition (Damsma Bakker et al., 2018; Reynolds et al., 2014), positive religious coping was not associated with better psychosocial outcomes. Children were recruited for this study during hospitalizations, which may have impacted baseline measurements of religious coping and adjustment outcomes, and the results of this study. This study had a number of limitations such as

a limited sample size, ethnic and religious homogeneity, limited data collection points, and the use of non-standardized follow-up measures. Future studies should utilize longer assessment periods to better understand how depression and religious coping change over time and utilize standardized measures to examine these constructs (Benore, Pargament, & Pendleton, 2008).

Cotton and colleagues conducted a cross-sectional study and a longitudinal study to explore religious coping among predominately African American samples of adolescents with asthma from urban settings. Cotton and colleagues (2012) first conducted a cross-sectional study and recruited 151 adolescents with various levels of asthma severity from an urban children's medical center. The majority of the sample (81%) endorsed being both religious and spiritual, with a smaller portion identifying as being either religious (7%) or spiritual (4%). Almost half of the sample indicated that religious coping played an important role in helping them cope with their asthma, with the majority of youth reporting use of positive religious coping. Higher scores on most religious coping measures (all except negative religious coping) were associated with being African American and having a religious preference. This study did not examine the relationship between religious coping and psychosocial or health outcomes. Importantly, almost half of youth endorsed a belief that providers should incorporate religious coping into health care visits and treatment. Of those who wished to incorporate religious coping into health care visits, 71% indicated that this would help providers understand how religious coping influences asthma coping. A small number of participants had actually discussed their religious beliefs with providers during visits (28%). These results highlight that youth with asthma are using religious coping and that they believe that it should be incorporated into their medical care.

Cotton et al. (2013) extended their previous study by examining the longitudinal relations between negative religious coping, negative secular coping, and depressive symptoms among youth with asthma (N = 132). Youth with asthma completed measurements at baseline and 11-14-months later. The cross-sectional and longitudinal results of this study indicated that both negative secular coping and negative religious coping were associated with increased depressive



symptoms among youth with asthma. The results from the studies conducted by Cotton et al. (2012, 2013) highlight that youth with asthma are using religious coping, want this coping strategy to be incorporated into their medical care, and that negative religious coping is related to increased depression. Future research should investigate these constructs over a longer study period and with a larger, more representative sample (Cotton et al., 2013).

Overall, there is limited research examining the associations between religious coping and depression among youth with asthma; however, the existing studies suggest that both positive and negative religious coping are important predictors of depressive symptoms among youth with asthma. Specifically, to date, there are only three studies, and only two longitudinal studies, that examine how religious coping may be associated with mental health outcomes such as depression among this vulnerable population. Only one study has examined the stability of religious coping among youth with a chronic medical condition, and no studies have examined this among youth with asthma. Research focusing on youth with other chronic medical conditions (e.g. CF, IBD, and diabetes) has identified associations between positive religious coping and mental health outcomes such as increased quality of life, increased adherence, decreased externalizing problems, and fewer internalizing problems. Given that asthma is the most prevalent chronic illness of childhood, it is important to better understand the role of religious coping and how it is related to depression among these vulnerable youth. The present study aims to expand the literature by examining the longitudinal associations between religious coping and depression among youth with asthma. More specifically, the present study seeks to investigate the stability of and associations between depression and religious coping across multiple developmental periods (adolescence and young adulthood) using a large, nationally representative sample.

### **The Present Study**

The present study utilized four waves of data from the National Longitudinal Study of Adolescent Health (Add Health), a nationally representative longitudinal study, to examine the following among youth with asthma: 1) the stability of depressive symptoms and religious coping

across time and 2) the longitudinal associations between religious coping and depressive symptoms. The specific aims of this study are as follows: 1) identify the mean levels of depression and religious coping across time for individuals with asthma and examine bivariate correlations across time; 2) examine the stability of depressive symptoms across time; 3) examine the stability of religious coping across time; and 4) investigate the cross-lagged and longitudinal relationships between religious coping and depression among adolescents with asthma. It is hypothesized that both depression and religious coping will remain moderately stable across time. Additionally, based on previous literature it is hypothesized that depression and religious coping will be associated both cross-sectionally and longitudinally.

## CHAPTER II

### REVIEW OF LITERATURE

The current chapter will review the literature pertinent to the proposed study. The first section will provide an overview of pediatric asthma, including classification, etiology, prevalence, symptomatology, and treatment. The second section will discuss child and adolescent overall psychosocial adjustment to pediatric asthma. The third section will provide a broad overview of depression among children and adolescents with a diagnosis of asthma. The fourth section will provide a board overview of the literature focusing on religious coping. The final section will focus on the proposed study.

#### **Pediatric Asthma**

Asthma is the most prevalent chronic medical condition among children and adolescents, currently estimated to impact at least 6 million children (Global Initiative For Asthma (GINA), 2018; National Institutes of Health (NIH) et al., 2007). Asthma remains the leading cause of pediatric health care utilization. Specifically, asthma is the cause of approximately 157,000 hospitalizations and over 640,000 emergency department visits per year (Akinbami, Moorman, & Liu, 2011; Utidjian et al., 2017). Clearly, asthma is a serious public health problem.

Asthma is a chronic inflammatory disease of the airways that impacts the respiratory system (National Institutes of Health (NIH) et al., 2007). The disease is characterized by

inflammation and variable obstruction of the small airways, which can lead to a reduction in airflow for these individuals. Airway hyperresponsiveness to environmental triggers (e.g. smoke, pollen, animal dander, and dust), exercise, weather changes, or respiratory infections can result in airway obstruction and reduction in airflow (Postma & Kerstjens, 1998). When individuals with asthma are exposed to these triggers, they can experience exacerbations or difficulties in breathing (Global Initiative For Asthma (GINA), 2018; National Institutes of Health (NIH) et al., 2007). Breathing difficulties can also occur due to the excess production of mucus in, and the narrowing of, the airways. Although the body typically secretes mucus to prevent environmental triggers or irritants from moving through the airways, individuals with asthma can experience hypersecretion of mucus. This hypersecretion of mucus makes breathing difficult due to the further obstruction of the airways (Rogers, 2004, 2007). This combination of excess mucus and airway swelling can lead to the common symptoms of asthma: chest tightness, coughing, and wheezing. Coughing is a result of the excess mucous and inflamed airways, while wheezing is the result of air trying to pass through the narrow, constricted airways (Evans, Kim, Tuvim, & Dickey, 2009; National Institutes of Health (NIH) et al., 2007; Rogers, 2007). Asthma attacks occur when individuals have difficulty moving air in and out of their lungs. Individuals with asthma experience difficulties exhaling air due to inflammation of the airways (Global Initiative For Asthma (GINA), 2018). Over time, the inability to exhale air can cause hyperinflation, an excess of air in the lungs, which can exacerbate difficulties moving air in and out of the lungs. Hyperinflation can eventually lead to reduced oxygen delivery to organs and tissues in the body and death in those individuals with the most severe asthma (Global Initiative For Asthma (GINA), 2018; National Institutes of Health (NIH) et al., 2007).

**Diagnosis.** According to Global Strategy for Asthma Management and Prevention (GINA) (2018), symptoms such as recurrent or persistent coughing, wheezing, breathing difficulties, activity reduction, and a family history of asthma can be suggestive of an asthma

diagnosis among children 5 years of age or younger. Although difficult to diagnose asthma before the age of five, young children typically experience recurrent wheeze (Global Initiative For Asthma (GINA), 2018). The reduction of physical activity can be telling because children with poorly controlled or undiagnosed asthma show reductions in play or exercise due to difficulties breathing. Although there are no specific tests for diagnosis of asthma among children 5 years and younger, children can undergo a therapeutic trial for 2 – 3 months to review responsiveness to short-acting beta agonists; chest X-rays; or testing for atopy for children older than 3 years of age. Before children reach 4 to 5 years of age, it may be difficult for children to accurately perform lung function testing, so these test do not play a vital role in the diagnosis of asthma before 5 years of age (Global Initiative For Asthma (GINA), 2018).

National guidelines recommend that an asthma diagnosis for individuals older than five years of age be based on a number of factors, including (but not limited to) a history of respiratory symptoms and lung functioning tests indicative of asthma or obstruction (Global Initiative For Asthma (GINA), 2018). Youth with asthma often have a history of respiratory symptoms that have been variable, worsened over time, and were triggered from environmental variables (Global Initiative For Asthma (GINA), 2018). Previous documentation of limited airflow and at least one lung functioning test should be used to confirm variable expiratory airflow limitation. Results from lung functioning tests that are indicative of asthma include the following: positive bronchodilator (BD) reversibility test, positive exercise challenge test, positive bronchial challenge test, excessive variability in peak expiratory flow (PEF), or excessive variability in lung functioning tests (Global Initiative For Asthma (GINA), 2018).

**Treatment.** Asthma is managed via a stepwise approach and includes both non-pharmacological and pharmacological treatment components. Prevention of exposure to asthma-related triggers is important for managing asthma exacerbations. Exposure to environmental triggers such as weather changes, pollen, and smoke exposure is not always possible, but medication are also used to help control and reduce asthma-related symptoms (Global Initiative

For Asthma (GINA), 2018). The primary treatment for asthma is medication, which is often distributed via an inhaler- a device used to direct medication along the airways. Inhalers are filled with powders or mists that help to reduce this inflammation of the airways. There are two main types of inhalers: relievers (also known as quick relief or rescue inhalers) and preventers (also known as controller or long-term control inhalers) (National Institutes of Health (NIH) et al., 2007). Quick-relief inhalers often contain beta-agonists, which are used to help relax the constricted muscles of the inflamed airways, resulting in the widening of the airways, allowing air to travel more easily in and out of the lungs. Quick-relief inhalers are used as a quick-acting relief for individuals with asthma when they are experiencing asthma exacerbations. Preventer medications often contain corticosteroids and are used to help treat asthma symptoms over the long-term. These inhalers are used daily to help control asthma by reducing airway sensitivity and inflammation. Long-term reduction in airway inflammation can help reduce long-term damage to the airways, such as scarring (National Institutes of Health (NIH) et al., 2007). Youth with asthma are often prescribed both quick-relief and preventer medications.

**Classification.** Asthma is classified according to severity, control, and treatment responsiveness (Global Initiative For Asthma (GINA), 2018; National Institutes of Health (NIH) et al., 2007). Severity of asthma is categorized by three variables: daytime symptoms, nighttime symptoms, and lung function (National Institutes of Health (NIH) et al., 2007). Clinical presentations of asthma can vary greatly among individuals, and asthma symptoms can be either intermittent or persistent. Intermittent asthma is used to describe individuals who experience asthma-related symptoms and sleep interruptions less than two times per week. Individuals who experience symptoms two or more times per week are described as having persistent asthma. Those who experience symptoms twice a week, but do not have daily symptoms are classified as having mild-persistent asthma. Individuals with mild-persistent asthma typically experience sleep interruptions three to four nights per month. Moderate-persistent asthma is characterized by daily asthma symptoms and sleep disruptions at least once per week. Individuals who experience daily

symptoms, multiple times per day, are described as having severe-persistent asthma. Severe-persistent asthma is the most severe asthma classification with almost nightly sleep disruptions. Severity is categorized by the most worst symptom or the most interfering symptoms for individuals with asthma (National Institutes of Health (NIH) et al., 2007).

**Etiology.** There is no singular cause of asthma, but research has linked asthma to several genetic and environmental factors (Kaugars, Klinnert, & Bender, 2004; Lemanske, 2002; Tibosch, Verhaak, & Merkus, 2011). Although a direct genetic link has not been confirmed, a number of genetic markers have been associated with asthma (Lenney, 1997). Recently, there has been an increased examination of genetic factors, and the complex interactions of genetics with the environment (Global Initiative For Asthma (GINA), 2018; Lenney, 1997). For example, data have shown that asthma is influenced by several prenatal and early childhood factors (Global Initiative For Asthma (GINA), 2018; Kaugars et al., 2004).

Maternal depression, stress, and substance use are all risk factors for asthma onset and morbidity among youth. The relationship between maternal depression and early childhood asthma diagnosis and morbidity has been extensively examined (Endrighi, McQuaid, Bartlett, Clawson, & Borrelli, 2018; Otsuki et al., 2010; Rioseco et al., 2017). Overall, data suggest that maternal depression is a significant risk factor for pediatric asthma. Maternal smoking during pregnancy and child post-natal environmental smoke exposure are also linked to asthma diagnoses and poorer asthma course (Burke et al., 2012; Global Initiative For Asthma (GINA), 2018). Maternal stress during pregnancy is associated with an increased likelihood of developing asthma during childhood (Grizenko et al., 2015). Additionally, family distress during early infancy has been linked to asthma onset at age three (Mrazek et al., 1999), with higher levels of family stress associated with increased production of asthma related cytokines (Marin, Chen, Munch, & Miller, 2009). Children's exposure to adverse childhood experiences is also associated with increased odds of asthma (Wing et al., 2015). Overall, genetics and children's exposure to

suboptimal maternal psychosocial functioning, stressors, and tobacco appear to play a role in asthma onset and course.

Asthma outcomes also vary by demographic factors. Asthma disproportionately affects children of lower socioeconomic statuses, minority races, and those who face additional stressors, such as neighborhood stress and those who live in urban areas (Acosta-Pé rez et al., 2012; Brunner et al., 2014; Carter-Pokras & Gergen, 1993; Gergen et al., 1988; Hughes et al., 2017; Keet et al., 2015; The Centers for Disease Control and Prevention, 2018; Utidjian et al., 2017). Rates of asthma are higher among those who fall below the national poverty level (11.8%) compared those who are greater than 450% above the poverty line (7.1%) (The Centers for Disease Control and Prevention, 2018). Race and ethnicity of individuals are also linked to increased odds of developing asthma (Wing et al., 2015). Children of Mexican descent who are exposed to higher levels of neighborhood crime have increased odds of developing asthma and higher rates of visits to the emergency department (Eldeirawi et al., 2016). Rates of asthma are higher among black children and children of Puerto Rican descent compared to white children (Acosta-Pé rez et al., 2012; Carter-Pokras & Gergen, 1993; Gergen et al., 1988; Keet et al., 2015; The Centers for Disease Control and Prevention, 2018). Some data suggest that children of non-Hispanic Black families are more likely to use emergency departments for asthma-related incidences compared to children of non-Hispanic white households, which may suggest suboptimal asthma management at home (e.g. worse symptoms or progression of disease) (Brunner et al., 2014; Hughes et al., 2017; Utidjian et al., 2017).

Neighborhood characteristics, such as perceived neighborhood stress, have also been attributed to increased rates of asthma symptoms among children (Tobin et al., 2016). Rates of asthma are typically higher among children living in urban areas compared to children living in rural areas (Gergen et al., 1988; Keet et al., 2015). Additionally, those with poor housing environments are at increased odds of using emergency departments compared to those who own their own home (Hughes et al., 2017). One study found that poor housing environments predicted



worse asthma outcomes for children of Puerto Rican descent but not children of other Hispanic populations (Keet et al., 2015).

Rates of asthma are comparable between males and females before puberty, with males having slightly higher rates of asthma (Postma, 2007). After puberty, females have higher rates of asthma (10.4%) compared to males (6.2%) (The Centers for Disease Control and Prevention, 2018). An important risk factor in the development asthma during young adulthood is being a female (Postma, 2007). Female risk factors such as changes during puberty (e.g. menstruation, hormonal changes), menopause, and pregnancy play an unknown role in the development and severity of asthma related symptoms (Fuseini & Newcomb, 2017). In sum, socioeconomic status, minority status, sex, exposure to stressors, housing and living conditions, and maternal psychosocial functioning are all linked to pediatric asthma outcomes.

### **Psychosocial Functioning Among Children and Adolescents with Asthma**

Overall, youth with asthma are at an increased risk for a variety of mental health problems compared to youth without asthma. Compared to youth without asthma, youth with asthma experience higher rates of externalizing behavior difficulties (Blackman & Gurka, 2007; Desai et al., 2017; Grizenko et al., 2015; McQuaid et al., 2001). Additionally, these youth are at increased risk to more frequently engage in risky and deleterious health behaviors (Bender, 2006; Bush et al., 2007; Centers for Disease Control and Prevention (CDC), 2013; Fedele et al., 2012; Reid et al., 2018). Higher rates of internalizing disorders (e.g. depression and anxiety) (Alati et al., 2005; Delmas et al., 2011; Dudeney et al., 2017; Gillaspay et al., 2002; Goodwin et al., 2003; Hasler et al., 2005; McQuaid et al., 2001; Opolski & Wilson, 2005; Ortega et al., 2003, 2004; Ortega & Rosenheck, 2002) and decreased health-related quality of life (Cui et al., 2015; Ford et al., 2003; Hommel et al., 2002; Kalyva et al., 2016) have also been found among youth with asthma compared to youth without asthma. These difficulties are described in more detail below.

**Externalizing symptoms.** Children with asthma have higher rates of Attention-Deficit Hyperactivity Disorder (ADHD) and behavioral disorders compared to 1) rates from the general

population as assessed by the Centers for Disease Control (CDC) (Desai et al., 2017) and 2) compared to the general population of Canadian youth (Grizenko et al., 2015). Specifically, rates of ADHD are twice as high among youth with asthma compared to youth without asthma (Blackman & Gurka, 2007). Youth with more severe asthma are diagnosed with ADHD almost three times as often compared to healthy peers (Blackman & Gurka, 2007). Previous research found that rates of prescribed medications for ADHD did not differ between those with and without asthma (Blackman & Gurka, 2007). Additionally, rates of behavior difficulties are higher among youth with asthma compared to healthy controls (Blackman & Gurka, 2007; McQuaid et al., 2001).

**Substance use and risky health behaviors.** Adolescents and young adults with asthma are also at an increased risk for engaging in deleterious health behaviors such as using alcohol, tobacco, and marijuana use (Bender, 2006; Bush et al., 2007). Tobacco use among youth with asthma is especially problematic given its detrimental effects on respiratory functioning. Importantly, the use of tobacco products has been linked to worsening of asthma symptoms, poorer asthma control, and increased need for medical management (Reid et al., 2018). Compared to those who do not smoke, youth with asthma who smoke experience more unhealthy days (physically and mentally) over a month, reductions in health related quality of life (HRQoL) (Cui et al., 2015), and higher rates of depression (20.7%) (Bush et al., 2007). Despite the health consequences, rates of tobacco use are higher among youth with asthma compared to youth without asthma (Mcleish & Zvolensky, 2010), and electronic cigarettes are reported to be the most commonly used product among adolescents and young adults with asthma (Fedele et al., 2016; Mcleish & Zvolensky, 2010; Reid et al., 2018).

**Health-related quality of life.** Youth with asthma experience lower HRQoL compared to individuals without asthma (Cui et al., 2015; Ford et al., 2003; Kalyva et al., 2016), with asthma severity playing an important role in the level of impairment (Kalyva et al., 2016). Decreases in physical, social, and psychological HRQoL have been shown to impair adults with

asthma, with individuals reporting approximately 10 days per month where they feel impaired (Ford et al., 2003). Lower asthma-specific HRQoL may be associated with gender, asthma severity, length of diagnosis, and exposure to environmental tobacco smoke (Kalyva et al., 2016). Perceived poorer asthma control is associated with lower HRQoL among youth with asthma. Lower perceived asthma control may be negatively influenced by lower HRQoL and daytime sleepiness and sleep quality a night (Li et al., 2016). Adolescents with coughing and wheezing symptoms are at increased risk for lower HRQoL compared to both adolescents without asthma and those with asthma who do not experience asthma symptoms (Cui et al., 2015). Furthermore, depression and anxiety-related symptoms negatively influence HRQoL among adolescents and young adults with asthma (Hommel et al., 2002).

**Anxiety.** An extensive body of literature has examined the prevalence of internalizing problems among youth with asthma. Cross-sectional studies have shown consistent links between asthma and anxiety disorders among youth (Delmas et al., 2011; Goodwin et al., 2003; McQuaid et al., 2001; Ortega, Huertas, Canino, Ramirez, & Rubio-Stipec, 2002; Ortega et al., 2004, 2003). A recent meta-analysis indicated that about 23% of youth with asthma have an anxiety disorder; a rate approximately three times higher than that of their healthy peers (Dudeney et al., 2017). Adolescents with asthma who experience a number of life stressors such as lower socioeconomic status, occupational or educational challenges, and minority status experience higher levels of anxiety compared to those without asthma who also experience similar life stressors (Gillaspy et al., 2002). Disease severity also plays a role in the development of internalizing disorders, with more severe asthma being associated with higher incidence of internalizing disorders, such as anxiety (Vila, Nollet-Clemencon, De Blic, Mouren-Simeoni, & Scheinmann, 1998).

Fewer studies have examined the longitudinal relationship between anxiety and asthma status (Alati et al., 2005; Hasler et al., 2005). One study examined the longitudinal relations between asthma activity (e.g. physician diagnosis of asthma and past 12-month asthma breathing difficulties) and panic. The results showed that asthma activity status, being female, smoking

behaviors, and anxious temperament styles were predictive of later panic among a community sample of young adults with asthma (Hasler et al., 2005). Additionally, anxiety disorders (other than panic) among young adults with asthma are predictive of later smoking behaviors, which is known to increase the recurrence of asthma-related symptoms (Hasler et al., 2005).

Another study investigated the bidirectional longitudinal relationships between internalizing symptoms and asthma (Alati et al., 2005). Caregivers reported on child asthma status and internalizing problems at 5 and 14 years of age. Results indicated that internalizing problems at age 5 were not predictive of asthma diagnosis at age 14; however, asthma diagnosis at age 5 was associated with greater odds of developing later internalizing symptoms (Alati et al., 2005). These results suggest that children with earlier asthma diagnoses (e.g. before 5 years of age) have a greater risk of developing internalizing problems.

Overall, cross-sectional research has demonstrated an increased risk of children with asthma developing anxiety or anxiety-related difficulties compared to children without asthma youth (Delmas et al., 2011; Goodwin et al., 2003; McQuaid et al., 2001; Ortega et al., 2002, 2004, 2003), with disease severity playing an important role (Vila et al., 1998). More recent reports indicate that youth with asthma are three times more likely to develop internalizing disorders compared to healthy peers (Dudeney et al., 2017). Importantly, longitudinal research also suggests that youth with asthma are more likely to develop internalizing problems such as anxiety (Alati et al., 2005). Additionally, it appears that young adults with asthma are at increased risk for engaging in deleterious health behaviors later in life (Hasler et al., 2005)

### **Overview of Depression**

Children with asthma are more likely to develop internalizing problems, such as depressive symptoms, compared to healthy peers (Ahmadi-fshar et al., 2016; Gillaspay et al., 2002; Katon et al., 2007; Lahaye et al., 2011; Meuret et al., 2006; Padur et al., 1995; Waxmonsky et al., 2006). Approximately one in four youth with asthma experience symptoms of depression, suggesting that asthma is a risk factor for developing depressive symptoms (Lu et al., 2012).

Although most research supports this finding, Vila and colleagues (2000) found no differences in depression among those with asthma compared to healthy peers (Vila et al., 2000). However, the authors note that the psychometric properties of the measures used may have limited their findings, thereby underestimating the number of affective disorders among the study population. Research has identified multiple predictors of meeting diagnostic criteria for depressive disorders among adolescents with asthma, including being female, having parents with lower education levels, living in a household with a lower income level, and being on Medicaid (Katon et al., 2007).

Cross-sectional studies have identified that comorbid asthma and depression are associated with multiple negative psychosocial and physical health outcomes. Youth with comorbid depression and asthma are more likely to engage in risky and deleterious health behaviors such as smoking (Bush et al., 2007). Depressive symptoms are also related to increased functional impairment (McCauley, Katon, Russo, Richardson, & Lozano, 2007), higher reports of health care utilization (Guglani, Havstad, Johnson, Ownby, & Joseph, 2012), and decreased quality of life (Guglani et al., 2012) among youth with asthma. Additionally, comorbid depressive symptoms and asthma are associated with poorer health outcomes, including increased airways resistance (Miller, Wood, Lim, Ballow, & Hsu, 2009) and more frequent use of quick-relief medications (Feldman et al., 2013).

Cross-sectional studies have also found that youth with comorbid asthma and depression who are from communities with more stress are an especially at-risk group. Youth from inner-city communities have higher rates of depression, and depression among these youth is associated with higher disease severity (Waxmonsky et al., 2006). Among youth with increased neighborhood stress, elevated depressive symptoms are related to increased daily asthma symptoms and nighttime symptoms (Tobin et al., 2016). Additionally, adolescents with asthma who experience higher levels of neighborhood stress report more anhedonia than those who do not experience high levels of neighborhood stress (Tobin et al., 2016).

Thus far, there is inconsistent data on the relationship between depressive symptoms and asthma severity, and all studies to date are cross-sectional. Some studies have found positive associations between asthma severity and depressive symptoms (Mrazek, 1992; Richardson et al., 2006; Waxmonsky et al., 2006); however, other studies have not found an association (Afari, Schmaling, Barnhart, & Buchwald, 2001; Janson, Björnsson, Hetta, & Boman, 1994; Mullins, Chaney, Balderson, & Hommel, 2000; Vila et al., 2000). Discrepancies in the literature and the lack of longitudinal studies limit the conclusions that can be drawn about the relationship between asthma severity and depressive symptoms. However, cross-sectional studies on asthma and depressive symptoms among youth indicate that depressive symptoms are associated with several poorer health outcomes.

There are fewer studies that examine the longitudinal relationship between asthma and depression. Some studies have found strong associations between asthma status or symptoms and depression (Goodwin et al., 2004). Importantly, longitudinal studies have shown that depressive symptoms among youth with asthma are predictive of later increased asthma morbidity, systematic inflammation, and healthcare utilization (Shanahan et al., 2013; Weil et al., 1999). Another category of longitudinal research in this area has focused on understanding the temporal relations between asthma and depression, with results suggesting that asthma precedes the development of internalizing disorders (Alati et al., 2005; Feldman et al., 2006). The stability of depression has been examined among the general population (Cole et al., 1998; Gregory, Rijdsdijk, Lau, Dahl, & Eley, 2009; Merikangas et al., 2003; Nivard et al., 2015), but only one study examining the stability of depression among children with asthma (Ramos Olazagasti et al., 2012). The sections below will provide more detail on longitudinal studies examining asthma and depression.

**Associations between asthma and depression.** Goodwin and colleagues (2004) examined the associations between asthma, depression, and anxiety among a New Zealand cohort of adolescents and young adults from the community (Goodwin et al., 2004). The study included

two assessment waves. Data were first collected when youth were 16-18 years of age; youth were 18-21 years of age during the second assessment period. Cross-sectional associations between asthma, depression, and anxiety were examined at each time point. At both time points, there was a positive association between depression/anxiety and asthma. This study did not investigate if adolescents and young adults with asthma were more likely to experience later internalizing disorders or if individuals with internalizing disorders have higher odds of developing later asthma (Goodwin et al., 2004). A major limitation of this study is the cross-sectional analyses, despite longitudinal data collection, thereby limiting any conclusions about temporal precedence or about the stability of symptoms.

**Temporal associations.** Two longitudinal studies sought to better understand the temporal associations between asthma status and depression among youth. Alati and colleagues (2005) examined the directionality of the associations between asthma and depression and anxiety among a large cohort of children from Australia. Maternal-reports of child internalizing problems and child asthma symptoms were collected at two time points across the life of the child (5 years and 14 years of age). Results showed that children who experienced asthma symptoms at age five had greater odds of developing internalizing problems at age 14 compared to those who did not experience asthma symptoms at age 5, again suggesting increased risk for youth with asthma. It is important to note that these associations were consistent for both males and females. Results of this study added to the existing literature by providing preliminary evidence of the temporal sequence of the association between asthma and internalizing problems. Limitations of this study include possible bias due to attrition, with a high number of drop out from mothers with lower family income and lower educational status. The authors also noted that these results may not be generalizable to more diverse populations or those with lower income, less education, and overall poorer mental health (Alati et al., 2005).

Another study examined the associations between asthma and internalizing disorders, including depression, among Puerto Rican youth (Feldman et al., 2006). Children between the

ages of 4 and 17 and their caregivers participated in a two-wave study (baseline and one-year follow-up) examining the association between asthma attacks and internalizing disorders, and the temporal precedence of these factors. Feldman and colleagues (2006) focused on the influence of asthma attacks rather than the presence or absence of asthma due to previous research that found that disease activity was a better predictor of internalizing disorders than asthma diagnosis (Ortega et al., 2004, 2003). Examination of cross-sectional results indicated that children with a lifetime history of asthma attacks were more likely to have an internalizing disorder at both time points compared to those without asthma attacks. Initial analyses indicated that baseline asthma attacks predicted subsequent internalizing disorders. However, after controlling for baseline internalizing disorders, those who experienced asthma attacks did not have significantly greater odds of having an internalizing disorder at one-year follow-up. Although these findings are important, there are limitations to the current study. For example, this study only examined the relationship between asthma attacks and internalizing disorders over a one-year period. Importantly, strengths of this study include that the results of this study may be highly generalizable to the community given the diverse sample in regard to gender and age of the child, location of residency (e.g. urban versus rural), and perception of poverty. This study is an important step in understanding the temporal associations between asthma and internalizing disorders.

**Stability of depression.** Overall, longitudinal studies conducted among the general population demonstrate that depressive symptoms appear to be highly stable over the course of many years (Lovibond et al., 1998; Merikangas et al., 2003; Nivard et al., 2015). In general, depression is less stable among younger children, but appears to become more stable from adolescence to adulthood (Cole et al., 1998; Lovibond et al., 1998; Merikangas et al., 2003). To date, there is only one study examining the stability of depressive symptoms among youth with asthma (Ramos Olazagasti et al., 2012). There are no studies that examine the long-term stability of depression across more than one developmental period (e.g. adolescence to young adulthood)



for individuals with asthma. The dearth of longitudinal studies evaluating the stability of depression among youth with asthma is a critical gap in the literature given the data indicating that depressive symptoms are associated with concurrent and later psychological and health difficulties. The relevant studies are detailed below with studies conducted among the general population detailed first.

Few studies have investigated the stability of depression among children, and to date no studies have examined the stability of depressive symptoms across adolescence and into young adulthood. Cole et al. (1998) conducted one of the only studies examining the stability of depression among children. Rates of depression were examined among elementary children every 6 months over a 3-year period (Cole et al., 1998). The sample was racially heterogenous and evenly distributed regarding gender, with the mean age around 9.8 years of age at baseline. Overall, the stability of depression for this sample was remarkably high across the three year period (Cole et al., 1998). Specifically, the auto-regressive beta weights ( $\beta$ ) for child's self-reports of depressive symptoms ranged from .87 to .49 over the course of 30 months. The authors noted that they may have found such high stability estimates for depression due to the limited time frame and the close spacing of the assessment waves. Future longitudinal studies should explore longer periods of time between data collection waves in order to more fully examine the stability of depressive symptoms across time, particularly across adolescence and into young adulthood.

The other study that examined the stability of depression among children utilized a twin sample study design. This study examined the stability of depression and sleep among twins over a two-year period using a cross-lagged model (Gregory et al., 2009). Over the two-year period, depression was stable from 8 to 10 years of age ( $r = .49$ ). Additional findings indicated that earlier sleep problems predicted later depression among these youth, but early depression did not predict later sleep problems. The results of this study are limited to examining changes in depression over a short period of time, two years. This study only examined depression stability

across one developmental period but excluded other important periods of development for depressive symptoms. Future studies should examine youth across both adolescence and young adulthood to better capture the development of and changes in depression.

Other studies have focused on examining the stability of depression among young adult samples. Lovibond and colleagues (1998) examined the stability of depression and anxiety in a large community sample of young adults in Australia. University students participated in two data collection waves. Initially, 3,540 students, who were recruited across six successive years (1986 and 1991), provided baseline data. All time 2 data was collected in 1994, resulting in the time between baseline and follow-up ranging from between 3 to 8 years. Only 882 students (24.9%) completed measures at both time points. Overall, the correlations between time 1 and time 2 depression scores were moderate, no matter the length of time between the waves. Specifically, there was a moderate correlation ( $r = 0.47$ ) when the time interval between baseline depression and follow-up depression was three years; the correlation was slightly weaker ( $r = 0.35$ ) when the time interval was eight years. Surprisingly, as the interval between data collection increased, the strength of the relationship between baseline and follow-up measurements of depression did not *significantly* decrease among these young adults, indicating strong stability of depression over increased periods of time. These results suggest the symptoms of depression are stable among a non-clinical, young adult sample; however, the authors did not examine potentially important covariates, such as health status. Additionally, no information regarding sample characteristics was provided, limiting the generalizability of the findings to other populations. Another important limitation of this study is that only 24.9% of participants provided data for baseline and follow-up. This attrition rate significantly limits the generalizability of these findings. Though the authors did not report on predictors of missing data, it may be that individuals with less resources or more mental health problems were dropped out of the study. A final limitation of this study is the sole focus on one developmental period, young adulthood (Lovibond et al., 1998). Future studies should explore depressive symptoms across adolescence and into young adulthood.

Another study examined the stability of depression among a community sample of young adults in Zurich across a 15-year time period (Merikangas et al., 2003). Young adults between 19 and 20 years of age completed a baseline interview and were subsequently administered semi-structured interviews once every 5 years for 15 years. Depression was found to be stable over the 15 years; more specifically, prior depression scores were significant predictors of later depression scores. A major limitation of this study is that the authors did not examine or control for gender differences in the stability of depression over time, which has been a significant covariate in other studies (Katon et al., 2007). Additional limitations of the study include the unreported sample demographic characteristics and the high rate of attrition (30%) over the study time period (Merikangas et al., 2003). The high attrition rate may be due to drop out from vulnerable or at-risk populations; however, no missing data analysis was conducted to explore predictors of missingness and there was an overall lack of demographic information on study participants. Given these limitations, it is difficult to make generalizations regarding the study findings.

To date, there is only one study that examines the longitudinal stability of depression among youth with asthma, despite the cross-sectional data supporting their increased risk. Ramos Olazagasti and colleagues (2012) examined the longitudinal relationship between asthma and depression among a large sample of Puerto Rican children ( $M_{age} = 11.57$ ) from New York (N = 598) and Puerto Rico (N = 673). Caregivers reported on their child's asthma (i.e., no asthma, intermittent (IA), or persistent (PA) asthma) and depression status yearly over the duration of three years. Cross-sectional analyses indicated that IA was more prevalent among Puerto Rican natives compared to New York natives, while PA was more prevalent among New York natives compared to Puerto Rican natives. Youth with asthma were more likely to report higher levels of depression compared to those without asthma; asthma severity was not related to the increased risk for depression. Over time, youth living in New York were more likely to report higher levels of depression compared to those living in Puerto Rico. Among youth living in New York, both IA

and PA were positively related to depression. Among Puerto Rican natives, there was no association between asthma status and depressive symptoms.

The authors also examined depression longitudinally. Across time, there was a significant increase in depressive symptoms for youth with IA and PA in New York. Among youth from Puerto Rico, there was no significant change in depression for youth with either IA or PA. The authors also examined the rate at which depressive symptoms decreased over time, however, there were no differences in the rate of depression changing over time for Puerto Rican children with asthma and without asthma at either site. Additionally, this study examined if changes in depression across time were different between youth with and without asthma across both sites. Among those with asthma living in New York, there was an increase in risk for depression, but the risk remained stable over three years. For those living in Puerto Rico, changes in depression were not related to asthma status.

Overall, these findings support previously reported literature regarding youth with asthma and depression: those with asthma are more likely to report depressive symptoms compared to youth without asthma. Novel longitudinal findings indicate that youth with asthma are more likely to experience depressive symptoms if they are living in a community where they are part of the minority population (e.g. Puerto Rican children living in New York) compared to those who are considered to be majority in the ethnic community (e.g. Puerto Rican children residing in Puerto Rico). To date, this is the only study that examines the stability of depression among youth with asthma (Ramos Olazagasti et al., 2012). The findings of this study are important given Puerto Rican youth's increased risk for asthma, however, the generalizability of the findings to other populations is limited. Future studies should examine the longitudinal relations between asthma and depressive symptoms among more nationally representative samples of youth to increase the generalizability of results. Additionally, it is important to expand these findings across other developmental periods, such as young adulthood.

Overall, the longitudinal studies that have examined depression and asthma have explored the temporal precedence and the stability of these constructs across time. Data suggest that asthma is a significant predictor of later depression among youth, however, the inverse relationship is not supported (Alati et al., 2005). Depression appears to be stable over time among healthy youth and young adults, and one study found that depression was stable among Puerto Rican youth with asthma. However, current gaps in the literature include a lack of understanding about what factors are influencing youth's depressive symptoms across time (Cole et al., 1998; Gregory et al., 2009; Lovibond et al., 1998; Merikangas et al., 2003; Ramos Olazagasti et al., 2012) and the lack of data on the stability of depressive symptoms among a representative sample of youth with asthma. Further, given the increased risk of depressive symptoms during adolescence (Angold & Costello, 2009), it is important to investigate depression across adolescence and young adulthood. Studies examining depression across both developmental periods would allow for stronger conclusions regarding the development and stability of depression across time.

The present study will expand upon the limited longitudinal research on asthma and depression by 1) using a nationally-representative sample of children with asthma and 2) by examining the stability of depressive symptoms across adolescence and young adulthood. Understanding the stability of depression among this vulnerable population can help identify key periods for monitoring and intervening with youth with asthma. Given the increased risk for developing depression and other internalizing disorders among youth with asthma, it is also important to explore the influence of potential resiliency factors or coping strategies that may reduce internalizing disorders among these youth. Religious coping has been shown to act as a protective factor against mental health concerns such as internalizing disorders among children with chronic medical conditions. Thus, the proposed study will also explore the longitudinal associations between depressive symptoms and religious coping among youth with asthma. This will be the first study to examine the longitudinal relationship between depression and religious

coping among youth with asthma. The relevant literature on religious coping is summarized below.

### **Religious Coping**

**Religiosity and spirituality.** A large body of literature suggests that many individuals turn to religion and spirituality when faced with stressful life events (Bonelli et al., 2012; Gonçalves et al., 2015; Phillips et al., 2014; Reynolds et al., 2013). Although closely intertwined terms, religion and spirituality have been described as separate entities (Zinnbauer et al., 1997). Spirituality is defined as a personal or experiential term, with the focus on belief in a higher power or God. Spirituality may be experienced through feeling peace and comfort from spiritual beliefs or feeling a spiritual connectedness to a higher power or being (Cotton, Zebracki, Rosenthal, Tsevat, & Drotar, 2006; George et al., 2000; Koenig et al., 2001). Religiosity is defined as being affiliated with a religious organization or institution and following those beliefs and practices (Zinnbauer et al., 1997). Components of religiosity include church attendance, prayer, meditation, and/or beliefs in a God (Zinnbauer & Pargament, 2014; Zinnbauer et al., 1997). The more formal, institutionalized, outward expression of beliefs can be thought of as religiosity, while spirituality is the internal expression of beliefs and connectedness (George et al., 2000; Koenig et al., 2001). According to the 2015 World Values Survey, almost 70% of Americans consider themselves to be religious and almost 80% of individuals consider themselves to uphold beliefs of spirituality (World Values Survey Association, 2014). Religion and spirituality are utilized during stressful times for a variety of individuals, this coping strategy is most commonly referred to as religious coping.

**Religious coping.** Religious coping is defined as the use of cognitive or behavioral techniques based in one's religion or spirituality when faced with stressful events (Pargament et al., 2000). Religious coping is the more commonly used term, but it encompasses both the religious and spiritual aspects of the coping mechanism (Pargament et al., 2000). Religious coping can be further broken down into positive religious coping and negative religious coping

(Pargament et al., 2000). Positive religious coping is defined as partnering with God and finding and seeking strength from God (Pargament et al., 2000). Across the literature positive religious coping is related to more positive outcomes, such as decreased depressive symptoms and better physical health (Ano & Vasconcelles, 2005). A recent systematic review concluded that more positive religious coping is related to better depressive outcomes during stressful life events (Bonelli et al., 2012). Negative religious coping includes behaviors or thoughts such as blaming God, feeling abandoned by God, or fearing that God is angry with you (Pargament et al., 2000). This type of coping is related to more negative outcomes (Pargament et al., 2000), such as increased anxiety, depression, burden, and hopelessness (Ano & Vasconcelles, 2005; Hebert et al., 2009). The use of negative religious coping techniques (e.g. feeling guilty and not living up to the high standards of their religious beliefs) may lead to social isolation from the religious community and more depressive symptoms (Bonelli et al., 2012). Much of the existing research has focused on the positive religious coping, with less research on negative religious coping strategies. This is a notable gap in the literature given there may be particular religious groups or individuals who are more likely to use negative religious coping strategies (Pargament, Smith, Koenig, & Perez, 1998), such as individuals faced with chronic stressors (Bjorck, Thurman, Jeffrey P. Bjorck; John W. Thurman, Bjorck, & Thurman, 2007).

Religious coping is used by a number of groups, however, there are differences among those who utilize this coping mechanism. Level of education is negatively related to use of religious coping, regardless of race (Chatters, Taylor, Jackson, & Lincoln, 2008). Compared to non-Hispanic whites, African Americans and Caribbean Blacks report greater use of religious coping techniques (Chatters et al., 2008). Additionally, among African Americans and Caribbean Blacks, those who are female and married are more likely to report the use of religious coping, such as prayer during stressful situations (Chatters et al., 2008). The majority of the religious coping literature focuses on individuals who identify as Catholics and Protestants (Ano & Vasconcelles, 2005).

**Religious coping among adults with chronic medical conditions.** Religious coping has been predominately studied among adults with chronic medical conditions (Holland et al., 1999; Keefe et al., 2001; Pargament et al., 2004; Siegel & Schrimshaw, 2002). Positive religious coping is associated with improvements in health among elderly individuals with various medical illnesses (Pargament et al., 2004). Research among adults diagnosed with advanced stages of cancer suggests that religious coping is associated with greater life satisfaction and lower pain levels (Holland et al., 1999; Yates, Chalmer, James, Follansbee, & McKegney, 1981). Individuals with rheumatoid arthritis report more frequent use of positive religious coping compared to negative religious coping (Keefe et al., 2001), and the use of positive religious coping is related to increased positive mood, lower levels of negative daily mood, and more social support (Keefe et al., 2001). Older adults with HIV/AIDS report a number of positive outcomes associated with religious coping, including feeling empowered, strengthened, a sense of control, and less emotional burden related to their disease (Siegel & Schrimshaw, 2002). Overall, the literature suggests that religious coping among adults with chronic medical conditions is associated with positive physical and mental health outcomes. Similar to research with the general adult population, there has been little research that specifically looks at negative religious coping strategies.

**Religious coping among youth with chronic medical conditions.** Among children with chronic medical conditions, there is a smaller but growing literature focused on religious coping. A recent meta-synthesis examined the literature surrounding spirituality and chronic medical conditions for pediatric populations (Damsma Bakker et al., 2018). Damsma Bakker and colleagues (2018) evaluated twenty studies that examined child-reported spirituality among youth with a variety of chronic medical conditions. The studies were mixed in regard to methodology and the review included both quantitative and qualitative work and cross-sectional and longitudinal studies. Across studies, most children with medical conditions reported a belief in God or a higher power. Youth noted that having relationship with God brought them a sense of



comfort and strength. The authors noted the use of both positive and negative religious coping across various samples of youth with chronic medical conditions. Positive spiritual coping techniques were associated with number of positive health care and mental health outcomes across studies, such as increased quality of life, increased adherence, better healthcare utilization, and better pain management (Damsma Bakker et al., 2018). Across studies, youth reported that they used negative religious coping less often, but the most commonly reported negative coping technique was questioning (e.g., contemplating God's love or his plan for them or questioning what they had done to deserve their medical condition). Damsma Bakker and colleagues (2018) did not report on the outcomes associated with the use of negative coping techniques.

Overall, it appears that youth with chronic medical conditions use religious coping in a number of ways, and the use of positive religious coping is positively related to healthcare and mental health related outcomes. The majority of studies highlighted in this meta-synthesis focus on adolescent beliefs regarding spirituality, but not religiosity. It is important to note that the authors of the meta-synthesis focused on spiritual coping and did not use religious coping as a search term, potentially missing studies that focused on religious coping. In fact, an additional study examining longitudinal relations between depression and religious coping that was not included in the meta-synthesis is described below.

Reynolds and colleagues examined the longitudinal relationships between religious coping, depression, and conduct problems among youth with either diabetes or cystic fibrosis (CF) using an autoregressive cross-lagged path model (Reynolds et al., 2014). Reynolds et al. (2014) were interested in investigating the longitudinal stability of these variables among youth with a chronic medical condition. At baseline, depression and negative religious coping were associated: Youth who used more negative religious coping at baseline reported higher baseline levels of depression. There was no significant relationship between baseline positive religious coping and depression levels. Across the two years, all variables remained stable across time points: depression ( $\beta = .31$ ), positive religious coping ( $\beta = .41$ ), negative religious coping ( $\beta =$

.47), and conduct problems ( $\beta = .36$ ). Longitudinal analyses found that higher baseline positive religious coping was associated with fewer conduct problems, lower depression, and less negative religious coping at follow-up. Interestingly, use of more negative religious coping techniques at baseline was associated with increased use of positive religious coping techniques at follow-up. Additionally, youth with higher depression at baseline reported more conduct problems and more negative religious coping at follow-up; however, baseline depression was not associated with positive religious coping at follow-up. Depression at follow-up was associated with more negative religious coping at follow-up. (Reynolds et al., 2014). This was the first study to examine the stability of depression and religious coping among a group of youth with a chronic medical condition. Future research should examine the longitudinal stability of these constructs within additional populations of youth with chronic health conditions given the association between religious coping and depression. More specifically, that positive religious coping was associated with fewer depressive symptoms and less use of negative religious coping at follow-up.

**Religious coping among youth with asthma.** Despite the fact that asthma is the most common chronic medical condition in childhood, there is limited research on religious coping among youth with asthma. Three studies have examined religious coping among youth with asthma; two of these examined the longitudinal associations between religious coping and depression among youth with asthma. These studies are detailed below.

Benore and colleagues (2008) examined the longitudinal associations between religious coping and adjustment to hospitalization among youth with asthma. Youth with asthma ( $N = 87$ ;  $M = 11.6$  years) and their caregivers reported on religious coping and various psychosocial adjustment outcomes, including depression, at two time points (baseline and one-month follow-up). The sample was predominately African American (94%). Youth with asthma reported more frequent use of positive religious coping than negative religious coping. Baseline negative religious coping was positively associated with baseline depression ( $r = 0.337$ ), but baseline

positive religious coping was not significantly associated with depression. Correlations at one-month follow-up indicated that depression was not associated with positive or negative religious coping. After controlling for several demographic and disease-related variables (age, gender, religious importance, perceived overall health, asthma control, challenge of asthma), religious coping predicted a significant amount of variance in adjustment at both baseline and one-month follow-up above and beyond secular coping for children with asthma. Specifically, more baseline negative religious coping was predictive of greater baseline depression ( $\beta = 0.353$ ), but not predictive of depression at one-month follow-up; however, baseline negative religious coping was predictive of additional psychosocial outcomes at one-month follow-up (e.g. anxiety). There was no relationship between baseline positive religious coping and depression at baseline or one-month follow-up. A second regression model was used to assess the relationship between religious coping strategies and adjustment outcomes above and beyond secular coping strategies: Negative religious coping remained a significant predictor of greater depression for youth with asthma at baseline ( $\beta = 0.254$ ). Again, neither negative nor positive religious coping was predictive of depression at follow-up.

This study expanded the literature by examining the associations between psychosocial adjustment, including depression, and religious coping among youth with asthma. The findings from Benore et al. (2008) mirror earlier reported findings among youth with chronic medical conditions (Damsma Bakker et al., 2018) such that positive religious coping was utilized more frequently than negative religious coping among youth with asthma. Additionally, this study found that negative religious coping was associated with greater depression among youth with asthma at baseline, but not follow-up. Contrary to previous findings among individuals with and without a chronic medical condition, there were no significant findings related to the use of positive religious coping and better psychosocial adjustment outcomes. Children were recruited for this study during hospitalizations, which may have impacted baseline measurements of

religious coping and adjustment outcomes, and the results of this study. This study had a number of limitations such as a limited sample size, ethnic and religious homogeneity, limited data collection points, and the use of non-standardized follow-up measures. While validated assessments were used at baseline the authors shortened these validated measures for the follow-up assessment. The current study findings are difficult to generalize outside of a highly African-American (94%) and Baptist population (57%). Another limitation of this study is that religious coping and psychosocial adjustment were only assessed across a one-month period and the stability of these constructs was not examined. Future studies should utilize longer assessment periods to better understand how depression and religious coping change over time and utilize standardized measures to examine these constructs (Benore et al., 2008).

Cotton and colleagues conducted a cross-sectional study and a longitudinal study to explore religious coping among adolescents with asthma in an urban setting. Cotton and colleagues (2012) first conducted a cross-sectional study and recruited 151 adolescents with various levels of asthma severity from an urban children's medical center. The sample was composed of mostly females (60%), with a mean age of 15.8 years of age, and 85% of adolescents reported being African American. Religious coping was assessed using a variety of measures which have been previously validated for use with adult populations. The majority of the sample (81%) endorsed being both religious and spiritual, with a smaller portion identifying as being either religious (7%) or spiritual (4%). Most participants indicated that religion or spirituality played an important role in their life; they also reported that religion or spirituality helped them to find a purpose for their life or reported feeling comfort in their faith or spiritual beliefs. Almost half of the sample indicated that religious coping played an important role in helping them cope with their asthma, with the majority of youth reporting use of positive religious coping. Higher scores on most religious coping measures (all except negative religious coping) were associated with being African American and having a religious preference. This study did not examine the relationship between religious coping and psychosocial or health

outcomes. However, almost half of youth endorsed a belief that providers should incorporate religious coping into health care visits and treatment. Of those who wished to incorporate religious coping into health care visits, 71% indicated that this would help providers understand how religious coping influences asthma coping. A small number of participants had actually discussed their religious beliefs with providers during visits (28%). These results highlight that youth with asthma are using religious coping and that they believe that it should be incorporated into their medical care. Similar to previously reported studies, Cotton et al. (2012) found that youth with asthma mainly used positive religious coping techniques, but this study did not examine these variables and their association to internalizing disorders. Similar to Benore et al. (2008), researchers utilized a sample composed mostly of African American youth with asthma, and it may be difficult to generalize these results to broader communities of youth with asthma.

Cotton et al. (2013) extended their previous study by examining the longitudinal relations between negative religious coping, negative secular coping, and depressive symptoms among youth with asthma. Youth with asthma completed measurements at two timepoints, baseline and 11-14-month follow-up. At baseline, 151 (*Age* = 15.8 years) adolescents completed measures, and 132 youth with asthma completed measurements at both timepoints. At baseline, the majority of the sample identified as African American (85%) and as either Catholic (11%) or Protestant (64%). There was a significant decrease in depressive symptoms across time. An initial analysis investigated the baseline associations between demographics and baseline coping and outcome measures such as depression symptoms. Step one of the regression model indicated that being female and being African American were associated with greater depressive symptoms at baseline. In step two of the regression model, negative secular coping significantly accounted for an additional 9% of the variance for depressive symptoms. Lastly, more negative spiritual coping was associated with greater baseline depressive symptoms. Next, a step-wise regression model was used to examine depressive symptoms at follow-up. Demographic variables were entered into step one of the model but none of these variables significantly predicted later depressive

symptoms. In step two, higher baseline negative secular coping was significantly associated with increased depressive symptoms at follow-up. Lastly, higher baseline negative religious coping significantly predicted increased depressive symptoms at follow-up. Overall, the cross-sectional and longitudinal results of this study indicate that both negative secular coping and negative religious coping are associated with increased depressive symptoms among youth with asthma.

Cotton and colleagues (2013) examined the longitudinal associations between religious coping and depression among youth with asthma but did not examine the stability of these constructs. Contrary to previous research, Cotton et al. (2013) focused on the relationship between negative religious coping and depressive symptoms. This study utilized a smaller and largely homogenous sample. Additionally, data collection took place across approximately one year during adolescence. It may be important for future studies to examine these relations across multiple developmental periods, such as adolescence and young adulthood. Future studies should also seek to examine these relations among nationally representative samples of adolescents with asthma.

Overall, there is limited research examining the associations between religious coping and depression among youth with asthma; however, the existing studies suggest that both positive and negative religious coping are important predictors of depressive symptoms among youth with asthma. Specifically, to date, there are only three studies, and only two longitudinal studies, that examine how religious coping may be associated with mental health outcomes such as depression among this vulnerable population. Additionally, only one study has examined the stability of religious coping among youth with a chronic medical condition, and no studies have examined this among youth with asthma. Research focusing on youth with other chronic medical conditions (e.g. CF, IBD, and diabetes) has identified associations between positive religious coping and mental health outcomes such as increased quality of life, increased adherence, decreased externalizing problems, and fewer internalizing problems. Given that asthma is the most prevalent chronic illness of childhood, it is important to better understand the role of religious coping and

how it is related to depression among these vulnerable youth. The present study aims to expand the literature by examining the longitudinal associations between religious coping and depression among youth with asthma. More specifically, the present study seeks to investigate the stability of and associations between depression and religious coping across multiple developmental periods (adolescence and young adulthood) using a large, nationally representative sample.

## CHAPTER III

### METHODOLOGY

#### **Participants and Procedure**

Participants in the current study were a subset of adolescents from The National Longitudinal Study of Adolescent to Adult Health (Add Health) (Harris et al., 2009), a nationally representative longitudinal study. Add Health includes a representative sample of adolescents from across the United States using both school-based questionnaires and in-home interviews. Add Health utilized systematic sampling methods and implicit stratification to ensure that the study represented schools in the United States. Sampling stratification of schools was based on region, school size, urbanicity, type (public, private, parochial), and ethnic representation of the schools. To ensure that the sample was representative of the U.S. population, 80 high schools and 52 feeder middle schools were selected to participate in the study. Participation rates among the originally identified schools was over 70%. Schools were identified in the appropriate stratum to replace schools that refused. Overall, 79% of all schools contacted to participate in Add Health agreed to participate.



In Wave 1, a school-based assessment was completed with more than 90,000 students. A subset of youth was chosen to participate in the core sample that completed in-home assessments for Wave 1 and subsequent waves. The core sample was created by stratified sampling based on grade and sex, resulting in 200 students from each pair of schools (high schools and their associated middle school/ feeder school). The initial core sample was comprised of 12,105 youth who completed the Wave 1 in-home assessment. In addition to the core sample, multiple special samples were purposefully enrolled in the study, including ethnic and racial minority youth, individuals with varying relatedness to an identified participant (e.g., twins, half-siblings, full siblings, unrelated adolescents living in the same home), individuals who were adopted, youth with disabilities, samples from schools with varying urbanicity, and additional individuals who were identified via social network/ romantic partnership identification procedures. Overall, the core sample plus the special samples resulted in an overall baseline sample of 20,745 youth.

The present study utilized four waves from the larger Add Health Study: Wave 1, Wave 2, Wave 3, and Wave 4. The first wave of data (Wave 1) was collected during the 1994 – 1995 academic school year when participants were in grades 7 – 12; in Wave 1, a large body of students answered in-school questionnaires (N = 90,118) and a subset completed in-home interviews (N = 20,745). Waves 2 through 4 were conducted between 1996 and 2008 and utilized in-home interview procedures. Wave 2 (N = 14,738) was conducted in 1996, one year after the Wave 1, and includes data collected from participants from the Wave 1 core sample; the response rate was 88.6%. The third wave of data (Wave 3) was collected between 2001 and 2002 when participants (N = 15,197) were between the ages of 18 – 26 years of age; the response rate of 77.4%. Wave 4 data was collected in 2008 when participants (N = 15,701) were between the ages of 24 – 32 years of age; the response rate was 80.3%.

The present study used the first four waves of Add Health to understand the longitudinal relations between depression and religious coping across multiple developmental periods (Wave 1 and 2 = adolescence, Wave 3 = young adulthood, and Wave 4 = adulthood). The sample was

restricted to participants who were not missing data on weighting variables. A subpopulation command was then utilized to focus analyses on youth who had a diagnosis of asthma at baseline ( $N = 998$ ).

### **Measures**

Demographic (e.g., gender, child age, ethnicity, and race) information about the participants were drawn from in-home assessments completed by either the child or parent. Participant race was condensed into two groups due to lower numbers in racial minority groups (0 – White, 1 – Non-White).

**Asthma.** Asthma status was assessed via parent-report by asking, “Does the child have the following health problem: asthma or emphysema?” during Wave 1 data collection. Parents responded by indicating either “yes” or “no.” Eligible participants’ parents responded “yes” to this question at Wave 1. Although this question does not differentiate between asthma and emphysema, it is assumed that adolescents were diagnosed with asthma given that emphysema does not typically develop until adulthood (Tercyak, 2003). This approach for identifying youth with asthma in the Add Health dataset has been utilized effectively in other studies (Tercyak, 2006; Tercyak et al., 2003).

**Depression.** Depressive symptoms were measured using a modified 9-item version of the Center for Epidemiological Study- Depression (CES-D) measure (Primack, Swanier, Georgiopoulos, Land, & Fine, 2009; Radloff, Lenore, & Radloff, 1977). The modified 9-item CES-D was administered during each wave. Participants used a 4-point Likert scale (0 = *never*; 3 = *most of the time or all of the time*) to indicate how often items such as “I felt depressed” applied to them over the past week; reverse scoring was used for relevant items. A total score was computed with higher scores indicating more depressive symptoms. Prior research has documented the validity of shortened versions of the CES-D (Grzywacz, Hovey, Seligman, Arcury, & Quandt, 2006; Zhang et al., 2012); the 9-item CES-D has also demonstrated adequate to good reliability (Primack et al., 2009). The 9-item CES-D had good internal consistency across

all four waves in the current study (Wave 1 alpha = .80; Wave 2 alpha = .81; Wave 3 alpha = .81; Wave 4 alpha = .81).

**Religious coping.** Religious coping was assessed during all four waves using four questions assessing religious affiliation, frequency of religious service attendance and prayer, and the importance of religion. Participants were asked about their religious affiliation using the question, “What is your religion.” A multiple-choice response option with multiple listed religions was provided (e.g. Baptist, Jehovah’s Witness, Presbyterian, Catholic, etc.). The religious affiliation variable was dichotomized into religious affiliation (1) or no religious affiliation (0). If participants endorsed a religious affiliation they were asked three additional questions regarding religious coping. Participants were asked about religious services attendance through one question, “In the past 12 months, how often did you attend religious services?”, with response options ranging from “never” (0) to “once a week or more” (3). Participants were asked about prayer through the question, “How often do you pray?” with response options ranging from “never” (0) to “at least once a day” (4). Finally, religious importance was assessed using one question: “How important is religion to you?”. Response options ranged from not important at all (0) to very important (3). If participants endorsed no religious affiliation, they were not asked further religious coping questions. Composite religious coping scores were created for each wave. The composite scores were calculated by summing the four religious coping questions; scores ranged from 0 to 11 with higher scores indicating more religious coping. Participants who endorsed no religious affiliation received a religious coping score of 0. Individuals who endorsed a religious affiliation, and therefore answered the additional three questions, could have composite scores ranging from 1-11.

### **Overview of Analyses**

For all analyses, appropriate weighting strategies for the study design were used (Chen & Chantala, 2014). The subsample command was utilized to select youth with asthma in order to

maintain an appropriate weighting approach. Mplus version 8 was used for all analyses (Muthen & Muthén, 2017).

Missing data indicators were created for depression and religious coping across all four waves in order to conduct missing data analyses (Collins, Schafer, & Kam, 2001). Correlations between the variables of interest (e.g. depression and religious coping), missing data indicators, and demographic variables were explored to identify variables that would need to be included in the main analyses. Race and age were correlated with depression, but not correlated with the missing data indicator for depression. The following variables were correlated with both depression and the missing data indicator for depression: ethnicity and sex. For religious coping, race and age were correlated with main variable but not the associated missing data indicators. Sex and ethnicity were significantly correlated with religious coping and the missing data indicator for religious coping. In sum, sex and ethnicity were identified as variables important for understanding missing data. Full-information maximum likelihood methods were used to address the missing data (Muthen & Muthén, 2017). Instead of including sex and ethnicity only as an auxiliary variable (a variable that would be used in missing data analysis but not in the model), these variables were included as covariates because of their identified associations with the dependent variables in the prior literature (Postma, 2007; Wing, Gjelsvik, Nocera, & McQuaid, 2015); including these variables as covariates still uses the full-information maximum likelihood method to address potential biases related to missingness. Additional covariates were identified by investigating their correlation with baseline depression and religious coping. Demographic variables correlated with baseline depression and religious coping ( $p < .05$ ) were included as covariates. Covariates included in the subsequent analyses included: race, ethnicity, sex, and baseline age.

Model fit was assessed using the comparative fit index (CFI), chi-square ( $\chi^2$ ), Tucker-Lewis index (TLI), standardized root mean square residual (SRMR), and root mean square error of approximation (RMSEA) (Hu & Bentler, 1999). A good model fit is indicated by  $CFI > .95$ ,  $\chi^2$

> .05, TLI > .95, SRMR < .05, and RMSEA  $\leq$  .05 (Geiser, 2013). Modification indices were used to identify parameters to add to the model to improve model fit.

For Aim 1, descriptive statistics for rates of depressive symptoms and religious coping and bivariate correlations between wave-specific depression and religious coping among youth with asthma were identified. Aims 2 – 4 were achieved via examination of longitudinal model paths among youth with asthma. An autoregressive cross-lagged path model (Figure 1) was used to examine the autoregressive, concurrent, and longitudinal relations (including cross-lagged paths) between depression and religious coping. Auto-regressive cross-lagged path models have been previously used to examine associations between depression, spiritual coping, and psychological problems (Reynolds et al., 2014). The original model proposed identified a number of longitudinal paths (Figure 1), however due to poor model fit with this complex model, the model was simplified. First, a model with only concurrent correlations, adjacent autoregressive and cross-lagged paths was executed. Next, the originally proposed longitudinal paths between baseline depression and depression at Waves 3 and 4 were added; the same respective paths for religious coping were also added. Modification indices were then used to identify additional longitudinal paths that should be included in the model to improve model fit, resulting in two additional longitudinal paths between depression and religious coping being added (Depression Wave 2 predicting Religious Coping Wave 4; Religious Coping Wave 2 predicting Depression Wave 4).

More specifically, to achieve Aim 2, the autoregressive paths between adjacent measurements of depression (e.g., Waves 1 & 2) were examined. Similarly, for Aim 3, the autoregressive paths between adjacent assessments of religious coping were evaluated. To further examine stability, the associations between non-adjacent measurements of depression were investigated (e.g. the paths between depression at Wave 1 and Wave 3); this was also done for religious coping. Aim 4 was achieved via an examination of the cross-lagged associations between depression and religious coping (e.g., path from Wave 1 religious coping to Wave 2

depression). Other longitudinal paths between depression and religious coping were also examined. Standardized values are reported.

## CHAPTER IV

### FINDINGS

The main study sample was comprised of participants who indicated that they had asthma at baseline ( $N = 998$ ). At baseline, youth with asthma were between 7 – 12<sup>th</sup> grade and ranged in age from 12 – 19 years old ( $M = 15.48$ ,  $\sigma^2 = 2.42$ ). Additional participant demographic information can be found in Table 1.

#### *Aim 1*

Baseline levels of depression and religious coping were examined for youth with asthma. Baseline levels of depression scores for youth with asthma ranged from 0 – 23 with an average score of 5.70 ( $\sigma^2 = 18.45$ ). Baseline levels of religious coping ranged from 0 – 11 and the average score was 7.32 ( $\sigma^2 = 13.08$ ) for youth with asthma. The means and variances of depression and religious coping across all four waves are presented in Table 2.

The path model focused on youth with asthma (Figure 2) that examined depression and religious coping cross-sectionally and longitudinally had good model fit ( $\chi^2 = 23.23$ ,  $p < .01$ ; CFI: 0.99; TLI: 0.90; SRMR: 0.01; RMSEA: 0.05). The cross-sectional correlations between depressive symptoms and religious coping were non-significant across each of the four time-points (Wave 1:  $r = -.03$ ,  $p = 0.42$ ; Wave 2:  $r = -.07$ ,  $p = .11$ ; Wave 3:  $r = -.001$ ,  $p = .98$ ;

Wave 4:  $r = -.05, p = .31$ ).

### *Aims 2 and 3*

Among youth with asthma, depression had moderate stability over time, with higher depression at earlier time points predicting increased depression at subsequent time points across all four waves. More specifically, baseline depression significantly predicted depression at Wave 2 ( $\beta = .60, p < .001$ ; CI 95% [.54 – .66]; SE = .03). Depression in adolescence (Wave 2) significantly predicted depression in young adulthood (Wave 3) ( $\beta = .33, p < .001$ ; CI 95% [.24 – .42]; SE = .05). Depression in young adulthood (Wave 3) significantly predicted depression seven years later in adulthood (Wave 4) ( $\beta = .33, p < .001$ ; CI 95% [.24 – .43]; SE = .05).

Religious coping was moderately stable from adolescence to young adulthood (Wave 1 to Wave 4). Overall, higher religious coping at earlier time points was associated with increased religious coping at adjacent time points. Baseline religious coping (Wave 1) significantly predicted religious coping one year later (Wave 2) ( $\beta = .73, p < .001$ ; CI 95% [.68 – .79]; SE = .03). Religious coping during adolescence (Wave 2) significantly predicted religious coping during young adulthood (Wave 3) ( $\beta = .27, p < .001$ ; CI 95% [.17 – .38]; SE = .06). Young adults (Wave 3) who reported higher religious coping were more likely to report higher religious coping during adulthood (Wave 4) ( $\beta = .59, p < .001$ ; CI 95% [.52 – .66]; SE = .03).

The longitudinal associations between baseline depression and depression in young adulthood (Wave 3) and adulthood (Wave 4) were also assessed; the same was done for religious coping. Higher baseline depression (Wave 1) predicted higher depression during young adulthood (Wave 3) ( $\beta = .14, p = .001$ ; CI 95% [.06 – .23]; SE = .04) and adulthood (Wave 4) ( $\beta = .23, p < .001$ ; CI 95% [.15 – .31]; SE = .04). A similar pattern was found for religious coping: Higher religious coping at baseline was associated with higher religious coping at during both young adulthood (Wave 3) ( $\beta = .32, p < .001$ ; CI 95% [.22 – .41]; SE = .05) and young adulthood (Wave 4) ( $\beta = .12, p = .001$ ; CI 95% [.05 – .19]; SE = .04).



#### *Aim 4*

Next, the cross-lagged paths between depression and religious coping were investigated. Overall, earlier depression was not predictive of later religious coping. Wave 1 depression did not significantly predict Wave 2 religious coping ( $\beta = -.04, p = .12$ ; CI 95% [-.09 – .01]; SE = .03). Depression in adolescence (Wave 2) did not significantly predict religious coping scores in young adulthood (Wave 3) ( $\beta = -.002, p = .95$ ; CI 95% [-.06 – .05]; SE = .03). Depression at Wave 3 did not significantly predict religious coping at Wave 4 ( $\beta = .06, p = .23$ ; CI 95% [-.04 – .15]; SE = .05).

Only one cross-lagged path between religious coping and later depression was significant. Religious coping at Wave 1 did not significantly predict depression at Wave 2 ( $\beta = -.04, p = .22$ ; CI 95% [-.10 – .02]; SE = .03). Wave 2 religious coping did not significantly predict Wave 3 depression ( $\beta = 0.01, p = .75$ ; CI 95% [-.06 – .08; SE = .04). However, religious coping during Wave 3 significantly predicted depression during Wave 4 ( $\beta = -.17, p < .001$ ; CI 95% [-.25 – -.09]; SE = .04), such that increased religious coping during young adulthood predicted decreased depressive symptoms during adulthood, almost a decade later.

Additional longitudinal paths between depression and religious coping, beyond adjacent cross-lagged paths, were explored (Figure 2). Overall, earlier depression was not significantly predictive of later religious coping when examining non-adjacent paths. Depression at Wave 2 was not predictive of religious coping at Wave 4 ( $\beta = -.02, p = .66$ ; CI 95% [-.08 – .05]; SE = .04). On the other hand, religious coping was a significant predictor of later depressive symptoms: More religious coping during adolescence (Wave 2) was associated with *more* depression during adulthood Wave 4 ( $\beta = .13, p < .001$ ; CI 95% [.05 – .20]; SE = .04).

## CHAPTER V

### DISCUSSION

Approximately one in four youth with asthma experience symptoms of depression (Lu et al., 2012). Religious coping appears to play an important role in depressive symptoms for youth with chronic medical conditions (Damsma Bakker et al., 2018; Reynolds et al., 2014). Despite youth with asthma's increased risk for depressive symptoms and the positive outcomes associated with the use of religious coping, prior literature has not examined the long-term stability of, or association between, religious coping and depression for youth with asthma. The first aim of the present study was to identify mean levels of depression and religious coping across time for individuals with asthma. The second and third aims were to examine the longitudinal stability of depression and religious coping across time. The final aim was to better understand the longitudinal associations between depressive symptoms and religious coping from adolescence through adulthood for individuals with asthma.

#### **Depressive Symptoms**

Youth with asthma exhibited a fluctuating pattern of depressive symptomology such that they exhibited higher depressive scores in adolescence, followed by a decrease in symptoms in young adulthood, and then a subsequent increase in symptoms in adulthood. This pattern of depressive symptoms was also identified in a study that used Add Health data to describe

depressive symptoms among the general sample of adolescents (Wilkinson et al., 2016).

Compared to the Wilkinson et al. (2016) study, youth with asthma demonstrated more depressive symptoms, though slightly, during those developmental periods marked by more depressive symptoms (i.e., adolescence and adulthood) compared to their peers without asthma. Though the present study described the pattern of depressive symptoms for individuals with asthma across almost 15 years, it did not directly compare rates of depressive symptoms between youth with and without asthma. Future studies may wish to investigate statistical differences in the longitudinal patterns of depressive symptoms between those with and without asthma.

The similar rates and patterns of depressive symptoms in the present study on youth with asthma in Add Health in relation to the Wilkinson et al. (2016) study focused on the general Add Health population are worth mentioning given that prior literature has found that youth with asthma have more depression relative to their peers without asthma (Lu et al., 2012). The largely similar levels of depressive symptoms seen in youth with asthma in this study compared to previously reported studies on the general Add Health population may in part be due to methodical differences between the Add Health manuscripts and prior studies that found differences between depression between youth with and without asthma. For example, only one study in the Lu et al. meta-analysis that investigated differences in depression based on asthma status utilized a nationally-representative sample, which could limit other studies' generalizability (Lu et al., 2012). That cross-sectional study by Bender et al. (2007) focused on adolescents between 9<sup>th</sup> and 12<sup>th</sup> grade and found significant differences in depressive symptoms between youth with asthma and their healthy peers (Bender, 2007). Bender et al. (2007) again differed from the Add Health manuscripts in that they focused on youth with asthma who had experienced asthma symptoms in the past year and utilized a non-validated measure of depressive symptoms. Another methodological difference between the Add Health studies and other studies is that the Add Health studies utilized the 9-item CES-D to assess depression. Although the 9-item CES-D measure has demonstrated good reliability in prior literature and this study (Grzywacz et al.,

2006; Primack et al., 2009; Zhang et al., 2012), studies that utilize more rigorous assessment approaches, e.g., clinical interviews, might yield different results (Katon et al., 2007). Katon et al. (2007) utilized clinical interviews to assess depression among youth with and without asthma. Interestingly, the authors found similar results to ours when examining clinical interview data: Youth with asthma had slightly higher odds of experiencing depression, though the difference was non-significant (Katon et al., 2007). Overall, this study extended prior literature by identifying rates of depressive symptoms among a nationally representative sample of youth with asthma, and the results seems to coincide with results found in studies that assessed depression using gold-standard methodologies.

The longitudinal stability of depression is well understood within the general population (Lovibond et al., 1998; Merikangas et al., 2003; Nivard et al., 2015); however, there is a dearth of research examining the long-term stability of depressive symptoms among youth with asthma. To date, only one study has investigated the stability of depressive symptoms for youth with asthma (Ramos Olazagasti et al., 2012). However, that study focused on a sample of Puerto Rican youth and only examined the stability of depressive symptoms across three years during adolescence (Ramos Olazagasti et al., 2012). The present study builds upon that literature by further demonstrating the stability of depressive symptoms across multiple developmental periods and utilized a nationally representative sample of adolescents with asthma. Consistent with the existing literature examining the stability of depression among the general population and across multiple age groups (Lovibond et al., 1998; Merikangas et al., 2010; Nivard et al., 2015), the current data demonstrate that depressive symptoms were stable over nearly 15 years for youth with asthma. Depression was more stable during adolescence, and less stable between young adulthood and adulthood. Notably, these findings may be influenced by the shorter duration between Wave 1 to Wave 2. Although the stability of depressive symptoms is higher between Waves 1 and 2, the stability of depression across other time points mirrors results from previous studies (Reynolds et al., 2014). The stability of depressive symptoms in this study should also be

interpreted within the context of the identified fluctuations in depressive symptoms that were found across developmental periods; more specifically, the higher depressive scores in adolescence, followed by a decrease in symptoms in young adulthood, and then a subsequent increase in symptoms in adulthood. Future studies should incorporate more frequent assessments of symptoms across time to elucidate a more nuanced understanding of the developmental trajectory of these symptoms among individuals with asthma.

These findings demonstrate noteworthy levels of depressive symptoms among youth with asthma that persist from adolescence and into adulthood. A better understanding of the stability of these symptoms is crucial given that depressive symptoms are associated with several poor outcomes for youth with asthma (Ahmedani, Peterson, Wells, & Williams, 2013; Feldman et al., 2005; Ramos Olazagasti et al., 2012; Shanahan et al., 2013; Weil et al., 1999). Compared to youth with asthma who do not have depressive symptoms, youth with asthma who experience depressive symptoms have poorer disease management (Feldman et al., 2005), more frequent asthma-related emergency room visits (Ahmedani et al., 2013; Bardach et al., 2019), increased asthma morbidity and mortality (Shanahan et al., 2013), and are less likely to utilize mental health services (Shankar, Fagnano, Blaakman, Rhee, & Halterman, 2019). Given the increased risk of depressive symptoms among youth with asthma, and the increased risk of asthma-related morbidity and mortality among individuals with depressive symptoms, it is crucial to focus on mental health screenings and interventions for these youth (Bardach et al., 2019). Among the general population, systematic screening of depressive symptoms is associated with accurate identification of at-risk individuals, subsequent connections to mental health resources, and resultant decreased depressive symptoms (Siu et al., 2016). Implementing preventative depression screenings and connecting youth with mental health services may also help to decrease negative health outcomes, increase functional outcomes, and increase the cost-effectiveness of healthcare services for youth with asthma (Wright et al., 2016).

The American Academy of Pediatrics recommends universal depression screening for youth, 12 years of age and older (Zuckerbrot, Cheung, Jensen, Stein, & Laraque, 2018). Further, they recommend ongoing treatment and management of symptoms with evidence-based psychotherapeutic approaches and medications, consultation with mental health professionals, and continuous tracking of mental health symptoms (Cheung, Zuckerbrot, Jensen, Laraque, & Stein, 2018). The GINA Asthma Treatment Guidelines suggest annual depression screening for youth with asthma (GINA, 2018), given the increased risk for comorbid depression for these youth. Despite these recommendations, there is little support for how to best screen for elevated depressive symptoms among youth with asthma. Next steps for future research should focus on identifying the feasibility and effectiveness of implementing systematic depression screenings for youth with asthma, and then appropriate referrals/interventions, and investigating if it leads to improved psychosocial and asthma-related outcomes.

### **Religious Coping**

Religious coping is associated with decreased depressive symptoms among youth with chronic medical conditions (Damsma Bakker et al., 2018). Few studies have examined the use of this coping strategy among youth with asthma (Benore et al., 2008; Cotton, Grosseohme, Bignall, & Weekes-Kanu, 2014; Cotton et al., 2012), and no studies have examined the stability of religious coping among youth with asthma across multiple developmental periods. The current study examined mean levels of religious coping across time among a nationally representative sample of individuals with asthma and identified the longitudinal stability of this coping mechanism: Religious coping was stable across adolescence and into adulthood. This is consistent with existing literature suggesting that religious coping remains stable across adolescence among individuals with chronic medical conditions (Reynolds et al., 2014). These data enhance our understanding of the long-term use of religious coping, including whether religious coping is used across multiple developmental periods. The stability of religious coping varied across time, such that religious coping was highly stable in early adolescence (i.e., from

Wave 1 to 2), but was less stable across the transition from adolescence to young adulthood (i.e., Wave 2 to 3). There are several potential contributors to this shift in stability. First, there was a longer time period between the Wave 2 and 3 assessments compared to the Wave 1 and 2 assessments, therefore, the difference in stability may be an artifact of study design. On the other hand, this change in religious coping stability may be further explained by previous findings within the religiosity literature.

The literature suggests that religiosity remains stable across childhood and adolescence (Good, Willoughby, & Busseri, 2011; Stoppa & Lefkowitz, 2010). However, there is research to suggest that there are developmental changes which may impact religious identity development during adolescence. More specifically, it is hypothesized that adolescence is a sensitive period of development for religiosity of individuals given the number of developmental changes which occur (e.g., spiritual exploration); however these factors need to be further examined using longitudinal methodology (Good & Willoughby, 2008). Additionally, there are specific changes in religious behavior, such that there is a decrease in church attendance and prayer during adolescence (Lopez, Huynh, & Fuligni, 2011) and increases in the frequency of church attendance and prayer during later adolescence (Davis & Kiang, 2016) and older adulthood (Balbuena, Baetz, & Bowen, 2013). Religious coping scores for the present study were based on a composite score of religious affiliation, the importance of religion, and frequency of church attendance and prayer. It is possible that religious coping scores for this study were impacted by a normative drop in church attendance or prayer for adolescents and young adults. Future studies should examine the specific facets of religious coping to determine the stability of each aspect of the present religious coping score; this would facilitate a more nuanced understanding of how religious coping impacts depression.

Previous literature supports longitudinal associations between depressive symptoms and religious coping for youth with chronic health conditions (Reynolds et al., 2014) and more specifically, youth with asthma (Benore et al., 2008; Cotton et al., 2013). The present study is the

first study to longitudinally examine the stability of religious coping among adolescents with asthma across multiple developmental periods. Significant associations between depression and religious coping were identified, however, the results were mixed regarding the directionality of the associations. The use of religious coping during *young adulthood* was associated with decreased depressive symptoms in *adulthood*, consistent with previously reported literature on positive religious coping (e.g., praying for strength and support from God or a higher power) among youth with chronic medical conditions (Reynolds et al., 2014). On the other hand, religious coping during *adolescence* was associated with increased depressive symptoms in *adulthood*, which may indicate the utilization of negative religious coping during adolescence (e.g., praying to ask forgiveness from God) and/or the developmental changes in religiosity that occur in adolescence and adulthood (Balbuena et al., 2013; Davis & Kiang, 2016; Good et al., 2011; Lopez et al., 2011; Stoppa & Lefkowitz, 2010). Though the current design does not allow for a differentiation between what types of religious coping youth were using, considering how adolescents may be using more negative religious coping would be consistent with the results from Reynolds (2014). In their study among adolescents with chronic medical conditions, increased baseline depression was associated with later increased use of negative religious coping techniques. These results support the need for further investigation of specific types of religious coping to determine if adolescents with asthma are utilizing negative or positive religious coping techniques.

Two studies have previously examined the longitudinal associations between depression and religious coping for youth with asthma. Benore and colleagues (2008) examined the association between depressive symptoms and religious coping (positive and negative) among youth with asthma across a one-month period; there were no significant longitudinal associations between depressive symptoms and positive religious coping. Important methodological differences between the present study and the Benore study may help elucidate the differences in findings. The Benore study focused on children were recruited during an asthma-related



hospitalization, only used a one-month follow-up post hospitalization, and was a relatively homogenous sample (i.e., largely African American and identified as Baptist). The present study expanded upon the findings of Benore and colleagues such that this study utilized a sample of nationally representative individuals with asthma, resulting in a sample with more racial and ethnic diversity. Additionally, this study examined depression and religious coping across multiple developmental periods for individuals with asthma, furthering our understanding of how these constructs change and develop over time. Overall, the present study utilized a large sample of diverse individuals with asthma to better understand the relationship between religious coping and depression across multiple developmental periods.

Cotton et al. (2013) examined religious coping and depression among a sample composed of mostly African American adolescents who indicated their religious affiliation as protestant. Cotton et al. showed that religious coping is associated with increased depressive symptoms and, further highlight that this association is based on negative religious coping and not the use of positive religious coping. The present study found a similar pattern showing use of religious coping at earlier time points (adolescence) was associated with increased depressive symptoms in adulthood; however, this study was unable to identify the specific type of religious coping strategies used by adolescents. Overall, more research is needed to better understand the specific types of coping utilized by adolescents with asthma and how they relate to depressive symptoms across multiple developmental periods. Similar to the study by Benore and colleagues (2008), the study by Cotton et al., (2014) presents findings that may be difficult to generalize outside of urban, African American youth with asthma. However, the present study utilized a more nationally representative sample of individuals with asthma, further highlighting the need to better understand the longitudinal relations between depression and religious coping.

Taken together, the negative associations between religious coping and depressive symptoms found in the current study and the previous literature (Benore et al., 2008; Cotton et al., 2013; Reynolds et al., 2014) suggest that use of religious coping may positively affect depressive

symptoms, with our study highlighting that this relationship appears to only be significant in young adulthood and adulthood. Further, youth with asthma have indicated that they would like discussions about preferred coping, including religious coping, to be integrated into their medical care (Cotton et al., 2014). Mental health providers who work with young adults with asthma should consider incorporating assessments of preferred and/or commonly used coping strategies, including measures that assess religious coping, into their practice. The Brief COPE and the Brief RCOPE are two measures that could be utilized to measure coping styles among adolescents.

The Brief COPE (Carver, 1997) is a multidimensional coping inventory, that includes religious coping, and was adapted from the original COPE Measure (Carver, Scheier, & Weintraub, 1989). The original COPE measure is validated for use with adolescents (Phelps & Jarvis, 1994); however the Brief COPE has only been validated for adolescents with a sample from Malay (Saiful & Yusoff, 2011). To date, no studies have examined the validity of the Brief COPE among American adolescents. The Brief RCOPE is an empirically supported measure that more specifically measures positive and negative religious coping (Pargament, Feuille, & Burdzy, 2011). Use of the Brief RCOPE may help to better understand and identify the specific types of religious coping that youth with asthma are utilizing. Additionally, more specific measures of religious coping can be utilized to determine 1) the longitudinal stability of negative and positive religious coping among adolescents with asthma and 2) the associations between depression and positive and negative religious coping among individuals with asthma. Further, utilization of measures that assess a variety of coping strategies, including religious coping, may facilitate tailoring of treatment approaches to include preferred coping strategies and, when appropriate, connecting young adults with appropriate interdisciplinary team members (e.g., pastoral care, religious leaders within the community).

### **Limitations and Future Direction**

There are several notable limitations of this study that should be acknowledged. Although the present study utilized a nationally representative sample, there was a lack of individuals from

specific minority backgrounds. Therefore, the race and ethnicity of individuals was dichotomized into minority versus non-minority. This led to limited ability to further explore racial and ethnic groups that may be disproportionately impacted by asthma, such as individuals of Hispanic or African descent (Acosta-Pérez et al., 2012; Carter-Pokras & Gergen, 1993; Gergen et al., 1988; Keet et al., 2015; The Centers for Disease Control and Prevention, 2018). Additionally, there was a lack of diversity regarding the religious affiliation of individuals included in the present study. Similar to previously reported research (Benore et al., 2008; Cotton et al., 2014, 2013), the majority of individuals in the present study identify as Catholic (22.5%), Baptist (20.6%), or another Christian denomination (13.4%). However, approximately one-third of participants from the present study identified being affiliated with a non-majority religious group. Due to religious homogeneity, the findings of the present study are limited in generalizability outside of these predominate religious organizations within the United States. A third limitation is the use of a parent-reported diagnosis of asthma for participants. Future studies may wish to confirm asthma diagnoses with physicians. Additionally, the present study included only individuals who had a diagnosis of asthma at baseline. To better understand the association between asthma, depression, and religious coping across time, it may be beneficial to gather asthma diagnoses across all time points to ensure inclusion of individuals who develop asthma during a later periods (e.g., late adolescence, young adulthood) (Fuseini & Newcomb, 2017). This may help to increase of understanding of pubertal changes associated with asthma and depressive symptoms (Fuseini & Newcomb, 2017; Merikangas et al., 2010). Lastly, the measures of depressive symptoms and religious coping for this study were somewhat limited due to the epidemiological nature of the study (Harris, 2013). Although the internal consistency of the 9-item CES-D was comparable to the original CES-D measures, future studies should move towards use of validated measures or diagnostic interview to measure depressive symptoms. Similarly, religious coping was assessed through a composite score of three components of religiosity. These factors were utilized due to study design and availability of data. However, use of validated measures such as the Brief

RCOPE or the Brief COPE could help to facilitate a better understanding of religious coping for individuals with asthma and get a more nuanced understanding of the specific types of religious coping that are used by individuals with asthma.

Despite these limitations, the present study presents novel findings for youth with asthma and adds to the existing literature examining the longitudinal stability of depression and religious coping for youth with asthma. This study identifies the importance of early and consistent depression screenings among youth with asthma. Further, the present study highlights the association between religious coping and depression for these youth, but is limited in the interpretation of the use of religious coping by adolescents. Future studies should examine these constructs using more specific measures of religious coping, such as the COPE (Carver et al., 1989) and the Brief RCOPE (Pargament et al., 2011). Additionally, this study highlights the importance of understanding the various coping strategies that youth with asthma are utilizing and, as appropriate, incorporating these coping strategies into treatment plans for youth. Taken together, these findings suggest that depression should be monitored among individuals with asthma and that religious coping may play an important role in the psychological adjustment of adolescents with asthma.

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## APPENDICES

### APPENDIX A: TABLES

Table 1. Descriptive Statistics

Variable	N = 998 (%)
<i>Age</i>	M = 15.49 $\sigma^2$ = 2.42
<i>Sex</i>	
Male	47.39%
Female	52.61%
<i>Race</i>	
White	742.79 (74%)
Black	129.49 (13%)
Native American/American Indian	10.19 (1%)
Asian	20.78 (2%)
Other	39.12 (4%)
Multiracial	55.65 (6%)
<i>Ethnicity</i>	
Non-Hispanic	87.98%
Hispanic	12.02%
<i>Baseline Religious Affiliation</i>	
Catholic	22.5%
Baptist	20.6%
Christian Church	13.4%
No Religion	12.7%
Other religion	30.8%

Table 2. Depression and Religious Coping Scores

Table 2: Depression and Religious Coping Scores			
	<b>n</b>	<b>Mean</b>	<b>Variance</b>
<b>Depression</b>			
Wave 1 (1994 – 1995)	996	5.70	18.45
Wave 2 (1996)	996	5.45	18.79
Wave 3 (2001 – 2002)	992	4.42	15.50
Wave 4 (2016 – 2018)	995	5.41	17.04
<b>Religious Coping</b>			
Wave 1 (1994 – 1995)	979	7.32	13.60
Wave 2 (1996)	982	7.10	13.97
Wave 3 (2001 – 2002)	971	5.90	12.82
Wave 4 (2016 – 2018)	996	6.16	13.82

Figure 1. Original Proposed Model

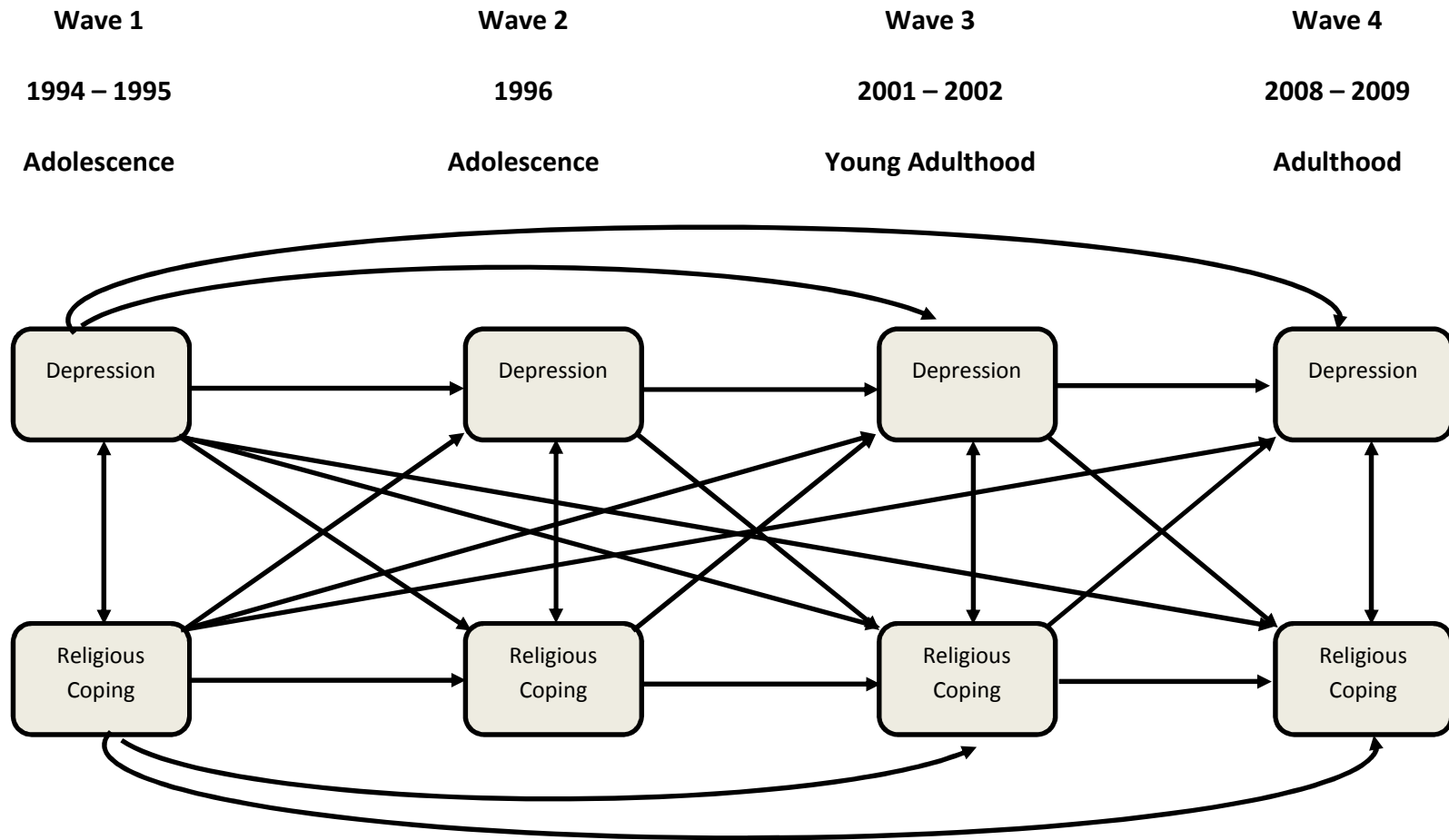


Figure 1. Original hypothesized model examining depression and religious coping across four time points spanning from adolescents to young adulthood

Figure 2. Final Model

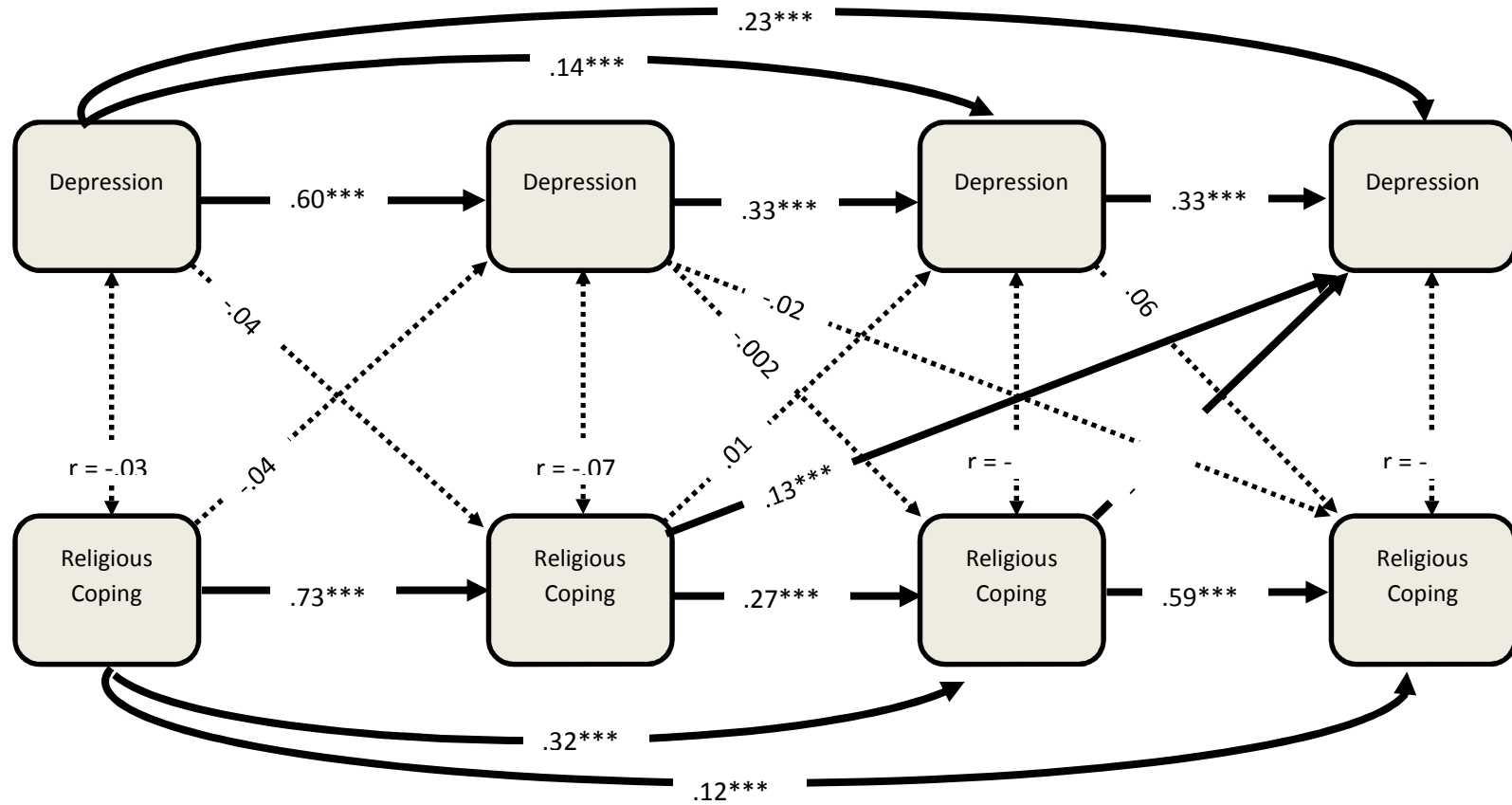


Figure 2. Autoregressive cross-lagged model of adolescent to adulthood depression and religious coping. All paths were adjusted for age, sex, race, and ethnicity. The model had good fit to the data:  $\chi^2(1) = 23.23, p < 0.01$ ; CFI = 0.99; TLI = 0.90; RMSEA = 0.05; SRMR = 0.01. All autoregressive and cross-lagged paths are standardized regression coefficients. Solid lines represent significant paths. Dashed lines represent nonsignificant paths. \*  $p \leq .05$ . \*\*  $p \leq .01$ . \*\*\*  $p \leq .001$ .



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