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Identifying Associations between Religious Commitment and Preventive Health Behaviors in a Southeastern Rural County

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IDENTIFYING ASSOCIATIONS BETWEEN RELIGIOUS COMMITMENT AND PREVENTIVE HEALTH BEHAVIORS IN A SOUTHEASTERN RURAL COUNTY

by

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ABSTRACT

Health disparities within the United States (US) are continuing to impact ethnic minorities living in rural areas nationwide. In response, there is growing interest in using faith-based settings as vehicles to deliver much needed disease prevention interventions. However, few studies have identified the relationship between private and public religious commitment, individually, and the behaviors or risk factors associated with chronic disease. The purpose of this study was to observe the association between religious commitment, both private (i.e., time spent trying to grow in one's religious understanding) and public (i.e., frequency of attendance, time spent in fellowship with others) individually, and levels of physical activity (PA), fruit and vegetable (F&V) consumption, self-efficacy in changing those behaviors, and body mass index (BMI). Self-reported data were gathered from rural church members (≥18 years old) located within a single southeastern US county included in Phase 1 of the Faith, Activity, and Nutrition Dissemination and Implementation (FAN D&I) study. Distributed surveys assessed components of FAN implementation, participation in moderate and vigorous PA, F&V consumption, PA and F&V self-efficacy, demographic and health information, church attendance, and private and public religious commitment. Correlation analyses were performed to determine the strength of association between predictor and outcome variables. Study hypotheses were tested by examining relations between public and private religious commitment (independent variables) and health behaviors with multiple linear and logistic regression models. Mixed models were used to adjust for the clustering

of participants within churches. Private and public religious commitment were run in separate models because of collinearity between measures. All models controlled for church randomization assignment, member health rating, education, age, and gender. Participants (n=1,443) were predominantly women (68.75%), African American (88.84%), and, on average, 54.8 ± 15.8 years of age. Roughly half the sample was obese (50.49%), self-reported having high blood pressure (55.86%), and had some college education (49.71%). Private and public religious commitment were not associated with meeting MVPA recommendations, meeting F&V consumption recommendations, or BMI. Both religious commitment measures, however, were moderately and positively associated with F&V (p=<.01) and PA (p=<.01) self-efficacy and negatively associated with physical inactivity (p=.01). Religious service attendance was not associated with any of the study's outcome variables. Significant relationships between religious commitment and PA self-efficacy, F&V self-efficacy, and physical inactivity suggest that individuals who indicate a higher degree of religious commitment are more likely to believe in their ability to succeed in improving PA and healthy eating behaviors, and are less likely to be physically inactive. This study adds to the scientific literature describing the association between religion/spirituality and increased longevity. Future researchers should use study samples with greater religious commitment variability, use more objective measures for PA participation and comprehensive measures for F&V consumption behaviors, and employ measures separate from religious service attendance to quantify degrees of religiosity.

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LIST OF ABBREVIATIONS

BRFSS…….Behavioral Risk Factor Surveillance System

CDC……..…Centers for Disease Control and Prevention

D&I……Dissemination and Implementation

FAN…….Faith, Activity, and Nutrition

F&V……....Fruit and vegetable

PA……Physical activity

RCI-10…….The Religious Commitment Inventory-10

SES……..Socioeconomic status

US……....United States

USC…….University of South Carolina

CHAPTER 1

INTRODUCTION

Health disparities within the United States (US) are continuing to place an emotional, physical, and spiritual strain on ethnic minorities living in rural areas nationwide (Agency for Healthcare Research and Quality, 2015). In response, there is a growing body of research addressing behaviors causing health disparities in rural African American communities. Churches are key community settings that attract members of all ages, socioeconomic status (SES) groups, and ethnic backgrounds, attended by a large percentage of African Americans weekly (Pew Research Center, 2015). Because of such qualities, churches provide unique opportunities for addressing health disparities within African American communities.

Previous studies show that religion may positively affect several components of health (Koenig, 2015). There is also substantial literature showing that physical activity (PA) participation and fruit and vegetable (F&V) consumption reduce risk for non-communicable diseases (Van Duyn & Pivonka, 2000; Warburton, Nicol, & Bredin, 2006). An individual's self-efficacy, or confidence in his or her capacity to execute behaviors, has often been identified as a significant mediator when trying to make these behavioral changes (Lewis, Marcus, Pate, & Dunn, 2002; Rhodes & Fiala, 2009).

However, few studies have gathered data directly from the rural communities in which these health behaviors are developed and maintained (Agency for Healthcare Research and Quality, 2015). Additionally, few studies have identified the associations

between religious commitment, both private (i.e., time spent trying to grow in one's religious understanding, religions influence on one's approach to life) and public (i.e., frequency of attendance, time spent in fellowship with others), and levels of PA and F&V consumption. Therefore, it is important to address this gap in the literature by identifying associations between church members' private and public religious commitment individually, their preventive health behaviors, and their levels of self-efficacy underlying these behaviors. Doing so in areas most affected by health disparities will aid in efforts to understand the potential effect religious commitment has on health behaviors, underscoring the importance of implementing health promotion programs within underrepresented communities.

Specific Aim 1: To examine whether public and private religious commitment are associated with fruit consumption, vegetable consumption, and combined fruit and vegetable consumption.

Hypothesis: Public and private religious commitment will be positively associated with fruit consumption, vegetable consumption, and combined fruit and vegetable consumption.

Specific Aim 2: To examine whether public and private religious commitment are associated with meeting moderate to vigorous physical activity guidelines and physical inactivity.

Hypothesis: Public and private religious commitment will be positively and negatively associated with meeting moderate to vigorous physical activity recommendations and physical inactivity, respectively.

Specific Aim 3: To examine whether public and private religious commitment are associated with fruit and vegetable self-efficacy.

Hypothesis: Public and private religious commitment will be positively associated with fruit and vegetable self-efficacy.

Specific Aim 4: To examine whether public and private religious commitment are associated with physical activity self-efficacy.

Hypothesis: Public and private religious commitment will be positively associated with physical activity self-efficacy.

Specific Aim 5: To examine whether public and private religious commitment are associated with BMI.

Hypothesis: Public and private religious commitment will be negatively associated with BMI.

CHAPTER 2

BACKGROUND

Worldwide, non-communicable diseases are estimated to kill 38 million people each year (World Health Organization, 2013). The prevalence of non-communicable disease such as hypertension, stroke, heart disease, diabetes, and certain cancers continues to rise both nationally and globally, accounting for nearly two-thirds of total deaths (World Health Organization, 2013). These diseases generate high productivity losses and healthcare costs, producing a globally estimated economic burden of $22 trillion in 2010 alone (World Economic Forum & Harvard School of Public Health, 2011)

Adding to the complexity of this issue, health disparities exist within non-communicable diseases along the lines of race and ethnicity (Agency for Healthcare Research and Quality, 2008), SES (Kondo, 2012), education (Fiscella & Kitzman, 2009), and rural residency (Agency for Healthcare Research and Quality, 2015). Higher rates of stroke mortality have also been identified in certain parts of the southeastern U.S., creating what is widely known as the Stroke Belt. Liao et al. noted that the currently known risk factors for stroke (hypertension, diabetes, coronary heart disease, physical inactivity, poor dietary behaviors, and smoking) and low SES account for most of this disparity between regions (Liao, Greenlund, Croft, Keenan, & Giles, 2009). Addressing such health disparities is a priority identified by the US Department of Health and Human Services (US Department of Health and Human Services, 2011).

Strong evidence indicates that modifiable health behaviors such as tobacco use, alcohol consumption, poor dietary habits, and physical inactivity are the main underlying causes of non-communicable diseases (Beaglehole et al., 2011). While there has been progress in reducing premature deaths in the U.S. from excessive tobacco and alcohol use, this progress is being counteracted by increases in deaths linked to poor diet and physical inactivity (Committee on Population, Division of Behavioral and Social Sciences and Education, Board on Health Care Services, National Research Council, & Institute of Medicine, 2015). Poor dietary patterns and sedentary lifestyles account for roughly 4.6 million deaths each year, making them key risk factors for non-communicable diseases (Beaglehole et al., 2011; World Health Organization, 2009). Diets high in F&V have been shown to be protective for obesity, several cancers, stroke, and cardiovascular disease (CVD) (Boeing et al., 2012; Oyebode, Gordon-Dseagu, Walker, & Mindell, 2014; Wang et al., 2014). Similarly, having a physically active lifestyle has been associated with lower mortality rates in CVD, stroke, cancer, obesity, diabetes, depression, and osteoporosis (Kushi et al., 2012; Li & Siegrist, 2012; Reiner, Niermann, Jekauc, & Woll, 2013; Tobias et al., 2014). Increasing the proportion of those who consume at least 2.5 cups of vegetables and 2 cups of fruit per day (U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2015) as well as the proportion who engage in moderate PA for at least 150 throughout the week (US Department of Health and Human Services, 2008) are also national health priorities.

Public health professionals are actively seeking ways to reach those who are most affected by health disparities. Faith-based organizations are an essential source of support for communities and individuals nationwide, engaging members of all ages and

backgrounds. According to a global survey by the Pew Research Center, America has the highest levels of religious involvement, including self-reported religious affiliation, congregational membership, and religious service attendance, when compared to other industrialized nations (Pew Research Center, 2015). Additional data indicates that over 76% of the American population identifies with a religious affiliation, with over 69% of those attending religious services weekly or monthly (Pew Research Center, 2015). In addition to being identified as key settings for spiritual worship, churches are also settings where health promotion programs can be implemented in a way that is both socially and culturally acceptable (DeHaven, Hunter, Wilder, Walton, & Berry, 2004). Sharing decision making responsibilities and resources amongst health professionals and faith-based organizations has been recognized as an effective approach to reach those individuals facing health disparities (Wilcox et al., 2013), who are commonly underrepresented in health prevention research (Agency for Healthcare Research and Quality, 2008, 2015).

Religion/spirituality and health

There are several psychological, social, and behavioral mechanisms that have been proposed to understand how religious commitment might influence health (Koenig, 2012). First, religion provides resources for coping with stress, increasing the frequency of positive emotions, and reducing the likelihood that stress will result in emotional disorders or unhealthy behavior patterns that lead to poor physical health. These resources include powerful beliefs that give meaning to difficult life circumstances, provide a sense of purpose, and provide an optimistic worldview. Constructs such as optimism and sense of purpose are increasingly recognized as contributors to positive

health outcomes (Cohen, Bavishi, & Rozanski, 2016; DuBois et al., 2015). Second, most religions have doctrines explaining how to live life and how to treat others (e.g., honesty, generosity, self-discipline, patience), reducing the likelihood of stressful life or social events if followed. Third, most religions emphasize fellowship among congregants. This behavior may lead to social support during difficult times and increase the likelihood of receiving trusted health information. High levels of social support and positive psychological well-being have shown protective effects against premature mortality and CVD (Boehm & Kubzansky, 2012; Shor, Roelfs, & Yogev, 2013). Finally, specific religious proscriptions help to explain why religious individuals might avoid health certain behaviors (e.g., alcohol abuse or overeating) or engage in behaviors to keep oneself healthy (e.g., body is a "temple"). (Koenig, 2012).

There has been a sizeable amount of research explaining the association between religion/spirituality, physical and mental health outcomes, and preventive health behaviors (Lucchetti & Lucchetti, 2014). Many of these studies have been based on data gathered from telephone surveys, have used religious service attendance as the sole measure of religious commitment, and have focused primarily on smoking, alcohol consumption, and risky sexual behaviors (Cockerham, 2005). Several studies have also examined the relationship between spirituality and religion, including attendance, on mortality rates (Chida, Steptoe, & Powell, 2009; Kim, Smith, & Kang, 2015; Li, Stampfer, Williams, & VanderWeele, 2016).

Various constructs related to religion/spirituality have been used in the literature. Therefore, a summary of terminology is necessary before beginning this review (see Table 2.1).

The following sections provide more details to substantiate associations between religiosity/spirituality and: (1) mortality; (2) physical health outcomes; and (3) preventive health behaviors. Literature from the past 15 years (i.e., since 2001) is reviewed. Each section begins with the most recent literature review or meta-analysis and continues to describe results from more recent individual studies, if applicable. PA and healthy eating behaviors are discussed with an emphasis on the various religious measures used in the literature (e.g., religious coping, spiritual health locus of control, social support), along with the measure central to this study (i.e., religious commitment). Finally, this chapter concludes with gaps in the literature and the role this study has in addressing those gaps.

Religion/spirituality and mortality

Over the past 15 years, several longitudinal studies, meta-analyses, and reviews have generally found that religiosity/spirituality is significantly and negatively associated with all-cause mortality. The most recent review was a meta-analysis of 69 studies by Chida et al. in 2009. They found that religiosity/spirituality was associated with reduced risk of mortality among healthy populations (11% risk reduction), but not among diseased populations. They speculated that the lack of associations among diseased populations could indicate that religiosity/spirituality has little impact on mortality once diseases are established (i.e., greater role in prevention). The authors also examined whether the type of religious commitment measure was related to outcomes and found that public measures (i.e., church attendance) were significantly associated with decreased mortality, but private measures (i.e., prayer) were not. Of the studies included in this analysis, 72.5% (50/69) examined church attendance, while only 10.1% (7/69) examined private commitment. Similarly, an earlier review by Hummer et al. found that

religious attendance showed the strongest association and private religious activities showed the weakest associations with mortality risk (Hummer, Ellison, Rogers, Moulton, & Romero, 2004). Luchetti et al. (Lucchetti, Lucchetti, & Koenig, 2011) combined three previously published meta-analyses (Chida et al., 2009; Hummer et al., 2004; McCullough, Hoyt, Larson, Koenig, & Thoresen, 2000), and found that greater religious commitment was associated with an 18% risk reduction in all-cause mortality.

To our knowledge, only one longitudinal study since 2009 identified associations between religious commitment and mortality. The Nurses' Health Study, a large prospective longitudinal study of US women, reported 33% lower all-cause mortality in once-weekly attenders compared to non-attenders (Li et al., 2016). However, the use of a single measure of religiosity (i.e., attendance) is a limitation of this study. Authors of the previous review papers stated that additional work is needed to clarify which aspects of religious commitment are most important for decreased mortality and which aspects can potentially elevate a person's disease resistance for a public health benefit.

Religion/spirituality and physical health outcomes

Most studies examining associations between religiosity/spirituality and health outcomes have been cross-sectional or longitudinal. Although many positive social and mental health outcomes have been studied (Bonelli & Koenig, 2013; Koenig, 2015; Nooney & Woodrum, 2002; Seybold & Hill, 2001; Strawbridge, Shema, Cohen, & Kaplan, 2001), this section only focuses on physical health outcomes. Within the past 15 years, three major reviews of the associations between religiosity/spirituality and physical health outcomes were found (Jim et al., 2015; Koenig, 2015; Masters & Hooker, 2013). These reviews report findings for several health outcomes, but cancer and CVD outcomes

are most common. Because obesity is a risk-factor for both CVD and cancer, and contributes to many non-communicable diseases, results are also presented for obesity. Overall, these reviews support a trend of lower risk, or improved physical health outcomes, for those who report higher levels of religiosity/spirituality.

Cardiovascular disease. A recent systematic review included 19 studies examining the association between religiosity/spirituality and CVD prevalence prior to 2010 (Koenig, 2015). Of those, 63% (12/19) found a protective effect of religiosity/spirituality, with only one study finding higher CVD prevalence in those more religious. Among the 13 highest quality studies, 69% (9/13) found a protective effect of religiosity/spirituality. Koenig also identified 16 additional studies examining the relationship between religiosity/spirituality and CVD risk factors including blood pressure, heart rate variability, and inflammatory markers; 69% (11/16) indicated a significant protective effect of religiosity/spirituality (Koenig, 2015). These findings were consistent with a more recent review from Masters and Hooker (2013), who concluded that longitudinal research demonstrated a positive association between religious commitment and decreased CVD (Masters & Hooker, 2013). Studies to date have typically used unidimensional measures of religious commitment (i.e., service attendance). No additional reviews examining associations between CVD and religious commitment since 2013 were located.

Cancer. Religiosity/spirituality has been shown to play a role in cancer prevention (Koenig, 2015) and treatment (Jim et al., 2015). A systematic review by Koenig (2015) included 29 studies before 2010 that examined the relationship between religiosity/spirituality and risk of cancer development. Slightly more than half, or 55%

(16/29), reported a significantly lower risk of cancer development in those who reported high levels of religiosity/spirituality, with 7% (2/29) reporting significantly higher risk. When limited to the 17 best-designed studies, 65% (11/17) reported a significantly lower cancer risk in those who had higher levels of religiosity/spirituality; none reported higher cancer risk (Koenig, 2015). These studies primarily used measures of public religious commitment (e.g., service attendance, adherence to church doctrines) and religious salience.

A meta-analysis by Jim et al. (2015) included 101 studies examining whether religiosity/spirituality is associated with better physical health outcomes in over 32,000 adult cancer patients. religiosity/spirituality was categorized within this study as affective (i.e. religious salience, spiritual health locus of control), behavioral (i.e., religious commitment), cognitive (i.e., religious coping), and other (i.e., religious social support, affiliation). Overall, religiosity/spirituality was significantly associated with higher levels of physical well-being ($z = .153$), functional well-being ($z = .343$), and physical symptoms ($z = .282$) in the cancer patients studied. These findings underscore the importance of attending to patients' religious needs throughout cancer treatment (Jim et al., 2015). No additional studies examining associations between cancer and religious commitment since 2015 were located.

Obesity. Compared to CVD and cancer, far fewer studies have examined associations between religious commitment and obesity despite its impact on most non-communicable diseases. To our knowledge, obesity has not been addressed in any recent literature reviews or meta-analyses. Cline and Ferraro (2006) conducted a longitudinal study to examine whether dimensions of religious life (e.g., religious affiliation, salience,

attendance) are associated with weight gain and the development of obesity during eight years of follow-up in 3,617 American adults. They found that those who attended church services more often were less likely to become obese (Cline & Ferraro, 2006). Taylor et al. (2013), in contrast, reported a higher likelihood of obesity in those who attend church weekly compared to those who attend less frequently (Taylor, Belay, Park, Onufrak, & Dietz, 2013). Authors of both studies called for longitudinal studies to address inconsistencies regarding religious behaviors and obesity.

A cross-sectional analysis of the Jackson Heart Study found no significant association between religious attendance, private prayer, daily spiritual experiences, and BMI in African Americans (Reeves, Adams, Dubbert, Hickson, & Wyatt, 2012). However, they reported that none of these dimensions were significantly related to lower energy intake, alcohol use, and smoking in their sample. Reeves et al. also recognized the need for additional longitudinal studies.

Religion/spirituality and preventive health behaviors

Several studies have been conducted addressing smoking cessation, risky sexual behaviors, and religiosity/spirituality. A recent review from Koenig reported that 90% (75/83) and 84% (42/50) of high quality studies indicate inverse relationships between various measures of religiosity/spirituality (i.e., public and private religious commitment, affiliation) and smoking and risky sexual behaviors, respectively. No studies found that religiosity/spirituality was positively related to smoking or risky sexual behavior. Thus, the protective association between religiosity/spirituality and these health behaviors is quite consistent and well-studied (Koenig, 2015). Less conclusive, however, are studies

examining associations between religious commitment and PA or healthy eating behaviors.

Physical activity. The previously-described review by Koenig et al. included 37 studies examining the relationship between religiosity/spirituality and PA or exercise prior to 2010. They reported that 68% (25/37) of studies found greater PA participation in more religious/spiritual individuals, and 16% (6/37) found lower levels of PA in more religious/spiritual individuals. In studies that were considered high-quality, 76% (16/21) reported significantly greater PA participation in those who scored higher in religiosity/spirituality and only 9.5% (2/21) reported negative findings. Most of those studies have used a variety of validated self-report surveys and religious service attendance to measure PA and religious commitment, respectively (Koenig, 2015).

Several cross-sectional studies have been conducted since 2010 (Koenig's review) using various measures for religious commitment and PA. A study by Dodor (2012) examined the relationship between religious commitment (religious attendance, salience, and prayer) and physical activity with a large national sample of African Americans. Results indicated that participants who prayed more often were more likely to be physically active, but this relationship was not seen for religious attendance or salience (Dodor, 2012). A study by Debnam et al. (2012) found a significant positive association between perceived religious social support and moderate PA in a national sample of African Americans (Debnam, Holt, Clark, Roth, & Southward, 2012). These results are congruent with a study by Baruth et al. (2013), who found that perceived environmental church support for PA was significantly associated with higher levels of leisure-time PA and lower levels of sedentary behavior in men but not in women (Baruth et al., 2013).

Another study from Debnam et al. (2012) found no significant associations between spiritual health locus of control, neither passive or active, and PA in a similar sample of African Americans (Debnam, Holt, Clark, Roth, Foushee, et al., 2012). A recent study by McKenzie et al. (2015) studied the association between religious commitment and health behaviors among Black Seventh-day Adventists in Canada. Participants completed a questionnaire measuring religiosity and lifestyle practices promoted by the Seventh-day Adventist church, including PA. Results of this study indicate a small but significant positive association between religious commitment and all lifestyles practices, including PA (McKenzie, Modeste, Marshak, & Wilson, 2015). Findings from these studies suggest that the dimensions of religion/spirituality associated with PA are complex and require further understanding.

Seven studies were located within the past 15 years (i.e., since 2001) that examined the relationship between measures of religious commitment, specifically, and PA behaviors. Five of these studies used a cross-sectional design with large representative samples, and the majority assessed PA via self-report measures and public religious commitment via religious service attendance. Similar measures were used in the remaining two with samples from faith-based settings. A small but significant positive association between religious commitment and PA was reported in all 7 studies. (Gillum, 2006; Hill, Burdette, Ellison, & Musick, 2006; Hill, Ellison, Burdette, & Musick, 2007; Izquierdo-Porrera, Powell, Reiner, & Fontaine, 2002; Kim & Sobal, 2004; Merrill & Thygerson, 2001; Schlundt et al., 2008).

Healthy eating behaviors. The previously-described review by Koenig included 21 studies published prior to 2010 relating various measures for religiosity/spirituality

and healthy eating behaviors of: (1) consumption of a healthy diet (e.g., intake of fiber, green vegetables, fruit, and fish); (2) reduced intake of unhealthy foods (e.g., snacks, processed foods, and fat); (3) intake of vitamins to supplement diet, and (4) healthy eating patterns, such as eating breakfast and following generally recommended guidelines. Significant positive associations between religiosity/spirituality and healthy eating behaviors were observed in 62% (13/21) of the studies, with only one study producing a negative association. When limited to the 10 studies that were considered high quality, 70% (7/10) found a significant positive association between healthy eating behaviors and religiosity/spirituality; the remaining 30% (3/10) reported null findings. Based on these results, associations between religiosity/spirituality and healthy eating behaviors (e.g., F&V intake) appear to be positive, but are not sufficiently known. The most commonly used measures for religiosity/spirituality were religious commitment (i.e., church attendance) and religious social support; brief dietary assessments and food frequency questionnaires most commonly measured healthy eating behaviors (Koenig, 2015).

Several studies have examined the relationship between religiosity/spirituality and healthy eating behaviors since 2010 (Koenig, 2015). A study by Baruth et al. (2011) reported cross-sectional data from a sample of African American church members, examining the relationship between perceived environmental church support and healthy eating behaviors. Results indicated a significant positive association between perceived environmental church support and higher F&V intake (Baruth, Wilcox, & Condrasky, 2011). A study by Debnam et al. (2012) produced similar results when examining the associations between religious social support and F&V intake in a large representative

sample of African Americans (Debnam, Holt, Clark, Roth, & Southward, 2012). Debnam et al. also conducted a cross-sectional study identifying the association between spiritual health locus of control and F&V consumption, finding a significant positive association between active spiritual health locus of control and F&V consumption, but not between passive beliefs and F&V consumption. (Debnam, Holt, Clark, Roth, Foushee, et al., 2012). Finally, Holt et al.'s study (2014) with a national sample of African Americans demonstrated a positive association between religious coping and greater vegetable consumption, but not fruit consumption (Holt, Clark, Debnam, & Roth, 2014).

A total of 9 studies in the past 15 years (i.e., since 2001) have examined associations between religious commitment measures specifically (i.e., religious service attendance, involvement) and healthy eating behaviors. Each study used a cross-sectional design, and the majority assessed religious commitment via religious service attendance and healthy eating behaviors via validated self-report measures. Five of the nine reported significant positive associations with the remainder reporting null findings. All studies conducted since 2010 have found no significant associations related to healthy eating behaviors. Six of these studies were composed of large representative samples and only one had a sample from a faith-based setting. (Arredondo, Elder, Ayala, & Campbell, 2005; Kim & Sobal, 2004; Kim, McEwen, Kieffer, Herman, & Piette, 2008; Obisesan, Livingston, Trulear, & Gillum, 2006; Park, Edmondson, Hale-Smith, & Blank, 2009; Pitel et al., 2012; Reeves et al., 2011; Salmoirago-Blotcher et al., 2011; Schlundt et al., 2008).

Gaps in the literature

This literature review illustrates that high religiosity/spirituality is generally associated with reduced risk of mortality, more favorable physical health outcomes, and more favorable preventive health behaviors. Although several dimensions of religiosity/spirituality have been examined, few studies have focused on public and private religious commitment individually and their associations with health behaviors. Religious service attendance has been the most commonly-used measure for religiosity across studies; however, using this as the sole measure of religiosity does not adequately measure the contribution of religious commitment to health, since one's ability to regularly attend religious services may simply be an indicator of physical function (i.e., better health) (Roff et al., 2006). Thus, physical function could explain the associations between religious attendance and health outcomes (i.e., a confounding variable). Additionally, evaluating religious service attendance alone does not fully measure one's religious commitment, neglecting religious behaviors often done in private (e.g., prayer, meditation, reading). To our knowledge, this study will be among the first to examine the association between religious commitment (private and public), PA self-efficacy, F&V consumption self-efficacy, and physical inactivity using a large sample. Because few studies have analyzed data from individuals of rural communities, who are commonly underrepresented in health research (Agency for Healthcare Research and Quality, 2015), the importance of this study is highlighted.

The purpose of the current study is to address gaps in the literature by: (a) collecting religious commitment information from rural church members using a validated measure for private and public religious commitment, including religious

service attendance; (b) examining associations between religious commitment and both self-reported PA and F&V consumption; (c) examining associations between religious commitment and both PA and F&V consumption self-efficacy; (d) examining associations between religious commitment and BMI. Gathering data from populations most affected by health disparities will aid in efforts to understand the potential effect religious commitment has on health behaviors, underscoring the importance of implementing health promotion programs within underrepresented communities.

Table 2.1 Religious terminology in the literature

Term	Definition
Spirituality	inward or personal side of relating to the sacred, a god, or gods (Oman, 2014)
Religion	institutional or organized forms of relating to the sacred, a god, or gods (Oman, 2014).
Religion/spirituality, religiosity, and religiousness	umbrella terms referring to the numerous aspects of religious activity, dedication, and belief (Chida et al., 2009; Jim et al., 2015; Koenig, 2015)
Religious commitment	the degree to which a person adheres to his or her religious values, beliefs, and practices and uses them in daily living; this term encompasses public and private religious commitment (Worthington Jr. et al., 2003).
Public or organized religious commitment	religious activity of organizational nature such as church attendance and participation in prayer groups, reflecting social aspects of religion (Koenig, Smiley, & Gonzales, 1988).
Private or non-organized religious commitment	activity of non-organizational nature such as private prayer, reading devotional literature, and watching or listening to religious programs (Koenig, Smiley, & Gonzales 1988).
Religious salience	the importance of religion to an individual (Wimberley, 1984).
Spiritual health locus of control	also referred to as *God locus of control,* involves the belief that God has control over one's health; this construct includes both an active and passive dimension (Holt, Clark, & Klem, 2007).
Active spiritual health locus of control	the belief that a higher being empowers a person to be proactive about health behaviors (Holt et al., 2007).
Passive spiritual health locus of control	the belief that a higher power is in control of health outcomes (Holt et al., 2007).
Religious Coping	religiously framed cognitive, emotional, or behavioral responses to stress (Wortmann, 2013)

CHAPTER 3

METHODS

The analyses conducted for this thesis used data gathered from Phase 1 of the Faith, Activity, and Nutrition Dissemination and Implementation (FAN D&I) study.

Study design

Using the Reach, Efficacy, Adoption, Implementation, and Maintenance (RE-AIM) model (Glasgow, Vogt, & Boles, 1999) and the Consolidated Framework for Implementation Research (Damschroder et al., 2009), the FAN D&I study was a multiphase, 5-year study based on an effectiveness trial of the FAN intervention (Wilcox et al., 2010). Phase 1 of the FAN D&I study was a group randomized control trial focused on churches of any denomination in a single South Carolina county. Enrolled churches were randomized to either an early intervention group (n=39) or a delayed intervention control group (n=20). Fifty-four churches (35 early intervention, 19 delayed intervention) participated in the evaluation of FAN. In Phase 2, the program will be conducted in a large religious denomination throughout the entire state of South Carolina.

Study setting

Phase 1 took place in a single rural county in South Carolina, with an estimated population of 22,747 residents (US Census Bureau, 2015). This county is medically underserved and has a high proportion of African Americans (58.1%) compared to the remainder of the state (27.6%) (US Census Bureau, 2015). Housed within the county is an active group of stakeholders who partnered with representatives from the University of

South Carolina's (USC) Arnold School of Public Health to aid in addressing these health concerns. Prior to working with USC, these stakeholders had previous experience working with county churches in initiatives promoting smoke free policies, farmers' markets, and preventive health behaviors.

Church recruitment

Church contact was initiated via email (where possible), standard mail, and phone call after conducting an audit identifying churches within county lines. Interested churches completed a telephone screener and were enrolled if eligible. Churches were eligible if they were located within the target county, had a minimum of 20 members, agreed to participate in evaluation procedures, and were willing to be randomized into either the early intervention or delayed control group.

Randomization was conducted by the study's statistician who had no contact with the churches. Church representatives, stakeholders, and research staff were immediately notified of group assignments to prepare for the FAN training.

Intervention overview

Because the purpose of this thesis is not to evaluate the impact of FAN, but rather to examine associations between religious commitment and PA, F&V consumption, and related self-efficacy, the FAN intervention will only be briefly described. Original development of the FAN Program and its effectiveness is described in detail elsewhere (Wilcox et al., 2010, 2013).

Using a community based participatory research approach, FAN was developed by a planning committee composed of church and university representatives targeting social, cultural, and policy influences within participating churches. In the FAN D&I

study, a "train the trainer" approach was used to disseminate healthy eating and PA information to church committees, who then worked to make changes in their respective congregations.

Churches enrolled in FAN were asked to assemble a FAN committee of three to five members. A church program coordinator was required. Church committees attended an 8-hour training that emphasized the importance of healthy eating and PA, linked FAN goals to scripture, engaged pastor support, and discussed approaches to program implementation. FAN trainings were delivered by educated Community Health Advisors - recruited members of the community who served as resources for FAN committees by providing program and technical assistance. FAN committee members were asked to assess their current church activities and construct creative ways to help them create opportunities for PA and healthy eating, share messages about physical activity and healthy eating, engage pastors in supporting program messages, and set guidelines or policies to support PA and healthy eating (Cohen, Scribner, & Farley, 2000). Concluding the training, committee members were given resources to help disseminate healthy eating information and promote PA within their churches throughout the following 12 months. They received monthly technical assistance calls from a Community Health Advisor over this period. After submission and approval of a program plan and budget, a monetary incentive was provided to participating churches.

Data collection procedures

In the summer of 2016, 8-12 months after the training of early intervention churches in the FAN program, data were collected in early intervention and delayed control churches. Seventeen research staff (≥2 per church), blind to the church's group

assignment (early intervention vs. delayed control), were assigned to visit each of the participating churches. The majority of surveys were distributed on Sundays following the conclusion of the worship services.

To be included in the FAN D&I study, survey respondents had to attend the church (not be visitors) and be 18 years of age or older (n = 1,425). However, because we were not testing the impact of the intervention, we also included surveys completed by 18 visitors for the current study (n = 1,443).

All individuals within the church were informed of the purpose of the study and exclusion criteria via a cover letter attached to the survey. Surveys were anonymous. The evaluation was granted exempt status from the Institutional Review Board at the University of South Carolina. Members were asked to proceed with the survey if they consented to participate. Staff were nearby and available to address questions and concerns or to administer the survey if needed.

To minimize participant burden and maximize response rates following church services, self-report measures were used. The 7-page survey assessed components of FAN implementation, participation in moderate and vigorous PA, F&V consumption, PA and F&V self-efficacy, demographic and health information, church attendance, and private and public religious commitment. Following completion of the survey, responses were checked by available research staff for completeness and accuracy where possible. All measures used in this study were approved by the study's community advisory committee prior to data collection.

Measurement staff participated in a 6-hour training session prior to data collection. This training consisted of a detailed presentation explaining the FAN D&I

study, organization and logistics for travel, and procedures and expectations for data collection in faith-based settings. Additionally, each staff member took part in a one-hour practice session where they read survey instructions, answered questions, and reviewed mock surveys for completeness and problems.

Measures

Sociodemographic and health-related measures. The Centers for Disease Control and Prevention's (CDC) Behavioral Risk Factor Surveillance System (BRFSS) measures were used to gather self-reported gender, age, race, height, weight, highest year of education completed, health rating, and health history (Centers for Disease Control and Prevention & U.S. Department of Health and Human Services, 2005). BMI was calculated using the standard formula, kg/m^2.

Physical activity participation. The CDC BRFSS measure was used to gather self-reported moderate and vigorous PA (MVPA) information (Centers for Disease Control and Prevention & U.S. Department of Health and Human Services, 2005). This measurement has shown sensitivity to change in an intervention focused on mid-life and older adults (Wilcox et al., 2009). Reliability and validity of the BRFSS PA measure have been previously reported and findings suggest it can classify adults into the recommended levels of PA as defined by Healthy People 2010 (Yore et al., 2007).

Participants were asked whether they participated in moderate activities for at least 10 minutes at a time when not at work. If the response was yes, they were asked to report the number of days and total time per day spent doing so. The same order of questions was used for vigorous activity. Examples of both moderate- and vigorous-intensity activities were given. Participants were categorized into one of the following

three groups consistent with recommendations of 150 minutes per week of moderate or 75 minutes of vigorous intensity PA or a combination: 1) *inactive*—participated in no PA for more than 10 minutes in a usual week; 2) *irregularly active*—participated in at least 10 minutes of MVPA in a usual week, but not enough to meet recommendations; or 3) *regularly active*—participated in enough MVPA to meet or exceed the previously stated recommendations (US Department of Health and Human Services, 2008).

Fruit and vegetable intake. A 2-item measure was administered to assess usual daily F&V intake. Validity of this measure has been previously reported, with a correlation of .28 when compared to fruit vegetable servings by food frequency questionnaire and three 24-hour recalls in a sample of African American churches. Albeit small in magnitude, this correlation is comparable to other self-report dietary measures (Resnicow et al., 2005)

After reading examples of various 1-cup equivalencies for fruits provided by ChooseMyPlate.gov (United States Deprtment of Agriculture, 2016), participants were asked to report how many cups of fruit (including 100% pure fruit juice) they usually consume per day. A similar question and list of examples were provided for vegetable intake. Participant responses were categorized by meeting F&V recommendations of consuming ≥ 3 cups of vegetables per day (yes/no), ≥ 2 cups of fruit per day (yes/no), and ≥ 5 cups of F&V combined (yes/no) (U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2015).

Physical activity self-efficacy. A 5-item measure was used to assess PA related self-efficacy (Marcus, Rakowski, & Rossi, 1992). Examples of items asked include: "How confident, or sure, are you that you could participate in regular PA when you are

tired?" and "How confident, or sure, are you that you could participate in regular PA when you feel you don't have time?" Responses were given on a 7-point Likert scale, with 1 being *not at all confident* and 7 being *very confident.* An average score across the five items was computed. This measure has been shown to have adequate internal consistency, test–retest reliability, and concurrent validity, with a Cronbach's alpha of .71 (Kim et al., 2008). The 5-item measure for PA self-efficacy showed good internal consistency reliability in this study (Cronbach's alpha = 0.88).

Fruit and vegetable self-efficacy. F&V consumption related self-efficacy was assessed using an 8-item measure. Examples of items asked include: "How confident are you that you could choose fruits and vegetables instead of higher fat foods?" and "How confident are you that you could eat healthy foods like fruits and vegetables, when you are depressed or in a bad mood?" Items were answered on a 7-point scale from *not at all confident* to *very confident*. This measure for F&V self-efficacy previously achieved an internal consistency of 0.92 (Resnicow et al., 2004). The 8-item measure for F&V self-efficacy showed good internal consistency reliability in this study (Cronbach's alpha = .93.

Religious commitment. The Religious Commitment Inventory-10 (RCI-10) was used to assess participants' self-reported religious commitment in addition to monthly attendance frequency. The RCI-10, shown in table 3.2, contains six items regarding private commitment, including, "My religious beliefs lie behind my whole approach to life." and "It is important to me to spend periods of time in private religious thought and reflection." The remaining four items assess public religious commitment, including, "I enjoy working in the activities of my religious organization." and "I keep well informed

about my local religious group and have some influence in its decisions." Worthington et al. examined the psychometric properties of this scale in six studies, using diverse samples. The RCI-10 achieved high internal consistency for both public and private commitment, as well as for the full scale (values exceeded .87). Similar results were found for three-week and five-month test-retrest reliability of the scale. Their studies also consistently indicated adequate evidence for construct and discriminant validity for the full-scale RCI-10. Exploratory and confirmatory factor analyses indicated that although public and private religious commitment emerged in a two-factor solution, they were highly correlated factors, and the authors suggest a one-factor structure comprised of the 10 items (Worthington et al., 2003). Participant responses of religious service attendance and commitment from each scale (private and public) were examined separately in the present study. The RCI-10 showed high internal consistency (Cronbach's alpha) in this study for both public (.76), private (.76), and total religious commitment (.87). Overall, the sample was very religious, with slightly greater variability in private religious commitment compared to public religious commitment.

Power Analysis

Data from the original Faith, Activity, and Nutrition effectiveness trial (Wilcox et al., 2013) were used for estimates of Phase 1 effect sizes and intraclass correlation coefficients. There was a 2:1 ratio (intervention:control) in the assignment of churches to treatment conditions. For simplicity, an equal number of participants who would complete surveys from each church was assumed. Table 3.1 illustrates that with the number of churches we enrolled, we were adequately powered to detect small effect sizes (d=0.20) with 10-20 participants per church for our outcomes of interest.

Data Analysis

Descriptive statistics included means, standard deviations, and frequencies for gender, age, race, education, BMI, self-reported health conditions, health rating, religious commitment, religious service attendance, moderate to vigorous PA, F&V intake, PA self-efficacy, and F&V self-efficacy.

After stratifying the sample (early intervention vs. delayed control), correlation analyses were performed to determine the strength of association between predictor and outcome variables using Pearson's and point-biserial correlations. Because the pattern of associations did not differ appreciably across the two groups, analyses were conducted using the combined full sample. Randomization assignment was treated as a control variable in the regression analyses.

Regression models were used to test study hypotheses. Multiple logistic regression models examined whether the independent variables (attendance frequency, private religious commitment, public religious commitment) were associated with the dependent variables of meets weekly MVPA recommendations, physical inactivity, meets fruit consumption recommendations, meets vegetable consumption recommendations, and meets F&V consumption recommendations. Multiple linear regression models examined whether the same independent variables were associated with the dependent variables of PA self-efficacy, F&V self-efficacy, and BMI. Public and private religious commitment measures were tested in separate models, controlling for covariates, because of collinearity between these two measures. Mixed models were used to adjust for the clustering of participants within churches, and all models controlled for church randomization assignment and member health rating, education, age, and gender. The

variance component for church clusters was ‘0’ for both vegetable consumption and F&V consumption, so clustering was removed for those variables. Model assumptions were assessed using standard residual-based diagnostic procedures. An alpha level of .05 was used to determine statistical significance.

Table 3.1 Power Analysis

Number of churches		**Number of participants per church for d=.20**					
Control	**Intervention**	**10**	**20**	**30**	**40**	**50**	**60**
15	30	0.52	0.81	0.93	0.98	0.99	0.99
16	32	0.54	0.83	0.95	0.99	0.99	0.99
17	34	0.57	0.85	0.96	0.99	0.99	0.99
18	36	0.59	0.87	0.97	0.99	0.99	0.99
19	38	0.61	0.89	0.97	0.99	0.99	0.99
20	40	0.64	0.90	0.98	0.99	0.99	0.99

Table 3.2 Religious Commitment Inventory-10

1. I often read books and magazines about my faith.*				
Not at all true of me	Somewhat true of me	Moderately true of me	Mostly true of me	Totally true of me
2. I make financial contributions to my church.				
Not at all true of me	Somewhat true of me	Moderately true of me	Mostly true of me	Totally true of me
3. I spend time trying to grow in understanding of my faith.*				
Not at all true of me	Somewhat true of me	Moderately true of me	Mostly true of me	Totally true of me
4. Religion is especially important to me because it answers many questions about the meaning in my life.*				
Not at all true of me	Somewhat true of me	Moderately true of me	Mostly true of me	Totally true of me
5. My religious beliefs lie behind my whole approach to life.*				
Not at all true of me	Somewhat true of me	Moderately true of me	Mostly true of me	Totally true of me
6. I enjoy spending time with others in my religious affiliation.				
Not at all true of me	Somewhat true of me	Moderately true of me	Mostly true of me	Totally true of me
7. Religious beliefs influence all my dealings in life.*				
Not at all true of me	Somewhat true of me	Moderately true of me	Mostly true of me	Totally true of me
8. It is important to me to spend periods of time in private religious thought and reflection.*				
Not at all true of me	Somewhat true of me	Moderately true of me	Mostly true of me	Totally true of me
9. I enjoy working in the activities of my church.				
Not at all true of me	Somewhat true of me	Moderately true of me	Mostly true of me	Totally true of me
10. I keep well informed about my churchand have some influence in its decisions.				
Not at all true of me	Somewhat true of me	Moderately true of me	Mostly true of me	Totally true of me
* Indicates private religious commitment.				

CHAPTER 4

RESULTS

Sample Characteristics

Table 4.1 shows descriptive characteristics of the participating churches included in the present study. Most reported a predominantly African American congregation (92.59%), identified as Baptist (46.3%) or non-denominational (20.37%), and had a membership attendance of 26-50 (37.04%). Across all churches, the percentage of adults who completed the survey compared to those who were in attendance at the worship service was estimated at 73%; thus indicating high participation.

Data were collected from 1,443 participants from 54 churches from June to October of 2016. A majority of participants were women (68.75%), African American (88.84%), and, on average, 54.8 ± 15.8 years of age. Roughly half of the sample was obese (50.49%), self-reported having high blood pressure (55.86%), and had some college education (49.71%). Participants included in this analysis were highly religious (mean religious commitment >4 on a scale of 1-5), averaging greater than weekly church attendance. High levels of PA were reported (70.21% reported meeting MVPA recommendations) with fewer meeting recommendations for F&V consumption (25.82%). Additional descriptive characteristics can be found in Table 4.2.

Models Testing Associations Between Religious Commitment and Health Behaviors

Table 4.3 shows bivariate correlations between all study variables.

Fruit and vegetable consumption. In bivariate analyses, private and public religious commitment were positively and significantly associated with meeting fruit (private: p=.006; public: p=.003), vegetable (private: p=.004; public: p=.02), and combined F&V (private: p=.02; public: p=.02) intake recommendations, although the magnitude of associations was small. Religious service attendance was not related to F&V intake. The logistic regression models indicated that religious service attendance and religious commitment were no longer significantly associated with meeting fruit, vegetable, or combined F&V consumption recommendations when all covariates were included in the model (see Table 4.4).

Physical activity. In bivariate analyses, private and public religious commitment were positively and significantly associated with meeting MVPA recommendations (private: p=.005; public: p=.002) and significantly negatively associated with physical inactivity (private: p=<.0001; public: p=<.0001). Religious service attendance was not related to meeting MVPA recommendations or physical inactivity. The logistic regression models indicated that public and private religious commitment remained significantly negatively associated with physical inactivity (p=<.0001) when covariates were controlled. No independent variables of interest were associated with meeting MVPA recommendations in the adjusted logistic regression models.

F&V Self-efficacy. In bivariate analysis, private and public religious commitment were positively and significantly associated with F&V self-efficacy (private: p=<.0001; public: p=<.0001). Religious service attendance was not related to F&V self-efficacy. Multiple linear regression models indicated that both religious commitment variables

remained significantly and positively associated with F&V self-efficacy (private: p=<.0001; public: p=<.0001) with covariates included in the model (see Table 4.5).

PA Self-efficacy. In bivariate analysis, private and public religious commitment were positively and significantly associated with PA self-efficacy (private: p=<.0001; public: p=<.0001). Religious service attendance was not related to PA self-efficacy. Multiple linear regression models indicated that PA self-efficacy was positively and significantly associated with both commitment variables (private: p=<.0001; public: p=<.0001) with covariates included in the model.

Body mass index. In bivariate analyses, private and public religious commitment and religious service attendance were not associated with BMI. Additionally, none of the independent variables of interest were associated BMI in the adjusted multiple linear regression models.

Table 4.1 Descriptive characteristics of the churches participating in the evaluation (n=54)

Characteristic	Frequency n (%)	Mean ± SD
Religious denomination		
Baptist	25 (46.30)	
Non-denominational or independent	11 (20.37)	
Presbyterian	3 (5.56)	
African Methodist Episcopal (AME) / AME Zion	7 (12.96)	
Pentecostal	4 (7.41)	
Methodist	3 (5.56)	
Episcopal	1 (1.85)	
Predominant race of members		
White/Caucasian	3 (5.56)	
Black/African American	50 (92.59)	
Multiracial	1 (1.85)	
Member attendance		
1-25	7 (12.96)	
26-50	20 (37.04)	
51-75	14 (25.93)	
76+	13 (24.07)	

Table 4.2 Descriptive characteristics of the study participants (n=1,443)

Characteristic	Frequency n (%)	Mean ± SD
Gender		
Men	440 (31.25)	
Women	968 (68.75)	
Age		54.8 ± 15.8
Race		
White/Caucasian	96 (6.65)	
Black/African American	1,282 (88.84)	
American Indian/Alaska Native	2 (0.14)	
Hispanic/Latino	23 (1.70)	
Asian	2 (0.14)	
Multiracial	12 (0.83)	
Other	4 (0.28)	
Education		
Never attended	2 (0.14)	
Grades 1-8	33 (2.36)	
Grades 9-11	100 (7.14)	
Grade 12/GED	569 (40.64)	
College 1-3	374 (26.71)	
College 4+	322 (23.00)	
BMI		
Underweight	11 (0.90)	
Normal weight	179 (14.72)	
Overweight	412 (33.88)	
Obese	614 (50.49)	
Self-reported health conditions		
High blood pressure	777 (55.86)	
High cholesterol	502 (36.19)	
Arthritis	472 (34.1)	
Diabetes	328 (23.87)	
Asthma	131 (9.45)	
Osteoporosis	116 (8.39)	
Cancer	98 (7.07)	
Chest pain	62 (4.50)	
Stroke	45 (3.26)	
Heart attack	34 (2.46)	
Self-rated health		
Excellent	66 (4.66)	
Very good	400 (28.27)	
Good	683 (48.27)	
Fair	243 (17.17)	
Poor	23 (1.63)	

Religious commitment [a]		
Public		4.18 ± 0.83
Private		4.11 ± 0.77
Times per month attend worship services		4.83 ± 3.04
Years of church attendance		32.29 ± 22.67
Moderate to vigorous PA		
Inactive	194 (13.93)	
Underactive	221 (15.87)	
Meets recommendations	978 (70.21)	
Consumed F&V		
Servings of fruit per day		1.97 ± 1.26
Meets fruit consumption recommendations	785 (57.34)	
Servings of vegetables per day		2.11 ±1 .34
Meets vegetable consumption recommendations	412 (30.21)	
Total servings of F&V per day		4.03 ±2 .28
Meets F&V consumption recommendations	348 (25.82)	
Self-efficacy [b]		
Physical activity		3.70 ±1 .54
F&V		4.83 ± 1.45

[a] Values for public and private religious commitment range from 1 to 5. Higher scores indicate greater commitment.

[b] Values for PA and F&V self-efficacy range from 1 to 7. Higher scores indicate greater self-efficacy.

Table 4.3 Summarized data from the bivariate correlation analyses

Variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
1. Age	1													
2. Education	-.19**	1												
3. Gender	-.05	-.05	1											
4. Self-rated health	.04	-.13**	.02	1										
5. Meets MVPA recs	-.04	.03	-.12**	-.18**	1									
6. Physical inactivity	0	-.02	.01	.15**	-.62**	1								
7. Meets fruit consumption recs	.03	.04	.07**	-.07**	.1**	-.15**	1							
8. Meets veg. consumption recs	.06*	.02	.05*	-.1**	.09**	-.1**	.37**	1						
9. Meets F&V recs	.06*	.01	.06*	-.11**	.09**	-.08**	.50**	.90**	1					
10. PA self-efficacy	-.06*	.18**	-.08**	-.29**	.24**	-.18**	.14**	.14**	.14**	1				
11. F&V self-efficacy	.04	.17**	.12**	-.26**	.16**	-.15**	.25**	.21**	.20**	.55**	1			
12. BMI	-.09**	-.02	.14**	.25**	-.14**	.05	0	-.05	-.04	-.13**	-.12**	1		
13. Religious service attendance	.07**	0	.01	-.07**	.01	-.03	.03	.01	.01	.03	.01	.01	1	
14. Private religious commitment	.16**	.14**	.08*	-.14**	.08**	-.15**	.08**	.08**	.08**	.20**	.34**	-.03	.06*	1
15. Public religious commitment	.19**	.10**	0	-.18**	.09**	-.13**	.08**	.06*	.06*	.21**	.33**	-.02	.09**	.77**
*p ≤ .05; **p ≤.01														

Table 4.4 Logistic regression models for meeting MVPA and F&V intake recommendations

Variables	Meets MVPA Recs (n=1,252)			Physical Inactivity (n=1,252)			Fruit Consumption (n=1,230)			Vegetable Consumption (n=1,231)			F&V Consumption (n=1,218)		
Model testing public religious commitment	**B**	**SE**	***p***	**B**	**SE**	***p***	**B**	**SE**	***p***	**B**	**SE**	***p***	**B**	**SE**	***p***
Age	-.01	.00	.02	.00	.00	.34	.00	.00	.29	.01	.00	.01	.01	.00	.01
Gender†	-.63	.15	<.01	.13	.19	.52	.37	.13	<.01	.26	.14	.06	.33	.15	.03
Education‡	.07	.14	.59	-.14	.18	.45	-.09	.12	.46	-.09	.13	.49	-.06	.14	.67
Self-rated health	-.51	.08	<.01	.57	.11	<.01	-.18	.07	.01	-.25	.08	<.01	-.29	.08	<.01
Group randomization#	.11	.17	.50	-.43	.23	.07	.02	.16	.92	.19	.13	.15	.16	.14	.24
Attendance	.02	.02	.43	-.02	.03	.58	.03	.02	.23	.00	.02	.98	.00	.02	.91
Public religious commitment	.13	.08	.11	-.32	.11	< .01	.14	.08	.06	.09	.08	.29	.09	.09	.34
Model testing private religious commitment	**B**	**SE**	***p***	**B**	**SE**	***p***	**B**	**SE**	***p***	**B**	**SE**	***p***	**B**	**SE**	***p***
Age	-.01	.00	.02	.00	.00	.27	.00	.00	.27	.01	.00	.01	.01	.00	.00
Gender†	-.65	.15	<.01	.20	.20	.31	.35	.13	.01	.25	.14	.08	.30	.15	.04
Education‡	.09	.14	.53	-.19	.19	.32	-.08	.12	.49	-.07	.13	.58	-.04	.14	.80
Self-rated health	-.52	.08	<.01	.57	.11	<.01	-.18	.07	.01	-.25	.08	.00	-.28	.08	<.01
Group randomization#	.12	.17	.49	-.44	.24	.07	.02	.16	.89	.19	.13	.16	.16	.14	.26
Attendance	.02	.02	.40	-.02	.03	.53	.03	.02	.21	.00	.02	.97	.00	.02	.93
Private religious commitment	.17	.09	.06	-.46	.11	< .01	.16	.08	.06	.16	.09	.08	.18	.10	.06

† 'men' is the reference category for gender
‡ 'no college education' is the reference category for education
# 'delayed intervention control group' is the reference category for group randomization

Table 4.5 Multiple linear regression models for PA self-efficacy, F&V self-efficacy, and BMI

Variables	PA self-efficacy (n=1,256)			F&V self-efficacy (n=1,261)			BMI[a] (n=1,139)		
Model testing public religious commitment	**B**	**SE**	***p***	**B**	**SE**	***p***	**B**	**SE**	***p***
Age	.00	.00	.05	.00	.00	.18	-.04	.01	<.01
Gender	-.30	.09	<.01	.34	.08	<.01	1.90	.42	<.01
Education	.38	.08	<.01	.35	.08	<.01	.20	.41	.62
Self-rated health	-.45	.05	<.01	-.35	.05	<.01	2.05	.24	<.01
Randomization	-.15	.10	.13	-.12	.10	.24	-.38	.50	.45
Attendance	.00	.01	.62	.00	.01	.46	.06	.09	.49
Public religious commitment	.30	.05	< .01	.47	.05	< .01	.30	.26	.25
Model testing private religious commitment	**B**	**SE**	***p***	**B**	**SE**	***p***	**B**	**SE**	***p***
Age	.00	.00	.05	.00	.00	.13	-.03	.01	.01
Gender	-.34	.09	<.01	.28	.08	<.01	1.90	.42	<.01
Education	.36	.08	<.01	.32	.08	<.01	.26	.40	.53
Self-rated health	-.46	.05	<.01	-.37	.05	<.01	2.00	.24	<.01
Randomization	-.15	.10	.11	-.14	.10	.17	-.42	.51	.42
Attendance	.00	.01	.51	.00	.01	.68	.08	.09	.38
Private religious commitment	.35	.06	< .01	.51	.05	< .01	.02	.28	.94

[a]BMI is computed as kg/m^2

CHAPTER 5

DISCUSSION

Religious involvement is associated with increased longevity (Chida et al., 2009; Hummer et al., 2004; McCullough et al., 2000), but its relationship with the individual health behaviors that may explain this phenomenon is yet to be determined. This study examined whether private and public dimensions of religious commitment were associated with preventive health behaviors and BMI in a large sample of rural southeastern US church members. Although several dimensions of religiosity/spirituality have been examined, few studies have focused on both public and private religious commitment measures and their individual associations with PA, F&V consumption, and BMI. This study was also among the first to examine the association between public and private religious commitment, PA/F&V self-efficacy, and physical inactivity using a large rural sample.

The first research aim of this study was to examine the relationship between religious commitment, fruit consumption, vegetable consumption, and combined F&V consumption. Consistent with hypotheses, in bivariate analysis, there was a weak but significant positive correlation between these variables. However, inconsistent with our hypotheses, the associations became nonsignificant after introducing all covariates into the logistic regression model. This is the fifth study conducted since 2001 that has found a nonsignificant association between religious commitment (mainly public) and F&V consumption (Obisesan et al., 2006; Pitel et al., 2012; Reeves et al., 2012; Salmoirago-

Blotcher et al., 2011), creating an equal amount of positive and null findings. No studies regarding religious commitment and F&V consumption have used longitudinal data, including this thesis study; thus, any inference of the underlying mechanisms potentially causing the overall positive relationship between degree of religiosity/spirituality and healthy eating behaviors cannot be established. Such studies are needed to help shed light on this relationship.

The second research aim was to examine the relationship between religious commitment, meeting MVPA recommendations, and physical inactivity. Among this sample, consistent with our hypothesis, there was a weak but significant positive bivariate correlation between private and public religious commitment and meeting MVPA recommendations. Inconsistent with our hypothesis, however, this association became nonsignificant after controlling for health status in logistic regression models. Previously conducted studies have unanimously shown a weak but positive association between PA and religious commitment (Gillum, 2006; Hill, Burdette, Ellison, & Musick, 2006; Hill, Ellison, Burdette, & Musick, 2007; Izquierdo-Porrera, Powell, Reiner, & Fontaine, 2002; Kim & Sobal, 2004; Merrill & Thygerson, 2001; Schlundt et al., 2008). However, many of these studies have used attendance as their sole measure of religious commitment and didn't control for demographics or health related variables. A study by Kim and Sobal (2004) found a moderate association with public religious commitment and MVPA, but only in women (Kim & Sobal, 2004).

We identified a weak but significant negative bivariate correlation between both dimensions of religious commitment and physical inactivity. Consistent with our hypothesis, both dimensions of religious commitment remained significant after

introducing covariates into the logistic regression models. Our findings indicate that an increase in religious commitment was significantly associated with a decrease in physical inactivity. Therefore, one's degree of religious commitment may not be enough to influence their ability to meet recommendations, but it moderately and positively associates with their behaviors in achieving at least 10 minutes of MVPA each week. Our findings are similar to Gillum's (2006) cross-sectional study analyzing religious service attendance and leisure-time PA, which identified a significantly higher prevalence of physical inactivity in infrequently attending women. Additional studies observing private religious commitment specifically and physical inactivity are needed for comparison. Studies have shown that participants often over-report levels of PA when compared to objective measures (Hagstromer, Ainsworth, Oja, & Sjostrom, 2010). Therefore, our results and those of previously conducted studies may have been influenced by a self-report bias. Studies using objective measures for PA in addition to various measures of religiosity/spirituality are needed to determine the underlying mechanisms explaining the association between degree of religiosity/spirituality and positive health behaviors.

The third and fourth specific aims examined whether religious commitment was associated with F&V self-efficacy and PA self-efficacy. We found that public and private religious commitment were positively and significantly associated with both PA self-efficacy and F&V self-efficacy, even after controlling for demographic and health-related variables, confirming our hypotheses. Self-efficacy has been shown to be positively correlated with behavior change intentions as well as PA and healthy eating behaviors (Ashford, Edmunds, & French, 2010; Schwarzer & Renner, 2000). Several studies have examined the mediating effects of self-efficacy on PA participation and healthy eating

behaviors in faith-based interventions (Ball et al., 2007; Dornelas, Stepnowski, Fischer, & Thompson, 2007; Young & Stewart, 2006), but few have analyzed religion's role in self-efficacy for health behaviors. A study by Robinson and Wicks found a moderate positive correlation ($r = .36$, $p = .22$) between God locus of health control and exercise self-efficacy in a small sample ($n = 19$) of African American women; non-significance in this relationship was likely attributed to the small sample size (Robinson & Wicks, 2012). To our knowledge, our study was the first to analyze the associations between religious commitment (public and private separately) and self-efficacy outcomes related to PA and F&V consumption behaviors. Future faith-based studies might benefit by examining whether self-efficacy for health behaviors can be increased by: (a) combining scripture readings with behavioral health teachings; (b) helping members tie mastery experiences with private and public prayer (e.g., giving thanks when consuming healthy meals or engaging in PA); (c) increasing vicarious experiences by modeling positive health behaviors in the faith-based setting; and (d) using social persuasion from the pulpit during worship services. This may help to explain why faith-based programs grounded in the social cognitive theory have proven to be efficacious in the past (Ashford et al., 2010; Campbell et al., 2007; Peterson, Atwood, & Yates, 2002).

Finally, the fifth research aim examined the association between religious commitment and BMI. Our findings indicated that over half (50.49%) of this sample was obese, rates that are 10% and 18% higher than county and state estimates, respectively (The State of Obesity, 2016). Our sample's obesity rate is likely higher because it is primarily composed of African Americans, whereas county rates represent the entire county, which is 39.7% white and 58.1% African American (US Census Bureau, 2015).

Contrary to our hypothesis, religious commitment was not associated with BMI; these results were comparable to others studies that found no significant relationship between religious commitment and BMI, yet were in contrast with other studies that have found an increased risk of obesity for people who are more religious (Cline & Ferraro, 2006; Feinstein, Liu, Ning, Fitchett, & Lloyd-Jones, 2010; Ferraro, 1998). Obesity is complex and cannot be attributed to religiosity alone. However, it is recommended that religious organizations harness their potential for reach in the community to encourage changes in physical activity and healthy eating behaviors, especially in communities facing health disparities.

Limitations, Strengths, and Future Research

This study had several limitations and strengths. These limitations were mainly related to instrumentation and generalizability. Participants in this study were mostly African American church members residing in rural areas inside a single county located in the southeastern US; thus, limiting generalization to other populations. Although validated measures were used, our results were based entirely on self-report measures. Unusually high amounts of MVPA participation were reported among this sample. This finding may likely be attributed to reliance on a single method and/or social desirability biases inherent in self-report measures. The use of objective measures would have been useful, but was deemed not to be feasible for reasons of cost, logistics of having to visit 54 churches over a limited time period, participant burden, and church/participant acceptability. The data for this study were gathered from post intervention assessments only, prohibiting us from controlling for baseline scores. Finally, this was a non-probability sample of people recruited directly from churches. Participants had high

levels of worship service attendance and high levels of religious commitment. When studying associations between religious commitment and health-behaviors, it would be ideal to have a sample with high variability in religious commitment. However, we studied a large sample of church members who were high in religious commitment, thus our lack of associations may be due to a limited range, reducing our ability to identify significant differences when they exist.

Despite these limitations, our large sample size makes it a suitable representation of rural and predominantly African American populations. The majority of studies observing the relationship between religious commitment and preventive health behaviors have been conducted using data from large representative samples, such as the National Health and Nutrition Examination Survey. Therefore, few studies have gathered data directly from the rural communities in which health behaviors are developed and maintained. This study provides unique information regarding the relationships between religious commitment and health behaviors in an underserved rural population, a demographic that is commonly underrepresented in health research, yet experiences a disproportionate health-related burden. Indeed, the sample had a high prevalence of obesity, hypertension, high cholesterol, arthritis, and diabetes. Most prior studies assessing relationships between religious commitment and health behaviors used simplified measures for religion (i.e., church attendance) and did not examine religious commitment's relationship with PA or F&V self-efficacy and physical inactivity as outcome variables. Thus, this study contributes to the faith-based literature by filling these gaps and providing implications for further research on public and private religious commitment. Our sample is also quite diverse in age, gender, education, BMI, perceived

health status, F&V consumption behaviors, PA and F&V self-efficacy, and denominational association. Finally, our use of validated measures and extensive staff training increased internal validity and ensured fidelity in the data collection process.

Considering this study's limitations and strengths, we recommend researchers use samples with greater diversity in religious commitment and more objective measurements for PA, where possible, and more comprehensive measures of F&V consumption to gain a better understanding of religion's role in preventive health behaviors. Religious service attendance, commonly used as the sole measure of religious commitment in other studies, was not associated with any of the present study's outcome variables. This finding speaks to the importance of using more comprehensive measures for religious commitment. We recommend researchers use additional measures more specific to the various dimensions of religiosity (i.e., public and private religious commitment, religious salience) in efforts to understand the overall association between religion and increased longevity.

Conclusion

The results of this faith-based cross-sectional study indicated a lack of significant associations between both public and private religious commitment with meeting MVPA recommendations, meeting F&V consumption recommendations, and BMI among church members in rural Southeastern US. Private and public religious commitment, however, were significantly positively associated with F&V self-efficacy and PA self-efficacy and negatively associated with physical inactivity after controlling for demographic and health related variables. Thus, individuals who indicate a higher degree of religious commitment are more likely to believe in their ability to succeed in improving PA and healthy eating behaviors, and are less likely to be physically inactive. Future researchers

should use study samples with greater religious commitment variability, use more objective measures for PA participation and comprehensive measures for F&V consumption behaviors, and employ measures separate from religious service attendance to quantify degrees of religiosity.

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