The Relation Between Religiosity and Late-Life Depression in a Community Sample of Members of The Church of Jesus Christ of Latter-Day Saints

Lynn Marie Franklin

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THE RELATION BETWEEN RELIGIOSITY AND LATE-LIFE DEPRESSION IN A COMMUNITY SAMPLE OF MEMBERS OF THE CHURCH OF JESUS CHRIST OF LATTER-DAY SAINTS

by

Lynn Marie Franklin

A thesis submitted in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

in

Family, Consumer, and Human Development
ABSTRACT

The Relation Between Religiosity and Late-Life Depression in a Community Sample of Members of The Church of Jesus Christ of Latter-Day Saints

by

Lynn Marie Franklin, Master of Science

Utah State University, 2005

Major Professor: Dr. Maria C. Norton
Department: Family, Consumer, and Human Development

A secondary analysis of extant data from The Cache County Study on Memory Health and Aging (CCSMHA), this study examines the association between religiosity and new-onset depression between baseline and 4-year follow-up interviews in a sample of 1,439 community-dwelling elderly members of The Church of Jesus Christ of Latter-day Saints (LDS), aged 65 to 100. Logistic regression models found that church attendance, voluntarism in religious groups, and direct experiences of God occurring more often than weekly were (statistically and practically) significantly associated with lower depression risk. No evidence was found for moderator effects of gender or prior depression history; however, there was some evidence of a mediator effect of social network on the religiosity/depression association. These findings are consistent with similar studies but represent the first such study in an elderly LDS population. Future
directions include determining whether individual religious behaviors moderate the
effect of stressful life events in this population.

(126 pages)
ACKNOWLEDGMENTS

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I want to express my heartfelt gratitude for the research assistantship and mentorship of Dr. Maria C. Norton. Dr. Norton’s enthusiasm for research in epidemiology and her ability to mentor “newly minted” graduate students has been of seminal value in my academic work and thesis preparation at Utah State University. The Cache County Study provides a caring atmosphere where further study on the aging process is encouraged for individuals who are motivated to learn more about the challenges that face our aging population and the social policy of society itself. I want to thank Dr. Randall M. Jones very much for his networking efforts that led to my introduction to Dr. Norton and The Cache County Study on Memory Health and Aging.

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A final acknowledgment goes to my ever-so-patient husband, Barry, as I tried on my several potential personas of “what shall I do when I grow up.” Thank you, Barry, for your support and inspiration, for listening to me, and for your care throughout these years as I engage in academics.

Lynn Marie Franklin
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CHAPTER I

PROBLEM STATEMENT

An unparalleled shift in the proportion of the U.S. population aged 65 years and over is projected to transpire between the years 2010 and 2030. In 2000, the proportion of the U.S. population aged 65 and over was 12%. By 2030, this proportion is projected to increase to 20% of the U.S. population - approximately 70 million people (Administration on Aging, 2004). With increasing age come challenges to well-being, both physiological and psychological. The ability to maintain a positive outlook on life in the face of increased frailty and multiple losses is a major challenge.

One of the major needs of older adults will be in the area of mental health, and among the various mental health problems, depression is foremost. Geriatric depression (or late-life depression), defined as a depressive episode that commences at age 60 years and above, is a significant health problem accompanied by a decline in medical, cognitive and functional health, and increased suicide risk.

Prevalence is defined in epidemiological terms as the proportion of a population that meets the defining characteristics for a disorder within a specific time frame (Gallo & Lebowitz, 1999). The prevalence rate for geriatric depression, characterized by a significant number of depressive symptoms, is estimated to range between 15% and 30% (Gallo & Lebowitz; Pålsson & Skoog, 1997). Community-dwelling elderly individuals aged 65 and over have a prevalence rate between 6.4% and 24.3% for all depressive disorders, and a prevalence rate between 2% and 5% for major depression (Cole, Bellavance, & Mansour, 1999; Fountoulakis et al., 2003; Steffens et al., 2000).
Elderly persons who live in long-term care facilities (e.g., nursing homes, assisted living centers, rehabilitation centers) have a 12% prevalence rate for major depression and a 30% rate for subsyndromal or minor depression (Fountoulakis et al.).

Incidence rate refers to the proportion of individuals experiencing a disorder in a population of previously unaffected individuals over a specific time interval, typically one year (Gallo & Lebowitz, 1999). Incidence of depression varies depending on gender and age throughout the lifespan. Gender differentiation in depression becomes apparent from adolescence forward to midlife. Women’s incidence rates for major depression are highest between 20 and 40 years of age, mirroring their reproductive life.

Point prevalence for major depression in adult women is 1.5 to 2.0 times as high as in men (Kivelä, Pahkala, & Laippala, 1988; Livingston, Hawkins, Graham, Blizard, & Mann, 1990; Steffens et al., 2000). Some prevalence studies of geriatric depression have found that as people age, gender differences become less apparent (Livingston et al.; Skoog, 1993). Other studies have found that as age increases, women have higher prevalence rates for late-life depression than men (Takkinen et al., 2004). Recent unpublished incidence data from the Cache County Memory Study (Norton et al., in press) suggest an attenuation of the gender gap with aging.

Risk factors for geriatric depression include the following: (a) demographic characteristics such as female sex and older age; (b) prior depression history; (c) poorer health; (d) reduction in financial status; (e) loss of autonomy; (f) vascular medical history (e.g., stroke and cerebrovascular abnormalities); (g) stressful life events (e.g., death of loved ones, occupational displacement); (h) spouse’s depression; and (i)
decreased activities of daily living (basic, instrumental; Blazer, 2002).

Protective factors play an integral part in decreasing the impact of functional impairment and psychosocial risk factors in geriatric depression (Contrada et al., 2004). Religiosity (or religious involvement) is a psychosocial factor that may offer protection against geriatric depression (Braam et al., 2001; Koenig, 1995; Koenig, George, & Peterson, 1998; Koenig, George, & Titus, 2004; Koenig, McCullough, & Larson, 2001; McCullough & Larson, 1999; Murphy et al., 2000; Parker et al., 2003). An intrinsic religious orientation, defined as being religiously motivated for its own end, is oftentimes expressed through prayer or meditation. This has been found to be inversely associated with the number of depressive symptoms (Allport & Ross, 1967; McCullough & Larson; Smith, McCullough, & Poll, 2003). Others have found that gender (Angst et al., 2002; Barefoot, Mortensen, Helms, Avlund, & Schroll, 2001; Kockler & Heun, 2002; Loewenthal, MacLeod, Lee, Cook, & Goldblatt, 2002; Steffens et al., 2002) and religious involvement affect risk for onset of late-life depression (Braam et al., 2001, 2004; Hintikka, Koskela, Kontula, & Viinamäki, 2000; Schnittker, 2001). Gender may moderate the religiosity-depression association.

Little is known about the potential interaction of gender and religiosity because studies of religious involvement and depression seldom examine this potential moderator effect, and studies of gender’s effect on depression prevalence and incidence rarely consider religiosity. Published studies neither have examined this potential moderator effect in a community culture that is predominantly affiliated with The Church of Jesus Christ of Latter-day Saints (LDS), nor have they explored potential
moderator effects of religious affiliation in a community with such a preponderance of one affiliation.

Baltes' Lifespan Developmental Perspective

Baltes' lifespan developmental perspective clarifies the relationship between religious affiliation, private religiosity, public religiosity, and the extent to which they operate as protective/risk factors for late-life depression. This perspective is a process-status theory and, unlike a stage theory, suggests that human development varies in content both intraindividually and interindividually from one time in development to the next. Gains and losses are experienced as development proceeds in relation to the environmental context. The perspective offers an interpretation for the losses and gains experienced in individual development along multiple dimensions as life events impact the individual throughout the lifespan. Losses and gains are examined via multiple dimensions through an age-graded, history-graded, and nonnormative lens.

Baltes' lifespan development perspective predicts that as multiple risk factors for late-life depression accumulate, opportunities for individuals to practice their religion decrease with advanced aging. Elderly individuals are likely to experience increased levels of functional impairments and disease, thus limiting their mobility and autonomy. As friends and family of their age cohort die, their social network and social support system atrophies. Spousal bereavement, particularly for men, further magnifies the potential for loneliness along with decreased instrumental and emotional support formerly given by the spouse.
Depression is not a normative event of old age. Some individuals have a reserve capacity to weather potential multiple insults of old age, having developed resilience to multiple stressful life events. The majority of elderly people are not physically or mentally impaired. Yet, as individuals advance to the category of oldest-old, a loss of autonomy, disease, or social isolation tends to increase. These factors leave elderly individuals less able to practice their religion among a community of other like-minded individuals who have shared a similar social history and life experience.

Summary

Technological advances in medicine, sanitation, and nutrition have extended human life on a larger scale than any other time in history. Geriatric depression is a major public health concern. Many older adults do not enter this age bracket impaired, but develop impairments as they age (75+). Female gender is a risk factor common to studies of depression in adult women internationally.

There is evidence that religiosity may be protective against geriatric depression. This has been examined in a number of studies that use small, clinically-based populations, often leading to equivocal results due to methodological differences between studies.

Very few large, population-based studies have examined the relationship between religiosity and geriatric depression. Further, female gender may moderate the relation between religiosity and geriatric depression due to women’s increased use of religiosity for coping with life’s difficulties and their more frequent attendance at
religious services and private religious behaviors.

This thesis will focus on enhancing our understanding of the association between religiosity and late-life depression. To accomplish this, data will be drawn from The Cache County Study on Memory Health and Aging (CCSMHA), a longitudinal study of the genetic and environmental factors that effect risk for dementia. Data from the CCSMHA will be used to examine the interactions between gender, religiosity, and prior depression, for onset of late-life depression over a four-year interval. These findings may help inform pastoral counseling, primary care, or other forms of psychosocial interventions to reduce the overall public health problem of depression in late life.
CHAPTER II
REVIEW OF LITERATURE

Baltes' Lifespan Developmental Perspective

Nonnormative events, such as late-life depression, can influence the sequencing in which events in a person's life occurs. Depending on the source and type of nonnormative event, the timing (the average age for an event to occur) can skew a person's developmental path. An individual's development can also be affected by the duration of an event; in other words, the amount of time (e.g., acute versus chronic) that a nonnormative event influences the life experience of the individual. Also, the resilience of an individual can influence how well he or she functions during times of stress. Some individuals may be able to successfully integrate the occurrence of an event by seeking help from others to resolve an experience such as late-life depression. Life experiences are shaped by the context and settings of events (e.g., in the public sphere versus in the private sphere). The impact of an event extends across contextual formats, much as depression might affect facets of daily life across numerous life dimensions.

The likelihood of an occurrence, such as a mother suffering and dying from paraneoplastic cerebellar degeneration, may influence the lifespan development of her offspring, depending on prevalence, age of onset, and the recency of the disease. A disease that occurred once in late-life several years ago may have had only a small effect on the lives of her children. However, a recent episode of chronic, late-onset
depression that has been diagnosed as possibly being a prodrome of Alzheimer’s Disease in a young-old individual may have significant effects on the course of that individual’s life, as well as impacting the lives of significant others.

An individual’s environment is formed by the surrounding biological, historical, social, and cultural contexts. The propensity to develop late-life depression depends on the interaction between an “individual’s biogenetics and biopsychological ecology” (Baltes, 1987). Understanding the central concepts of age-graded, non-normative processes in a contextual environment is helpful to appreciate the impact of late-life depression. The impact of protective risk factors on late-life depression is influenced by the limitations of an individual’s potential ability to adapt to changing circumstances. An individual who is able to summon social resources or who is resilient possesses greater potential (or intraindividual plasticity) to avoid the negative consequences of non-normative events, such as late-life depression (Baltes).

This thesis maintains that Baltes’ (1987) perspective of human development throughout an individual’s lifespan provides a tool to understand the impact of late-life depression on the individual, family, and community levels. In order to further understand the epidemiology of late-life depression and its impact on the human family, this thesis will next consider the prevalence, incidence, heterogeneity, and multiple risk/protective factors of late-life depression.

Prevalence of Late-Life Depression

Geriatric depression is increasing in prevalence, primarily due to increased
symptom recognition and incidence. Prevalence rates are contingent on the diagnostic
criteria and methodology used to measure late-life depression. Recent prevalence
studies estimate that between 6.4% and 24.3% of the population aged 65 and over have
late-life depression (Ambo, Meguro, Ishizaki, Shimada, & Yamaguchi, 2001; Benazzi,
1998; Gottfries, 2001; Hybels, Blazer, & Pieper, 2001). Prevalence rates increase to
between 30% and 48.1% for elderly residing in nursing homes (Pålsson, Aevarsson, &
Skoog, 1999). Prevalence rates for sub-threshold depression in the elderly population
have been reported to be 9.9% (Hybels et al.).

Incidence of Late-Life Depression

With respect to gender there are mixed findings regarding incidence of geriatric
depression. A recent study reported incidence rates of late-life depression for older
adults aged 70 to 85 years old to be 12 per 1,000 person years for men and 30 per 1,000
person years for women. However, another study found no gender differences in late-
depression based on self-report of depressive symptoms (Bogner & Gallo, 2004). As an
aggregate figure for both sexes, incidence rates of late-life depression increased from 17
per 1,000 person years for those aged 70 to 79 years, to 44 per 1,000 person years for
those aged 79 to 85 years old (Pålsson et al., 2001).

Late-life depression has several deleterious effects on those it strikes. Effects of
geriatric depression include the following: (a) reduced productivity; (b) social
withdrawal; (c) subsequent health decline; (d) cognitive impairment; (e) higher medical
costs; (f) communication quality with others, including the spouse and other family
members; and (g) increased mortality and suicide risk (Alexopoulos, Kiosses, Klimstra, Kalayam, & Bruce, 2002; Bruce, 2002; Fingerman & Birditt, 2003; Lockwood, Alexopoulos, & van Gorp, 2002; Nisbet, Duberstein, Conwell, & Seidlitz, 2000; Sachs-Ericsson, Joiner, Plant, & Blazer, 2005; Schulz, Drayer, & Rollman, 2002; Stek et al., 2005).

Heterogeneity of Late-Life Depression

Late-life depression is heterogeneous across many dimensions. It includes older adults who experience their first incidence of depression during their younger years, termed early onset depression. Also included are older adults who have their first incidence of depression later in life, referred to as late-onset depression (age threshold for "late-life" depression ranges from 55 to 85+, with a median of 60 years). Those with early-onset depression are more likely to have a familial or genetic history of mood disorders, while late-onset depression is associated with higher rates of dementia, neurological disease, and cerebrovascular abnormalities. Late-onset depression is heterogeneous in terms of its variability in course including chronicity, severity, relapse/recurrence rates, and treatment response, in contrast to early-onset depression (Baldwin & O'Brien, 2002; Brodaty et al., 2001; Grace & O'Brien, 2003; Heun, Papassotiropoulos, Jessen, Maier, & Breitner, 2001).

Affective symptoms such as guilt, sadness, and depressed mood are less prevalent in geriatric depression, whereas somatic symptoms are more common, including:
(a) loss of interest or pleasure in activities that are normally enjoyable; (b) fatigue; (c) insomnia or hypersomnia; (d) early morning awakening (waking in the morning 2 hours or more before the usual time); (e) worse sadness; (f) objective evidence of psychomotor retardation or agitation (from the perspective of others); (g) marked loss or gain of appetite (a fluctuation of 5% or more of body weight in the past month); and (h) marked loss of libido (American Psychiatric Association, 1994; Blazer, 1982; Koenig, Meador, Cohen, & Blazer, 1992).

This thesis has provided some background to explain why prevalence and incidence of late-life depression has been rising. This thesis describes late-life depression as being heterogeneous in terms of age of onset, symptomology, recurrence, and remission. In the following section, the thesis considers risk factors that may provide some explanations for the onset of late-life depressive episodes and the variability in remission, recurrence, and chronicity of late-life depression. Among a multitude of potential factors, risk factors specifically addressed in this thesis include chronic depression, spousal bereavement, prior depression history, and gender differences in late-life depression.

Chronic Depression

Chronic depression is evident in 40% of those diagnosed with late-life depression (Fountoulakis et al., 2003). Dysthymia, (or chronic depression), is characterized by a mild to moderate depressed mood lasting at least two years, is twice as likely in women as in men. For a diagnosis of dysthymia, two (or more) of the following symptoms must be present: (a) poor appetite or overeating; (b) insomnia or
hypersomnia; (c) low energy or fatigue; (d) low self-esteem; (e) poor concentration or difficulty making decisions; or (f) feelings of hopelessness. Prior depression history, functional impairment, and comorbid anxiety are risk factors for chronic depression in the elderly. Chronic depression in elderly women is related to prior depression history, whereas recent psychosocial factors and health problems are risk factors for chronic depression in elderly men (Schoevers et al., 2003). Chronic and recurrent depressive episodes have been found to be more common in women than in men (Aneshensel, 1985; Ernst & Angst, 1992; Lucht et al., 2003; Sagud, Hotujac, Mihaljevic-Peleš & Jakovljevic, 2002).

Bereavement

Spousal bereavement has been found in some studies to be a prime risk factor for the advent of depression in grieving elderly persons. Both bereavement and depression are often associated with increased morbidity. It is estimated that at least 51% women and 14% men will be widowed after age 65. Some studies have found gender differences in spousal bereavement as a risk factor for geriatric depression, while others have not. In studies that found gender differences, bereaved elderly men were found to be at increased risk for depression, compared to their female counterparts. Some of these studies attributed the gender differences to be related to the differing characteristics in social network and social support between men and women. Previous studies found that men tend to rely upon their spouses as their sole confidante, and oftentimes primary resource for both expressive and instrumental support. Contrasted, the social network of women tends to be larger and members play multiple
roles. Nevertheless, despite the increased presence of social resources for women, they suffer greater amounts of depression in general from puberty onward.

Li, Liang, Toler, and Gu (2005) studied the effects of gender and prebereavement social support from spouses, adult children, and friends on widowhood adjustment among older adults in China. Widowhood had a negative mental health consequence for older Chinese. Social support from adult children buffered the deleterious effect of widowhood, whereas spousal support during the marriage increased one’s vulnerability. Support from friends was not found to have a significant effect. Gender difference in the effect of widowhood was also not evident (Li et al.).

A prospective study of 1,532 elderly Black and White individuals aged 65 and over found that the death of a spouse led to a higher risk of depression and anxiety, regardless of race (Carr, House, Wortman, Neese, & Kessler, 2001). Grace and O’Brien (2003) compared 66 bereaved elderly individuals, 33 of whom experienced first onset major depression after age 60 (late onset depression) and 30 of whom experienced first onset major depression before age 60 (early onset depression). Individuals with a history of late onset depression were more likely to have a confidante in their social network and were less likely to have experienced bereavement, in contrast to individuals with a history of early onset depression (Grace & O’Brien). The loss of a partner as a stressful life event was used by researchers to study the internal validity of the 15-item Geriatric Depression Scale (GDS) with participants from The Leiden 85-plus Study. Of 241 participants who lived with a partner at baseline, 32 participants were bereaved between baseline and follow-up, and subsequently
experienced an increase in the mean GDS score by 1.2 points (paired t test, \( p = .013 \); Vinkers, Gussekloo, Stek, Westendorp, & van der Mast, 2004).

**Gender Differences in Late-Life Depression**

Although not unequivocally confirmed, the majority of studies of geriatric depression report higher rates in females (Kockler & Heun, 2002; Sonnenberg, Beekman, Deeg, & van Tilburg, 2000). Gender differences in the epidemiology of geriatric depression have been summarized in a review of 79 studies (Sagud et al., 2002). Gender differences have been noted in diagnoses of seasonal affective disorder. The sex ratio for prevalence of seasonal affective disorders (SAD) has been reported between 2.7:1 and 9:1 (women:men; Lucht & Kasper, 1999). The first depressive episode in women has been noted to correspond closely to age at onset of puberty, rather than simply to chronological age, in women. Lifetime rates of comorbid depression and generalized anxiety disorder are more prevalent in women at a 2:1 ratio. Women are between 1.3 and 3.3 times as likely as men to have anxiety disorders, irrespective of whether it is comorbid with depression. In terms of comorbid depression and gender, alcohol and substance abuse are most often linked to comorbid depression in men (Simonds & Whiffen, 2003).

Risk factors for late-life depression do not tell the whole story of who gets late-life depression and who does not. And understandably the thesis focused on only a few of the many possible, known risk factors. The thesis is also interested in potential protective factors that may exist to help avert a depressive episode in the elderly.
individual. One risk/protective factor that has received attention, particularly in clinical studies, is religious involvement and its potential relationship to either the development of or resilience to late-life depression. The thesis will focus next on the multidimensionality of religious involvement in terms of the effects of extrinsic (public) religious involvement versus intrinsic (private) religious involvement on late-life depression.

Multidimensional Quality of Religiosity and Late-Life Depression

Psychosocial factors such as religiosity may play a role in geriatric depression risk. Religiosity has historically been an important social construct for sociologists and psychologists in their quest to better understand how people use religiosity to solve personal and social problems, in addition to enriching their quality of life. Allport and Ross (1967) developed an explanatory framework for the multidimensional forms of religiosity through the dichotomous social construct “extrinsic religiosity” and “intrinsic religiosity.” This dichotomy remains a useful social construct, even as additional forms of religiosity have informed our understanding of the multidimensional quality of religiosity.

Extrinsic Religiosity

Extrinsic religiosity is a means to an end, a way of fulfilling a specific want or need of the individual that social interaction in an organized religious format affords (Allport & Ross, 1967). In exchange for the possibility of need or want fulfillment,
whether it be physical, social, psychological, or spiritual, the individual becomes a participant, active or otherwise, in an organized religious community, and in turn, adopts the promulgated beliefs, customs, and attitudes of that specific religious community. Extrinsic religiosity includes participation in formal, organized religious activities including church attendance and participation in religious activities such as choir, youth groups, or committee work.

**Intrinsic Religiosity**

Intrinsic religiosity is concerned with religiosity’s value as an end in itself, rather than merely the means or path to attain rewards that religiosity may confer upon an individual. Intrinsic religiosity often involves concentration on an individual’s understanding of the Godhead, and concern for an individual’s personal viewpoint and behavior that is related to the transcendence of the self, a concept that is greater than the self. A closely related phenomenon is private religiosity that is concerned with religious activities undertaken by the individual, and not driven by organized religion. Both intrinsic religiosity and private or non-organized religiosity may take the form and content of personal prayer, meditation, or some other inner spiritual activity (Allport & Ross, 1967).

The thesis has examined the potential differential impact of intrinsic religiosity and extrinsic religiosity on its association with late-life depression in the individual unit of analysis. Next, the thesis examines the association between religious involvement and late-life depression on the national unit of analysis by directing the focus to contrasting cultural religious traditions in nations characterized by a homogenous
population in terms of a predominant religious affiliation that affects the overall community culture.

Religious Climate and Traditions

The application of new insights in the form of education may help to ameliorate conditions under which depression thrives. The religious climate of a surrounding environment may have the capacity to be a protective factor in guarding against depression. Traditional, conservative religious climates that are devotional in nature, with a high emphasis on religious participation in public religious activities, have greater protective factors (Braam, Beekman, van Tilburg, Deeg, & van Tilburg, 1997; Idler & Kasl, 1992).

On a macro level, the religious tradition of a country can promote either vulnerability or protective factors for depression (Braam et al., 1998; Braam et al., 1999b; Kennedy, Kelman, Thomas, & Chen, 1996). Religious traditions promote social organization, increase the quality of relationships, shape value patterns and moral codes, and promote identification with a community through a shared sense of belonging (Ellison, Gay, & Glass, 1989). Religious communities convey a greater sense of cohesion in countries with homogeneous traditions. The effect of religious involvement in countries with a homogeneous is a tradition decrease in the prevalence of depression (Braam, Beekman, Deeg, Smit, & van Tilburg, 1999a; Braam et al., 1997, 2004).

Religious Affiliation and Frequency of Church Attendance

Rates of depression can also be influenced by the interaction between religious
affiliation and frequency of church attendance. Rates of late-life depression tend to be lower among those who frequently attend religious services, particularly Roman Catholics. Elderly women in predominantly Roman Catholic countries who report fewer symptoms of depression attend church services more frequently (Braam et al., 2001).

Studies have found a stronger inverse association between frequent church attendance and depression among elderly women than among elderly men (Meertens, Scheepers, & Tax, 2003). This association has been demonstrated for both symptom count and DSM diagnosis depression measures (Braam et al., 1997). On a macro level, religious climate has a protective effect on geriatric depression, and this effect is more pronounced in countries whose public and cultural life is interlaced with religiosity (Braam, Sonnenberg, Beekman, Deeg, & van Tilburg, 2000).

Though there are some studies that focus on the interaction between religiosity and late-life depression in specific faith groups such as Calvinists (Braam et al., 1998); Catholics (Bienenfeld, Koenig, Larson, & Sherrill, 1997); Buddhists (Boey, 2003); Mainline Christians and Pentecostals (Meador et al., 1992); and Baptists (Musick, Blazer, & Hays, 2000), no published study could be located that examined the relation between religiosity and depression in a predominantly LDS community.

This section of the thesis considered the ramifications of religious involvement and religious affiliation on both the individual and national units of analysis as potential protective factors for late-life depression. The thesis also examined the role of church attendance as a specific religious activity which may offer potential protective qualities.
The thesis will focus in the following section on the potential role that gender differences and prior depression history, respectively, may have as moderators of the association between religious involvement and late-life depression.

Gender as a Moderator

Among published studies on late-life depression, female gender has been consistently associated with higher depression rates than found in males (Bogner & Gallo, 2004; Kockler & Heun, 2002; Parker & Brotchie, 2004; Simonds & Whiffen, 2003; Sonnenberg et al., 2000; Takkinen et al., 2004; Tam, Stucky, Hanson, & Parry, 1999). Women have also been found to be more religious than men (Levin, Taylor, & Chatters, 1994; Mitchell & Weatherly, 2000; Wink, Dillon, & Larsen, 2005). Given that religious involvement and male gender are both associated with less depression, yet women tend to be more religiously involved, it is reasonable to examine the question of whether or not gender moderates the association between religiosity and depression. In other words, it begs the question: Does religious involvement have the same effect on men and women in terms of depression risk?

There are at least two approaches one can use to test for moderating effects, as in testing whether a moderating effect of gender exists in the association between religiosity and depression. The first method is to test for a gender-by-religiosity interaction. If the interaction is statistically significant, this finding indicates that gender does moderate the association between religiosity and depression. Therefore, at different levels of gender (men versus women) a different strength of association exists.
A second method is to stratify the sample by gender and run separate analyses for men and women. This precludes having a statistical test to discern the statistical significance of differences in results between separate levels of stratification, such as men and women. However, stratification by gender that yields different results for men and women does provide some evidence for a moderating effect of gender.

Unfortunately, in the extant literature this linkage has not really been examined with either approach. Among the several hundred studies on religiosity and depression reviewed, only two studies were found to test for the moderating effect of gender on religiosity. Although several studies on the association between gender and depression can be found in a search of the literature, few studies have focused on gender as a potential moderator of the relationship between religiosity and late-life depression, and none were longitudinal. Instead, gender is typically included as a covariate in models of the effect of religiosity on depression. All that is known from these studies is that religiosity affects depression, net of the effect of gender, which is not the same concept as an effect modifier.

One of the two studies that provided some form of test for a moderating effect of gender was a nationwide Finnish study of 773 men and 869 women aged 65 and older (Hintikka et al., 2000). The study found no statistically significant association between church attendance and depression overall. However, they did find a significant positive association between religious service attendance and the absence of minor mental health problems for women (OR = 1.72, 95% CI 1.22 - 2.41, p < .001), but not for men (p value not provided).
The other study was a cross-sectional study of 2,676 participants, aged 17 to 65, which found through the interaction between gender and weekly religious service attendance. Weekly church service attendance was positively associated with remission from depression for women (OR = 3.56, 95% CI: 1.64 - 7.74), but not statistically significant for men (Strawbridge, Shema, Cohen, & Kaplan, 2001). These findings are suggestive of a gender moderating effect on religiosity’s effect on new-onset depression, but because the outcome measure was depression remission, it is not fully applicable. Hence, these two studies provide scant evidence for gender as a moderating effect on the religiosity/depression association and thus justify further study.

Prior Depression History as a Moderator

Studies of depression have found that prior depression history is a very stable predictor of subsequent depressive episodes. With increasing numbers of recurrent depressive episodes, periods of remission between depressive episodes become increasingly shorter, a pattern that leads to a state of chronic depression, particularly for women. No studies were identified in which prior depression history was tested as a potential moderator of the religiosity/depression association.

In the longitudinal studies, prior depression history is only included as a covariate, which is typically highly significant, even in the presence of religiosity and other demographic variables known to affect depression risk (e.g., Idler & Kasl, 1992, and unpublished data from the CCSMHA). Thus, all that is known from these studies is that religiosity affects depression, net of the effect of prior depression history, which is
not evidence for prior depression history as a moderator. A possible explanation for a lack of studies that include prior depression history in statistical models is the lack of a sufficient number of respondents who have a prior depression history. Therefore, studies are needed to test whether prior depression history is a significant moderator. A novel aspect of this thesis study on late-life depression is that it actually tests for an interaction between prior depression history and religiosity.

Social Network as a Mediator

As two separate socially constructed concepts, social support and social network are not synonymous. In social psychological literature, social network is the number of persons with whom one interacts and who provide social support. Social support (e.g., perceived, received, given, emotional, or instrumental) refers to things (e.g., comfort, help) offered to persons perceived to need or benefit from support given. The study focused on social network as evidenced by the questions asked of participants. The questions concerned both size of a respondent's network of family and friends and perceived adequacy of time spent with family and friends. Also addressed was one's perception of having one other person to confide in, a confidante.

Only a very few studies have methodologically tested for a social network mediator effect. The reason so few studies are found in a literature search is that testing for a social network mediator effect is an analysis that must be done explicitly. First, religiosity must be tested for its direct association with depression (without social network in the model). Second, in order for a social network mediator effect to occur,
the association between religiosity and depression must be found to become no longer significant when social network is added into the model. Third, social network must be found to be significantly related to depression, and religiosity must be found to be significantly related to social network. When all of these findings for the above methodological tests are found, a mediator effect for social network has been demonstrated.

A cross-sectional study in the Cache County population found some evidence to suggest that social networks mediate the relation between weekly or greater frequency of church attendance and current major depression for both men (OR = 3.99, 95% CI: 1.31 - 12.10 before social network and OR = 3.83, 95% CI: .97 - 15.20 after social network) and women (OR = .25, 95% CI: .08 - .76 before social network; OR = .26, 95% CI: .07 - 1.04 after social network; Norton et al., in press). Although several studies on the association between social network and depression can be found in a search of the literature, very few studies have focused on social network as a potential mediator of the relationship between religiosity and late-life depression, and none were longitudinal. In a literature search of Medline, PsychInfo, and Academic Search Elite, only four published studies were found that addressed the social network mediator effect on the association between religiosity and depression. One study found that social network was a significant mediator, while the other three studies found the opposite.

One study was found that compared community-dwelling African American and White elderly people in a major southeastern city in the U.S. In regression analyses for
African American subjects that controlled for medical problems and social stress, social support mediated the relationship between public religiosity and number of depressive symptoms (beta = -.14, $p < .05$ before social support, and beta = -.10, $p < .10$ after social support). In regression analyses for Whites it is private religiosity that is mediated by social support (beta = -.12, $p < .10$ before social support and beta = -.03, $p > .10$; Husaini, Blasi, & Miller, 1999. In contrast to the Husaini study, a Dutch study demonstrated that social support did not mediate the relation between religious involvement and clinical depression (OR = 1.59, 99% CI: 1.13 - 2.23 after controlling for social support; Braam et al., 1997).

The third study was on the effects of religiousness, religious coping, and social support in a clinical population with confirmed depression, undertaken at the Mental Health Clinical Research Center (MHCRC) for the Study of Depression in Late Life at Duke University ($N = 114$). In a multiple regression analysis of MADRS depression score at six-month follow-up interview (adjusting for baseline MADRS score), positive religious coping was statistically significant (beta coefficient = -.83, $p = .03$), net of the effect of social support (beta coefficient = -.27, $p = .26$). Thus, although the religiosity construct here was religious coping, this study provides some evidence that social support does not always mediate the association between religiosity and depression (Bosworth, Park, McQuoid, Hays, & Steffens, 2003).

NIA’s Established Populations for Epidemiologic Studies in the Elderly (EPESE), a study of healthy older adults ($N = 4,000$), found no evidence for social support being a mediator of association between worship service attendance and
depression. Although worship service attendance was inversely associated with depression (OR = 0.54, 95% CI 0.46 - 0.63; \(p < 0.001\)), social support did not significantly effect the association between worship service and depression (OR = 0.56; 95% CI 0.48 - 0.65; Koenig et al., 1997). With such equivocal findings in but a few studies, the potential of social network to mediate the religiosity/depression association remains a worthy topic of research.

In this segment, the thesis concentrated on the role of social network (or social support in various studies) as a potential mediator of the association between religious involvement and late-life depression. The next segment of the thesis examines the effect of differences in methodology on varying results among studies that address the association between religious involvement and late-life depression. The next few sections discuss findings of a meta-analysis undertaken by the author prior to the formulation of hypotheses addressed in this thesis.

Methodology and Differing Results Between Studies

Results of studies on the effect of religiosity on late-life depression vary because of the several methodological differences employed between studies. To address this complexity and facilitate a better overall understanding of the religiosity/depression association, a meta-analysis was undertaken with the objective to clarify the extent to which this association has been demonstrated and if so, in which direction and how methodological factors affect study findings. Aggregating the findings in a meta-analysis has the advantage of creating a large sample size that is culturally, religiously,
racially, geographically, and socioeconomically diverse.

A comprehensive literature review used the following search parameters to obtain research articles. Medline, PsychInfo, and Academic Search Elite, were used to identify 31 articles. A total of 162 findings were extracted from these articles, resulting from inferential statistical testing relating some construct of religiosity to a construct of late-life depression. Religiosity is a complex and multidimensional social construct. Some characteristics of the multidimensional forms that religiosity can take as socially constructed include: (a) frequency of religious attendance; (b) private/intrinsic/nonorganized forms of religiosity (e.g., prayer, scripture study, meditation); (c) public/extrinsic/organized forms of religiosity (e.g., membership in a church choir, teaching Sunday School, participating in youth groups, missionary work, or providing relief services to those in need through a religious organization); or (d) religious salience, defined as the meaning that religion has for the individual. Search words included: depression, elderly, geriatric, late-life, late life, older adults, aged, major depression, minor depression, religion, religiosity, religious, spirituality, gender, sex, differences, and their combinations.

For each of the 162 findings, the outcome of whether the finding was significant inverse, significant positive, or nonsignificant was coded, as were several methodological features of the study reporting the finding. It should be noted that observed significance levels are influenced by sample size. Thus, it would be preferable to have coded a common metric such as an effect size (e.g., correlation coefficient) for each finding. However, this would have been misleading because
studies varied greatly in the degree of adjustment for other “covariate” variables. When this occurs, a way to ameliorate the problem is to use the above trichotomous coding in order to examine in broader terms whether or not the findings demonstrated positive, negative or no significant relationship. The outcome and methodological characteristics were entered into an SPSS data file and cross-tabulations were computed, revealing the extent to which the characteristic was associated with the likelihood of significant findings. Each of the paragraphs in the following section describes a methodological characteristic and how it is related to the proportion of findings that are significant inverse, nonsignificant, and significant positive. The third category, significant positive (i.e., whether religious involvement was associated with increased depression risk), was observed very rarely and because its proportion can be easily calculated by difference, it will be omitted from these discussions.

The methodological characteristics that were examined include the following.

1. Measurement of depression (symptom count versus diagnostic category)
2. Measurement of religiosity (frequency of worship service attendance, private/intrinsic/non-organized, or public/extrinsic/organized).
3. Type of sample (clinic versus community)
4. Research design (cross-sectional versus longitudinal)

Findings from the meta-analysis on the association between religiosity and depression are described separately for each methodological characteristic examined.

*Findings by Depression Measurement*

The first methodological characteristic of studies that may influence findings is
the method of assessment for depression. The two common approaches are “symptom counts” and “DSM diagnoses.” Symptom count measures represent the number of endorsed depressive symptoms in a checklist, which is a measure of depression severity, ranging from subsyndromal depression to major depression. Commonly used symptom checklists include the Beck Depression Inventory (BDI; Beck & Steer, 1987), the Geriatric Depression Scale (GDS; Yesavage et al., 1983), and the Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977).

The Diagnostic and Statistical Manual of Mental Disorders—Fourth Edition (DSM-IV; American Psychiatric Association, 1994) provides uniform criteria for the assessment of mental health disorders by trained mental health professionals. The DSM assessment is designed to measure major depressive disorder, and is therefore more likely to miss minor depression or subsyndromal depression. Minor and subsyndromal depression negatively affect individual and family relationships at a magnitude similar to major depression (Cuijpers, de Graaf, & van Dorsselaer, 2004; Penninx, Beekman, Deeg, & van Tilburg, 2000). DSM-based instruments, such as the Diagnostic Interview Schedule for Depression (DIS-D; Robins, Helzer, Croughan, & Ratcliff, 1981; Robins, Helzer, Ratcliff, & Seyfried, 1982), and The Structured Clinical Interview for DSM-IV-TR (SCID; Rabkin & Klein, 1987), target specific symptoms and provide clinical thresholds for meeting DSM diagnostic categorizations.

In the present meta-analysis, among studies from symptom count measures of depression, 60% \((n = 50)\) of findings had a significant inverse association and 40% \((n = 34)\) of findings had no association between religiosity and depression (Boey, 2003;
In contrast, among studies using the DSM measure of depression, 39% \((n = 12)\) of findings had an inverse association, with a majority \((n = 19, 61.3\%)\) finding no significant association (Branco, 2000; Levav, Kohn, Golding, & Weissman, 1997; Milstein et al., 2003; Robison et al., 2003). These results suggest that symptom count measures are more likely to detect the association between major depression and minor (or subsyndromal) depression because they are sensitive to all levels of depression. The DSM measure of depression was designed to be sensitive to more severe forms of depression, such as major depression. Consequently, minor or subsyndromal depression is not likely to be detected by the DSM measure, thereby increasing the likelihood of under-reporting and under-treatment of less severe, though nevertheless disabling forms of depression.

**Findings by Religiosity Measurement**

A second methodological characteristic is measurement of religiosity. Three religiosity measures predominate in studies of late-life depression including: (a) frequency of church attendance; (b) public religiosity (extrinsic, organized); and (c) private religiosity (intrinsic, non-organized). Studies that used frequency of attendance at religious activities produced 60% \((n = 43)\) with significant inverse associations, and 35% \((n = 23)\) with no association (Bosworth et al., 2003; Branco, 2000; Meertens et al., 2003; Milstein et al., 2003). For studies that used public religiosity as a measure, 53% \((n = 9)\) of findings had no significant association between religiosity and depression, compared to 47% \((n = 8)\) of findings that reported an inverse association (Boey, 2003; Bosworth et al.; Mitchell & Weatherly, 2000; Smith et al., 2003). Studies that used
private religiosity as a measure of religiosity, 35% \((n = 10)\) of findings had an inverse association and 66% \((n = 19)\) of findings had no significant association between religiosity and depression (Bienenfeld et al., 1997; Bosworth et al.; Branco; Koenig et al., 1997; Musick, Koenig, Hays, & Cohen, 1998).

These findings suggest an inverse association is more likely when frequency of religious activities is used as a measure for religiosity. This may be due to confounding with functional mobility, activities of daily living, or frequency and satisfaction with social networks, which may explain the higher likelihood of a significant inverse association. They also suggest that when public religiosity is used as a measure of religiosity either an inverse association or no association is equally likely. The findings suggest no association between religiosity and depression is more likely when private religiosity is used as a measure for religiosity; however, these findings need further validation.

*Findings by Community Sample Versus Clinical Sample*

A third methodological characteristic is the nature of the sample of study participants, that is, how subjects were identified as eligible for study participation. In studies of late-life depression, two types of samples predominate, samples based on clinic patients and samples based on community samples (either full enumerations or random samples). With clinic-based studies, subjects have self-selected to seek help at the clinic and may therefore be more motivated to seek help, less concerned about social stigmas, and have higher financial resources compared to community members at
large. Causation of depressive episodes in clinic-based samples may be due to depression being more genetically based (e.g., biochemical imbalance), self-selection, help seeking, and increased severity of depression. Community-based samples, on the other hand, are selected from an entire enumeration of a population and are, therefore, more likely to have a full range of health, financial, social, and psychological status. Causation of depressive episodes in community-based samples may be attributed to psychological losses. Thus, results from community samples may be more readily generalized to the general population (Steinberg et al., 2004). In the present meta-analysis, among studies from community samples, 60% \((n = 51)\) of findings were reported to have a significant inverse association between religiosity and depression (Boey, 2003; Braam et al., 2004; Meertens et al., 2003; Mitchell & Weatherly, 2000). In contrast, in studies using a clinic-based sample, 27% \((n = 9)\) of findings were reported to have an inverse association, with the majority \((n = 23, 68\%)\) finding no significant association (Bosworth et al., 2003; Branco, 2000; Koenig, 1998; Robison et al., 2003). This suggests that community-based studies have a greater potential for identifying a significant association in this area, and a greater potential for social stigma bias.

Findings by Cross-Sectional Study Versus Longitudinal Study

A fourth methodological characteristic is a basic design feature: whether cross-sectional (one point in time) or longitudinal (multiple points in time). Cross-sectional studies have the advantage of being less expensive to administer yet direction of
causality cannot be inferred. In contrast, longitudinal studies can suffer methodological problems due to various threats to internal validity such as history and maturation threats, attrition bias and maturation effects as the elderly become increasingly frail, both cognitively and physically.

In the present meta-analysis, among longitudinal studies (n = 61), 56% (n = 34) of the findings reported a significant inverse association (Braam et al., 1997, 2004; Husaini et al., 1999; Kennedy et al., 1996; Schnittker, 2001), while 44% (n = 27) reported no association (Bosworth et al., 2003; Musick et al., 1998). In contrast, among cross-sectional studies (n = 52), an equal number of studies had findings with an inverse association (n = 26, 50%; Commerford & Reznikoff, 1996; Milstein et al., 2003; Mitchell & Weatherly, 2000) and no significant association (n = 26, 50%; Branco, 2000; Koenig, 1995; Koenig et al., 1997) between religiosity and depression. Results suggest longitudinal studies have greater potential in identifying a significant association, and so are preferable both for this reason and the ability to make some inference regarding possible causal pathways.

Summary of Methodological Differences in Religiosity and Late-Life Depression

The preceding results of the meta-analysis suggest that studies that are longitudinal and community-based, in which depression measurement captures both minor and major depression (either a symptom count or a means of evaluation of presence of any form of depressive episode), and in which religiosity measurement includes frequency of religious activities, have the greatest power to detect an inverse
association between religiosity and depression. These methodologically preferable
design features will be considered in the design of the study proposed herein.

As has been just demonstrated, meta-analysis is a tool to organize disparate
information from findings in several studies. Also important is a theoretical perspective
because it provides the underpinnings for an explanatory framework to operationalize
concepts that have been developed from social constructs, such as the association
between depression and religiosity. From this point predictions may be formed based
on future behavior or commonly shared attributes between similar cohorts.

Association Between Late-Life Depression and Religiosity

Lifespan Development Perspective

Late-life depression is a nonnormative developmental process that specifically is
defined as depression in elderly people aged 60 and over. Religiosity is a psychosocial
factor that operates as either a risk factor or a protective factor in late-life depression.
The potency of religiosity's role in late-life depression may be one of moderation of the
intraindividual plasticity of the person, the ability to adapt to changing environmental
conditions. Intraindividual plasticity may also be important in determining how the
propensity for late-life depression (influenced by the genotype) becomes ultimately
expressed (i.e., through the phenotype). Resilience to the simultaneous gains and losses
experienced during late-life developmental changes, both physical and psychological,
may have important consequences for whether a person develops late-life depression or
is able to weather the changes old age brings. Combinations of intrinsic and extrinsic
Religiosity may provide a format for the expression of intraindividual plasticity, either through increased resilience, reserve capacity, or social transactions with others. Religiosity may contribute to an individual’s propensity to adapt to changes in the surrounding bioecological environment, and avoid late-life depression.

Preliminary studies of the CCSMHA, with a predominantly LDS cohort, found a robust, strong, inverse association between frequency of church attendance and depression, particularly for elderly women ($p < .001$). A gender difference for this interaction was evident, with men exhibiting a weak association ($p = .143$; Norton et al., in press - unpublished logistic regression analyses that controlled for demographic and psychosocial variables). No published studies have examined the relation between religiosity (either as frequency of church attendance or the domains of intrinsic and extrinsic religiosity) and depression in the LDS culture.

**Purpose and Objectives**

While research studies have examined the relation between religious involvement and geriatric depression, results are equivocal due to vast differences in methodology between studies. Further, no published study has focused upon members of the LDS church, who report high rates of involvement in church activities. The thesis project used data from a large population-based epidemiological study of predominantly LDS church members to examine religiosity as a risk/protective factor for geriatric depression in a community.
CHAPTER III

METHODS

This chapter begins with a listing of the research questions followed by a parallel list of the concrete hypotheses that are tested to address each research question. This is followed by a description of CCSMHA, the source of data for this thesis project. Finally, the specifics of study design, methods, and data analytic plans are described.

Research Questions

1. What are the latent constructs for religiosity within an elderly population?
2. To what extent is religiosity (defined according to the latent constructs identified in the preceding question) associated with new-onset episodes of late-life depression, over a subsequent 4-year interval?
3. Does gender moderate the relation between religiosity and depression?
4. Does prior depression history moderate the relation between religiosity and depression?
5. Does social network have a mediating effect on the association between religiosity and late-life depression?

Hypotheses for Prediction of Onset of Depression

Within a 4-Year Interval

Hypothesis 1: Latent constructs for religiosity in an elderly population will be formed through factor analysis of 10 religiosity items. It is hypothesized that two
distinct factors will be identified, similar to private/non-organized/intrinsic forms of religiosity and public/organized/extrinsic forms of religiosity.

*Hypothesis 2*: Religiosity will be significantly associated with risk for subsequent depressive episode over a four-year interval, as follows:

2a. Higher levels of public/extrinsic/organized religiosity will be associated with reduced risk,

2b. Higher levels of private/intrinsic/non-organized religiosity will be associated with reduced risk, but to a lesser degree.

*Hypothesis 3*: Religiosity will be significantly associated with risk for subsequent depressive episode for women, but not for men. Specifically:

3a. Higher levels of public/extrinsic/organized religiosity will be associated with reduced risk, and this association will be significantly stronger for women than for men.

3b. Higher levels of private/intrinsic/non-organized religiosity will be associated with increased risk, and this association will be significantly stronger for women than for men.

*Hypothesis 4*: Religiosity will be significantly associated with risk for subsequent depressive episode for individuals with a prior depression history, but not for individuals without a prior depression history. Specifically:

4a. Higher levels of public/extrinsic/organized religiosity will be associated with reduced risk, and this association will be significantly stronger for individuals without a prior depression history, than those with a prior depression history.
4b. Higher levels of private/intrinsic/non-organized religiosity will be associated with reduced risk, and this association will be significantly stronger for individuals without a prior depression history, than those with a prior depression history.

_Hypothesis 5:_ Social network will have a mediating effect on the association between religiosity and depression. An inverse association between religiosity and depression will remain the same after adjusting for social network.

The Cache County Study on Memory Health and Aging

A large epidemiological study conducted in a community comprised predominantly of members of the LDS church provides an opportunity to address these research questions. Extant data from this study will be used to address the research objectives of the present study. The CCSMHA is an ongoing longitudinal, population-based observational epidemiological study whose primary focus is on dementia and the search for associated protective/risk factors. A glossary of terms is found in Appendix A.

The CCSMHA was funded initially by the National Institute on Aging (Grant #AG 11-380) from 1994 to 1999, with subsequent funding extending the study to 2007. The CCSMHA was designed: (a) To measure prevalence and incidence of Alzheimer's disease and other forms of dementia; and (b) to investigate the role of genes and environmental factors (including interactions) as either protective or risk factors for disease. Depression was also a pertinent area of study because of its connection with
cognitive decline and subsequent dementia. A baseline interview was conducted from 1995 to 1996 and follow-up interviews were conducted at approximately three years and seven years after the baseline interview (referred to hereafter as “Waves” 1, 2, and 3).

Design

This study is a secondary analysis of data from Waves 1, 2, and 3 of the CCSMHA. For each wave, subjects evaluated to have dementia were not eligible for subsequent waves, as they were designed to identify incident (new) cases. Because detailed religiosity measures were obtained exclusively at Wave 2, this wave represents the “baseline” measure for all independent variables. The exception to this is that depression data from Waves 1 and 2 are combined into the baseline depression measure, to encompass lifetime depression experience prior to and including the Wave 2 visit. The outcome is measured at Wave 3 and represents depressive episodes in the interval between Waves 2 and 3, a 4-year interval.

Sample

Subjects from the CCSMHA were included in this thesis study of religiosity and geriatric depression if they met the following requirements. Subjects needed to have participated in Waves 1, 2, and 3, returned the mail-in questionnaire given at Wave 2, evaluated to be non-demented during Waves 1, 2, and 3, and provided self-report data for Waves 1, 2, and 3.

The CCSMHA obtained Medicare enrollment lists from the Health Care
Financing Administration for men and women aged 65 and older as of January 1, 1995, who at the time were permanent residents of Cache County, Utah. Individuals who resided in nursing homes, assisted living centers, and other institutions were included in the eligible sample population. Of the 5,677 eligible participants, 5,092 completed the Wave 1 baseline interview, and 60 were deceased, 508 refused, 16 had permanently moved out of the area, and one needed a proxy interview, but no proxy was available (see Appendix B). This represents a 90% participation rate (5,092/5,677). From the 5,092 baseline participants, 356 subjects were found to be previously demented, and 33 were not eligible for Wave 2 because they were found to have incident dementia within Wave 1. This left 4,704 nondemented individuals eligible to participate in the next wave of the study, at which point depression episodes having their onset during the interval were identified. Of the 4,704 eligible participants, 3,391 completed the Wave 2 interview, 599 were deceased, 538 refused and 176 had permanently moved out of the area. Among the 3,391 participants, 151 were found to be incident demented, and 32 had onset of dementia within Wave 2, leaving 3,208 who were not previously demented or incident demented during Wave 2. From the 3,208 dementia-free Wave 2 participants, 762 (23.8%) did not return the mail-in questionnaire and were eliminated from this thesis study. Of the remaining 2,446 dementia-free participants who had returned a completed mail-in questionnaire, 1,796 completed the Wave 3 interview, 331 were deceased, 259 refused, and 60 had permanently moved out of the area. Of the 1,796 participants who completed the Wave 3 interview, 126 participants were found to have incident dementia within Wave 3. Finally, due to concerns over validity of proxy
data on depression, 54 participants who had one or more interviews in Waves 1 or 2 via proxy were eliminated from this thesis study. Of the remaining 1616 dementia-free participants, 177 participants who had an interview via proxy in Wave 3 were eliminated from this thesis study. The final sample of 1,439 participants includes those who were neither prevalent nor incident demented at Waves 1, 2, or 3; returned the completed mail-in questionnaire; and provided self-report data on all measures. Of these 1,439 subjects included in this thesis study, 57.9% are female, 100% are members of the LDS church, 65% are married, 0.1% are living with a partner; 31.5% are widowed, 2.6% are separated or divorced, and 0.8% were never married. The mean (and SD) for age at prevalence baseline screening was 75.03 years (4.94 years); and the mean (and SD) for educational attainment level was 13.74 years (2.70 years).

Field Procedures

At Waves 1, 2, and 3, participants were interviewed at their place of residence by trained lay interviewers (approximately 50 hours of training) who were blind to the study hypotheses, using a structured interview format. Interviewers were trained to be systematic and uniform in the administration of all interviews. The first step of the interview process was to mail a letter of introduction to the subject’s residence over the HCFA Administrator’s signature, certifying that the recruitment contact they were about to receive from Utah State University was for a legitimate NIH-approved study and their decision to participate would have no effect on their Medicare benefits. This was followed by the study’s own introductory letter outlining the study’s objectives, what participation in the study would entail, and mentioned that an interviewer would
come to their home to schedule an interview. The study’s introductory letter was followed approximately 1-4 weeks later by a knock on the door of the subject’s residence in an effort to schedule an interview at a time convenient for the subject. The third step was to obtain informed consent at the beginning of the face-to-face structured interview at the subject’s place of residence. Following the informed consent procedure, the interviewer administered a brief cognitive test, an interview designed to query prior lifetime risk factors for depression and dementia, and collected a DNA sample from buccal swab.

Three years later at Wave 2, equivalent procedures were employed with the exception that another DNA sample was not collected, and risk factor information covered the intervening three years, instead of lifetime history. A mail-in questionnaire containing psychosocial variables such as religiosity was left with the participant, along with a stamped, self-addressed envelope and a request to complete it and mail it back to the study offices. No follow-up effort was employed to increase participation rates of the mail-in questionnaire, in the interest of minimizing overall subject burden, in consideration of the additional in-person interviews planned as part of the study protocol. The CCSMHA made the determination in favor of lower participation for the mail-in survey in exchange for higher participation at Wave 3. Repeated attempts to obtain more mail-ins with additional effort increased the risk for lower participation at Wave 3, resulting in increased subject burden over the multiple waves and potentially fewer committed participants. Four years after the Wave 2 interview, the Wave 3 interview was conducted, which was equivalent to the Wave 2 interview, with the
addition of interview sections covering detailed nutritional history and family history.

The Institutional Review Boards of the Duke University Medical Center, the Johns Hopkins University School of Public Health, and Utah State University approved all procedures and instruments that involved contact with participants in the CCSMHA (see Appendix G). Informed consent was obtained at each new contact or procedure.

Measurement

Data and Instrumentation

The present study explores the relation between religiosity and depression in late-life. The operationalization of each construct will next be described in detail.

Depression. Researchers from CCSMHA have demonstrated that incidence rates of late-life depression (i.e., the number of new cases identified over a time interval) can be incomplete when it consists solely of reports of depressive symptoms that are used to identify new cases. Norton and colleagues demonstrated that measurement of incidence rates of late-life depressive episodes should also take into consideration reports of antidepressant use (Norton et al., in press). This is partially because some individuals are more comfortable reporting medication use than depression. This type of measurement is of even greater reliability when such use can be verified with the objective “medicine chest inventory” (i.e., visual inspection) approach. Thus, for the present study, depression is identified as endorsement in either the modified Diagnostic Interview Schedule – Depression Section (DIS - D) or specific antidepressant use, as described below.
The purpose of the National Institute of Mental Health Diagnostic Interview Schedule (DIS) is to provide an efficient method of collecting data for diagnostic purposes in epidemiologic studies and other research settings where employing clinically trained interviewers is not feasible (Helzer, Spitznagel, & McEvoy, 1987). To study the validity of an instrument, psychometrists need an absolute “gold standard” against which to compare it. Clinical diagnoses assigned by psychiatrists after completion of in-depth clinical interviews are the “gold standard.” The DSM diagnostic categories are so broad that no previous lay-interviewer instrument had the capability of providing an external standard for validity (Robins et al., 1981). Psychometric properties of the DIS were assessed using the method of paired interviews with the same subjects, which tests inter-rater reliability. For the diagnosis of lifetime mood disorders, kappa was 0.63, sensitivity was 80%, and specificity was 84% (Robins et al.). DIS for lifetime depressive disorders in current patients had a sensitivity of 79%, and a specificity of 81%. The validity of the DIS for lifetime depressive disorders in former patients had a sensitivity of 82%, and a specificity of 67% (Robins et al.).

A modification to the DIS was made by the CCSMHA by addition of a skip-out strategy (Steffens et al., 2000). Subjects who failed to endorse an episode lasting at least two weeks of sadness, loss of interest, and/or irritability over their lifetime (at Wave I) or in the preceding interval (for Waves 2 and 3) “skipped out” of the remainder of the depression interview for that Wave (see Appendix C). Others were asked about recent changes (either increases or decreases) in appetite or weight (when not trying to diet); difficulties in concentration or memory; restlessness; feelings of guilt or
hopelessness; problems with sleep; decreases or changes in energy level; suicidal thoughts; and the month and year of the onset of each separate, previous depressive episode. From these data, a variable was constructed to indicate any prior depressive episode (up to the Wave 2 interview) and another variable to indicate any new onset depressive episode in the 4-year interval between Waves 2 and 3. Individuals who endorsed any of the three gateway questions (sadness, loss of interest, or irritability) were counted as having experienced a depressive episode, regardless of the additional symptoms. Thus, major depression and minor depression were combined into a single variable, both for prior history and new-onset depression over the 4-year interval.

The secondary source of depression endorsement was derived from the “medicine chest inventory.” As part of the structured interview, participants were requested to bring out all medications (prescription and over-the-counter) for visual inspection. For each medication taken within the past two weeks, interviewers noted the prescribed strength, dosage requirements, types of medication, and whether they were self- or physician-prescribed medical condition or reason for taking each of the medications also was noted. Antidepressants are sometimes prescribed for conditions other than depression, such as problems with sleep or anxiety (Lenze et al., 2001; Salsman, Brown, Brechting, & Carlson, 2005). Therefore, antidepressant use was considered a positive indication of depression only when the subject identified the indication, or ailment for which the antidepressant was taken, as being “for depression” with onset of use beginning in the four-year interval between Waves 2 and 3.

Religiosity. The original version of the Religious Behavior and Background
instrument is a brief measure of religious practices divided into two main categories: God Consciousness and Formal Practices, including a total of 13 items. The study reported test–retest reliability to be high ($r = .94$), and concluded that the RBB is a reliable instrument for the assessment of religious behaviors (Connors, Tonigan, & Miller, 1996).

In the CCSMHA, religiosity was assessed with a modified form of the Religious Background and Behavior (RBB) questionnaire. Six of the original RBB behaviors were retained, including: thought about God, prayed, meditated, attended worship services, read/studied scripture/holy writings, and had direct experiences of God. In addition, the CCSMHA added four items, which included visiting with people from the individual’s religious group, volunteering in the religious group, researching family genealogy, and attending scripture study groups, to capture the unique characteristics of religious activities integral to the life of the LDS faithful. Each religious involvement variable was measured on a 5-point Likert scale with responses: never, less than once a month, once or twice a month, once a week, or more than once a week. In the baseline interview, subjects were queried about their religious preference. The sample population in the thesis includes only those subjects who answered in the affirmative to being members of the LDS church.

Response patterns for the religious involvement variables were dichotomized from the 5-point Likert scale into either 1 = more often than weekly religious involvement for each of the 10 religiosity variables or 0 = less often than weekly religious involvement for each of the 10 religiosity variables. The former dichotomized
response pattern was used as an indicator because more variation was found between dichotomous categories of religious involvement. "More often than weekly religious involvement" signified greater integration of religious involvement into the personal lifestyles of LDS members, compared to individuals who reported "weekly or less religious involvement."

The average Religious Background and Behavior (RBB) score for each respondent, which was used to measure religiosity in this thesis, was computed by summing each of the eight variables that had a 5-point Likert coding for each respondent and then was divided by the number of RBB variables (eight) for a total score, which ranged from 1 to 5.

**Social network.** The six social network variables that comprised the composite score for social network in the self-report questionnaire included: (a) How many people do you know well enough to visit? (b) How many times have you talked with friends or relatives on the telephone in the past week? (c) How many times have you spent time with someone in the past week? (d) Do you have someone you trust and confide in? (e) How often do you feel lonely? and (f) How often do you see relatives or friends? To obtain the measure for social network for each of the respondents, the six social network variables in the study were dichotomized and then the 0-1 variables were summed to arrive at a total social network score, which ranged from 1 to 5.

**Data Analysis**

Factor analysis was undertaken to identify the presence of latent variables that would explain the pattern of relationships among the 10 religiosity variables. The
The purpose of factor analysis is to provide a technique to reduce the number of variables; for example, in this case, from 10 religiosity variables to two or more factors. The goal is to examine how well the hypothesized factors (e.g., private religiosity, public religiosity, and frequency of church attendance) explain the observed data (e.g., religiosity data collected using the 10 religiosity variables in the community sample).

Factor analysis estimates how much variance in each observed variable can be accounted for by each latent variable. Factor loadings give the correlation between the original ten religiosity variables and each of the derived factors. The factor analysis method used, principal components analysis, derives as the first factor the one that accounts for the largest proportion of variance in the ten original religiosity variables. As factors are successively extracted, the amount of variability contained in each factor is progressively less. When little unexplained variability remains among the variables, the extraction of successive factors is discontinued. A more easily interpretable factor solution is obtained by “rotating” the factors along a set of hypothetical axes and recomputing factor loadings. This has the effect of making each variable’s unique contribution by each factor more apparent, and results in more divergent factor loadings within a variable, across factors. Another way of describing this kind of effect is that factor rotation results in a solution in which each observed variable is explained most strongly by a single factor (high loading) and only weakly by the other factors (low loadings). Factor rotation helps the researcher more clearly arrive at a conceptual definition of each derived factor. Factor rotation can either be “orthogonal” where the latent variables or the factors are presumed to be independent or “oblique” where they...
are assumed to be correlated. In the present set of analyses, an "oblique" rotation method, called OBLIMIN in SPSS, was used because the hypothesized factors, public and private religiosity, were assumed to be correlated. Ten individual religiosity questions were factor analyzed using principal components with oblique factor rotation. Oblique rotation allows for correlation between the latent variables or constructs. Oblique rotation was used to determine whether the theorized latent "constructs," "public religiosity," and "private religiosity" exist in this cohort. This approach was taken because private religiosity and public religiosity are assumed to be non-independent, correlated constructs.

New onset depression was dichotomized to indicate whether the subject reported at Wave 3 having had experienced any depressive episode in the intervening 4 years (whether via DIS or antidepressant endorsement). Bivariate tests between each religious behavior and depression were performed. Given the large sample size in this study, the decision was made to require both statistical significance at alpha = .05 and practical significance by the examination of effect sizes. For this study, a meaningful effect size (i.e., "practical significance") was defined as a reduction in depression risk of at least 1/3 (i.e., OR ≤ .67) for those manifesting the religious behavior (at frequency of more often than weekly). Tests for potential moderating effects of gender and prior depression history were conducted only for religious behaviors where statistical significance was obtained and a meaningful effect size was observed. Moderating effects of gender on depression risk were tested with two-way interaction effects between religious behaviors (with meaningful effect sizes) and gender. In addition to
the two-way interaction result, within-strata odds ratios were computed separately for men and women. The criterion used in this study for determining whether a moderating effect was present at a level of practical significance was whether a difference in the odds ratios of men and women was more than 20%. A similar approach was used for testing moderating effects of prior depression history.

Additionally, for each religious behavior manifesting the above statistical and practical significance thresholds, a test for a potential mediating effect of social network was conducted. A definitive procedure was used to test for the existence of a mediator variable (social network) between the independent variable (a specific religious involvement variable) and the dependent variable (new onset depression within the interval). First, logistic regression was used to determine whether a statistically significant bivariate relationship existed between the independent variable and the dependent variable. If the association between the two variables is not significant, the investigator halts the testing procedure. Second, if the bivariate relationship between the independent variable and the dependent variable is statistically significant at the predetermined level of significance, then logistic regression is used to test the statistical significance between the independent variable and the mediator variable. Third, logistic regression is used to test the statistical significance between the mediator variable and the dependent variable. When a statistically nonsignificant association is found in a bivariate relationship between the mediator variable and either the independent variable or the dependent variable (or both), then the testing procedure is halted. A fourth model is tested including both the independent variable and the mediator variable. The
criterion used in this study for determining whether a mediating effect was at a "moderate level" or higher, was a reduction in the magnitude of the odds ratio of at least 20%, after addition of the social network variable to the model.
CHAPTER IV

RESULTS

The current chapter presents results from all analyses for this thesis. First, descriptive statistics on the final sample are presented accompanied by a flowchart diagram that depicts the derivation of the final sample included in this thesis from the initial baseline participants in the CCSMHA. Next, an attrition analysis is presented that examined potential attrition bias due to some participants at the initial interview dropping out prior to follow-up interview. This is followed by tests for bivariate associations between new-onset depression and the independent variables of gender, prior depression history, social network, and religious involvement, both as a composite mean score and by individual item.

Presented next are the results of statistical analyses that address each research question. This begins with factor analysis of religious involvement questions from the initial interview to identify latent variables. Next, logistic regression models are presented that tested for the effect of religious involvement on new-onset depression over the subsequent 4-year interval. An overall logistic regression model was first tested, and then moderator effects of gender and prior depression history were tested in two additional models. Finally, the mediator effect of social network was tested.

Final Sample

Appendix B contains a flowchart that depicts the derivation of the final sample of participants for this thesis, starting with the initial 5,092 participants of the
CCSMHA (Breitner et al., 1999). After participants were eliminated who: (a) developed dementia; (b) did not participate in all three waves of the CCSMHA; (c) failed to return the mail-in questionnaire containing the RBB data; (d) gave proxy rather than self-report during at least one interview; or (e) reported not to be a member of the LDS church, the final sample was 1,439 individuals. Note that “Wave 2” in Figure 1 is referred to as the “initial interview” in this thesis because it is the earliest interview where RBB data are available, and “Wave 3” is the 4-year follow-up interview. In the sample of 1,439 subjects, 42.1% \((n = 606)\) were male, 57.9% were female \((n = 833)\), 65.0% married, 31.5% widowed, 2.6% separated or divorced, and 0.8% never married. Mean age was 75.03 years \((SD = 4.94)\) and mean education was 13.74 years \((SD = 2.7)\). There were 186 cases of new onset interval depression including 128 women (15.4%) and 58 men (9.6%).

Attrition Analysis

An attrition analysis was performed by testing for the effect of variables measured at the initial interview on participation status at the 4-year follow-up interview. This was done to determine the degree to which the final longitudinal sample might be biased. Categorical variables were tested using the chi-square test for independence, and continuous variables were tested using analysis of variance. Results are reported in Appendix D. Chi-square test results for gender found that gender and participation status were independent \(\chi^2 (N = 2,042, df = 4) = 7.43, p = .115\), with almost identical percentages of men (70.2%) and women (70.7%) remaining in the
study, and proportions with dispositions of proxy, deceased, refused, or moved out of the area comparable between the genders (see Appendix D, Table D1).

Prior depression history was also found to be independent of participation status $\chi^2 (N = 2,042, df = 4) = 6.40, p = .171$, with almost identical percentages of participation at follow-up among those with (70.1%) and without (70.6%) prior depression history (see Appendix D, Table D1). Marital status was significantly associated with follow-up participation status $\chi^2 (N = 2,037, df = 16) = 34.42, p = .005$, with married people ($n = 1,140, 73\%$) and never married people ($n = 12, 75\%$) more likely to continue in the study than separated or divorced people ($n = 33, 70.2\%$), and widowed people ($n = 253, 61.3\%$).

An attrition analysis was performed on four continuous variables including: age, education level, Religious Behavior and Background mean score (RBB), and social network using analysis of variance. Means for each of these variables were found to be statistically significantly different between participation status groups (see Appendix D, Table D2). As for religious involvement, those who remained in the study ($M = 3.69, SD = .74$), had proxy interview ($M = 3.62, SD = .73$) or who refused follow-up interview ($M = 3.62, SD = .78$) had comparable means on the RBB, reflecting higher levels of religious involvement than in the deceased ($M = 3.47, SD = .76$) and lower than RBB in those who moved ($M = 3.82, SD = .73; p < .001$; see Appendix C, Table C2), although none of these means differed by more than .5 on a scale of 1 - 5. As for education level, those who had proxy interviews ($M = 12.83, SD = 2.69$), had refused follow-up interviews ($M = 13.20, SD = 2.29$) or were deceased ($M = 13.38, SD = 2.82$)
at follow-up interview had comparable means, reflecting lower levels of education, in contrast to those with higher education levels in those who remained in the study \((M = 13.74, SD = 2.70)\) or moved out of the area \((M = 14.42, SD = .73; \ p = .001)\; \text{see Appendix D, Table D2).} \ As for the mean age of respondents at follow-up interview, those who remained in the study \((M = 75.03, SD = 4.94)\), who refused follow-up interview \((M = 76.12, SD = 5.47)\), or who moved out of the area \((M = 76.58, SD = 6.40; \ p < .001)\), had comparable means, reflecting lower age levels, in contrast to those with higher age levels who had a proxy interview \((M = 79.15, SD = 6.77)\) or were deceased \((M = 79.82, SD = 6.76; \ p < .001)\) at follow-up interview. As for social network, those who remained in the study \((M = 4.16, SD = 1.26)\) or who refused the follow-up interview \((M = 4.05, SD = 1.30)\), had comparable means, reflecting higher social network levels, in contrast to those with lower levels of social network who had proxy interview \((M = 3.67, SD = 1.56)\), had moved out of the area \((M = 3.77, SD = 1.19)\), or were deceased \((M = 3.77, SD = 1.31; \ p < .001)\) at follow-up interview (see Appendix D, Table D2).

The sample of respondents who remained in the study at four-year follow-up were more likely to be younger, be either married or never married, and reported higher levels of education, higher levels of social network, higher levels of religious involvement, and lower levels of depression, when compared to respondents who dropped out of the study at 4-year follow-up.
Bivariate Associations with New-Onset Depression

Gender and prior depression history are the two moderator variables and perceived social network is the mediator of the relation between religiosity and depression examined in this thesis, as articulated in the research hypotheses. Bivariate associations between depression and the independent variables examined in this study, namely gender, prior depression history, and social networks were conducted. Results are presented in Appendix E. Gender was significantly associated with rates of new-onset depression $\chi^2 (N = 1,253, df = 1) = 10.47, p = .001$ where 15.4% of females but only 9.6% of males reported new-onset depression in the interval (see Appendix E, Table E1). Prior depression history was significantly associated with rates of new-onset depression $\chi^2 (N = 962, df = 1) = 91.62, p < .001$ where 64% of participants who reported prior depression history, but only 28.6% of participants who reported no prior depression history at initial interview, acknowledged new-onset depression in the interval (see Table D1).

Religious involvement was significantly associated with new-onset depression in the interval. Participants who reported no new-onset depression in the interval reported statistically significantly higher religious involvement at initial interview ($M = 3.72, SD = 0.74), t = 2.71, p = .007$ (two-tailed) than those who had reported new-onset depression in the interval ($M = 3.56, SD = 0.74$; see Appendix E, Table E2).

Individual Religious Behaviors

We examined the ten religious behaviors individually and found that, generally,
those who do not experience interval depression reported higher rates of religious behavior than those who do experience new onset-depression in the interval. The 10 religiosity variables measured frequency of occurrence of each behavior on a five-point scale were comprised of never, less than once a month, once or twice a month, once a week, or more than once a week. Due to extremely low frequencies in the first three responses, each of these ten variables was dichotomized into 0 = “weekly or less often” and 1 = “more often than weekly” prior to conducting chi-square tests of independence with new-onset depression over the subsequent 4-year interval.

Only two of the religious behaviors were significantly associated with subsequent depression: volunteering with your own religious group, \( \chi^2(N = 1,199, df = 1) = 9.32, p = .002 \); and reading scriptures or holy writings, \( \chi^2(N = 1,239, df = 1) = 7.58, p = .006 \), with higher frequencies of religious behaviors associated with reduced probability of new onset depression (Appendix F). Worship service attendance had a trend toward reduced probability of depression with higher frequency of the behavior, \( \chi^2(N = 1,231, df = 1) = 3.76, p = .053 \). Religious behaviors not significantly associated with new-onset interval depression were: meditating, \( \chi^2(N = 1,328, df = 1) = 2.33, p = .127 \); attending scripture study groups, \( \chi^2(N = 1,373, df = 1) = 2.07, p = .150 \); and visiting with people in your religious group, \( \chi^2(N = 1,418, df = 1) = 1.79, p = .182 \); having direct experiences of God, \( \chi^2(N = 1,103, df = 1) = 1.23, p = .267 \); researching family genealogy, \( \chi^2(N = 1,374, df = 1) = 0.40, p = .528 \); praying, \( \chi^2(N = 1,418, df = 1) = 0.30, p = .587 \); and thinking of God, \( \chi^2(N = 1,423, df = 1) = 0.11, p = .743 \).
Hypothesis #1: Religiosity Factor Analysis

The factor analysis identified two factors with the first factor explaining 44.4% of variance and the second factor explaining 11.9% of the variance, for a total of 56.3% of the variance explained by the two factors. The factor structure matrix revealed that the following five variables dominated the first factor, in descending order of factor loadings: volunteering in your religious group ($\lambda = .79$), attending scripture study groups ($\lambda = .71$), having direct experiences of God ($\lambda = .70$), visiting with people from your religious group ($\lambda = .64$), and researching family genealogy ($\lambda = .60$; see Table I). One of the five variables, “having direct experiences with God,” may easily be construed as either a public or a private activity.

The factor structure matrix revealed that the following three variables dominated the second factor, in descending order of factor loadings: praying ($\lambda = -.88$), thinking about God ($\lambda = -.86$), and meditating ($\lambda = -.61$; see Table I), three behaviors that may reasonably be considered private religious activities.

The factor structure matrix revealed that the factor loadings of the remaining two variables were evenly split between the two latent variables or factors. The factor loadings registered evenly on the two latent factors were attending worship services ($\lambda = .68$ on factor one and $\lambda = -.65$ on factor two) and reading scripture or holy writings ($\lambda = .70$ on factor one and $\lambda = -.68$ on factor two; see Table I).

A decision was made to analyze individual religiosity variables, rather than the composite variables for public religiosity and private religiosity. The decision was based upon the relatively low overall percentage of variability in the ten religious
Table 1

Factor Loadings of 10 Religious Involvement Variables with Principal Component Analysis Factor Analysis Using OBLIMIN Rotation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Rotated factor structure matrix</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Extrinsic religiosity</td>
<td>Intrinsic religiosity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>λ</td>
<td>λ</td>
<td></td>
</tr>
<tr>
<td>Thinking about God</td>
<td>.25</td>
<td>-.86</td>
<td></td>
</tr>
<tr>
<td>Praying</td>
<td>.38</td>
<td>-.88</td>
<td></td>
</tr>
<tr>
<td>Meditating</td>
<td>.41</td>
<td>-.61</td>
<td></td>
</tr>
<tr>
<td>Attending worship service</td>
<td>.68</td>
<td>-.65</td>
<td></td>
</tr>
<tr>
<td>Reading scripture or holy writings</td>
<td>.70</td>
<td>-.68</td>
<td></td>
</tr>
<tr>
<td>Having direct experiences of God</td>
<td>.70</td>
<td>-.41</td>
<td></td>
</tr>
<tr>
<td>Visiting with people from your religious group</td>
<td>.64</td>
<td>-.20</td>
<td></td>
</tr>
<tr>
<td>Volunteering in your religious group</td>
<td>.79</td>
<td>-.46</td>
<td></td>
</tr>
<tr>
<td>Researching family genealogy</td>
<td>.60</td>
<td>-.17</td>
<td></td>
</tr>
<tr>
<td>Attending scripture study groups</td>
<td>.71</td>
<td>-.33</td>
<td></td>
</tr>
</tbody>
</table>

behaviors that could be explained by the two latent religiosity variables. The two factors explained only 56% of the variability in the religiosity variables. In addition, two of the ten religious behaviors, church attendance and reading scriptures or holy writings, did not clearly align themselves with either of the two main factors. Within the first factor, one variable, having direct experiences of God, was ambiguous as to face validity in terms of whether it was a form of public religiosity or private religiosity. Therefore, an analysis of individual items was completed to obtain the results for this thesis. Given that the majority of respondents are involved in religious events at least weekly, individual religiosity variables were coded 0 = weekly or less often versus 1 =
more often than weekly. Dichotomized religious involvement variables were employed to test research hypotheses, provided at least one of the two dichotomous categories had frequency count of at least 10% of the sample.

In summary, the principal components factor analysis with OBLIMIN rotation for ten religiosity variables and the factor structure matrix motivated the decision to use individual religiosity items to address the research questions. Eight of the original ten religious involvement variables met the above criterion (at least 10% of respondents were in each of the two dichotomous categories). Logistic regression analyses were examined separately for each of the following eight variables: meditating; volunteering in your religious group, reading scriptures or other holy writings; attending worship services; having direct experiences of God; researching family genealogy, visiting with people from your religious group; and attending scripture study groups.

**Hypothesis #2: Logistic Regression for Religious Behaviors**

The remaining analyses in this study have dichotomized the religious behavior variables from 5 levels to 2 levels, dichotomizing at a frequency of “more often than weekly” versus “weekly or less often.” This was done because retaining a 5-level religious behavior measure resulted in sparse cells when examining interaction effects. Logistic regression models were computed with single item indicators of religious behavior predicting new-onset depression over the subsequent 4-year interval (Table 2, Model 1). There were three religious behaviors that met both statistical significance ($p < .05$) and practical significance criteria (a reduction in depression risk in excess of...
Table 2

Logistic Regression of Three Religious Involvement Variables on New-Onset Depression and the Moderating Effect of Gender

<table>
<thead>
<tr>
<th>Religious Involvement</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Greater than weekly vs. less than or equal to weekly)</td>
<td>Religious involvement variable alone</td>
<td>Religious Involvement Variable</td>
<td>Gender</td>
</tr>
<tr>
<td>Attending worship service</td>
<td>OR (95% C.I.)</td>
<td>.62 (.43, .88)</td>
<td>.63 (.44, .90)</td>
</tr>
<tr>
<td>Volunteering in religious group</td>
<td>.64 (.44, .93)</td>
<td>.66 (.45, .97)</td>
<td>1.68 (1.20, 2.35)</td>
</tr>
<tr>
<td>Having direct experiences of God</td>
<td>66 (.44, .99)</td>
<td>.66 (.44, .99)</td>
<td>1.79 (1.24, 2.59)</td>
</tr>
</tbody>
</table>

Note. Model 1 included only the religious behavior variable; Model 2 included both the religious behavior variable and gender; Model 3 included the religious behavior variable (not shown), gender (not shown), and the religious behavior x gender interaction in order to demonstrate that, for each of the three religious behaviors examined, the two-way interaction was not significant, and therefore the moderator effect of gender was non-significant.

1/3), including: attending worship services (OR = .62, 95% CI: .43, .88; \( p = .008 \)), volunteering in one’s religious group (OR = .64, 95% CI: .44, .93; \( p = .019 \)), and having direct experiences of God (OR = .66, 95% CI: .44, .99; \( p = .046 \)).
Hypothesis #4: Logistic Regression for Moderator Effect of Prior Depression History

Logistic regression models examined the potential moderator effect of prior depression history. A nonsignificant two-way interaction was found between prior depression history and religious involvement for each of the three religious behaviors. In other words, prior depression history is not a moderator for the effect of religious involvement and new-onset depression. The effect of religious involvement on depression, for each of the three religious behaviors measured, was equivalent both for respondents with prior depression history and for respondents with no prior depression history (see Table 3, Model 3).

Table 3

Logistic Regression of Three Religious Involvement Variables on New-Onset Depression and the Moderating Effect of Prior Depression History

<table>
<thead>
<tr>
<th>Religious involvement variable</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attending worship service</td>
<td>Religious</td>
<td>Religious</td>
<td>Religious</td>
</tr>
<tr>
<td>(Greater than weekly vs. less</td>
<td>involvement</td>
<td>involvement</td>
<td>involvement x</td>
</tr>
<tr>
<td>than or equal to weekly)</td>
<td>variable alone</td>
<td>variable</td>
<td>prior depression</td>
</tr>
<tr>
<td></td>
<td>OR (95% C.I.)</td>
<td>OR (95% C.I.)</td>
<td>history</td>
</tr>
<tr>
<td></td>
<td>.62 (.43, .88)</td>
<td>.62 (.43, .89)</td>
<td>4.49 (3.24, 6.22)</td>
</tr>
<tr>
<td>Volunteering in your religious</td>
<td>Religious</td>
<td>Religious</td>
<td>Religious</td>
</tr>
<tr>
<td>group</td>
<td>involvement</td>
<td>involvement</td>
<td>involvement x</td>
</tr>
<tr>
<td></td>
<td>variable</td>
<td>variable</td>
<td>prior depression</td>
</tr>
<tr>
<td></td>
<td>OR (95% C.I.)</td>
<td>OR (95% C.I.)</td>
<td>history</td>
</tr>
<tr>
<td></td>
<td>.64 (.44, .93)</td>
<td>.70 (.47, 1.03)</td>
<td>4.52 (3.25, 6.29)</td>
</tr>
<tr>
<td>Having direct experiences of</td>
<td>Religious</td>
<td>Religious</td>
<td>Religious</td>
</tr>
<tr>
<td>God</td>
<td>involvement</td>
<td>involvement</td>
<td>involvement x</td>
</tr>
<tr>
<td></td>
<td>variable</td>
<td>variable</td>
<td>prior depression</td>
</tr>
<tr>
<td></td>
<td>OR (95% C.I.)</td>
<td>OR (95% C.I.)</td>
<td>history</td>
</tr>
<tr>
<td></td>
<td>.66 (.44, .99)</td>
<td>.61 (.40, .93)</td>
<td>5.13 (3.54, 7.44)</td>
</tr>
</tbody>
</table>

Note. Model 1 included only the religious behavior variable; Model 2 included both the religious behavior variable and prior depression history; Model 3 included the religious behavior variable (not shown), prior depression history (not shown), and the religious behavior x prior depression history interaction in order to demonstrate that, for each of the three religious behaviors examined, the two-way
Hypothesis #5: Logistic Regression for Mediator Effect of Social Network

The approach used to test for a mediator effect includes the following components. First, the bivariate association between a religious involvement variable and late-life depression must be statistically significant (before social network was added to the model). Second, when social network was added to the model, three characteristic relationships between variables must follow. One, a substantial reduction in the statistical significance of the religious involvement variable must have occurred. Two, a statistically significant association between the religious involvement variable and the mediator, social network, must be evident. Three, the association between the mediator variable (social network) and late-life depression must also have a statistically significant relationship.

Attending worship service. The bivariate association between attending worship service and new-onset depression met both statistical and practical significance criteria before social network was added to the model \((OR = .62, CI = .43, .88, p = .008)\). Social network was significantly associated with attending worship service (beta coefficient = .12, \(t = 4.74, p < .001\)) and depression \((OR = .71, CI = .63, .80, p < .001\)). The inverse association between attending worship service and depression declined somewhat when social network was added to the model, which increased the evidence for the presence of a mediating relationship between attending worship service and new-onset depression \((OR = .69, CI = .48, .99, p = .044\); see Figure 1).

Reading scriptures or holy writings. The bivariate association between reading scriptures or holy writings (a religious involvement variable) and new-onset depression
Figure 1. Analyses testing mediator effect of social network on relationship between attending worship service and new-onset depression.

met statistical significance criteria, but not practical significance criteria before adding social network to the model (OR = .69, CI = .51, .95, p = .021). Social network was significantly associated with reading scriptures or holy writings (beta coefficient = .09, t = 3.47, p = .001) and depression (OR = .70, CI = .62, .79, p < .001). The inverse association between reading scriptures or holy writings and depression declined when social network was added to the model, which increased the evidence for the presence of a mediating relationship between reading scriptures or holy writings and new-onset depression (OR = .75, CI = .54, 1.02, p = .068; see Figure 2).

Volunteering in one’s religious group. The bivariate association between volunteering in your religious group (a religious involvement variable) and new-onset depression met both statistical and practical significance criteria before social network was added to the model (OR = .64, CI = .44, .93, p = .019). Social network was
**Figure 2.** Analysis demonstrating lack of mediator effect of social network on the relationship between reading scripture or holy writings and new-onset depression.

significantly associated with both volunteering in one’s religious group (beta coefficient $= .13, t = 4.81, p < .001$) and depression ($OR = .70, CI = .62, .79, p < .001$). The inverse association between volunteering in one’s religious group and depression declined when social network was added to the model, which increased the evidence for the presence of a mediating relationship between both volunteering in one’s religious group and depression ($OR = .72, CI = .49, 1.06, p = .095$; see Figure 3).

**Having direct experiences of God.** The bivariate association between having direct experiences of God (a religious involvement variable) and new-onset depression met both statistical and practical significance criteria before social network was added to the model ($OR = .66, CI = .44, .99, p = .046$). Social network was significantly associated with having direct experiences of God (beta coefficient $= .09, t = 2.86, p = .004$) and depression ($OR = .69, CI = .60, .79, p < .001$). The inverse association
Model 1: Volunteering in one’s religious group → New-onset depression

\[ OR = .64, \quad CI = .44, .93, \quad p = .019 \]

Model 2: Volunteering in one’s religious group → New-onset depression

\[ OR = .72, \quad CI = .49, 1.06, \quad p = .095 \]

\[ \beta = .13, \quad p < .001 \]

Social network

\[ OR = .70, \quad CI = .62, .79, \quad p < .001 \]

**Figure 3.** Analyses testing mediator effect of social network on the relationship between volunteering in one’s religious group and new-onset depression.

Between having direct experiences of God and depression declined when social network was added to the model, which increased the evidence for the presence of a mediating relationship between both having direct experiences of God and depression \((OR = .71, \quad CI = .47, 1.07, p = .100; \text{see Figure 4})\).

**Summary**

Attending worship services, volunteering in one’s religious group, and having direct experiences of God met both statistical significance and practical significance criteria for association with subsequent new-onset depression. Reading scriptures and other holy writings met statistical significance, but not practical significance. Attending scripture study groups met practical significance, but not statistical significance. In all cases, significant associations were inverse such that greater frequencies of the religious
Having direct experiences of God → New-onset depression

Model 1: $OR = .66$
$CI = .44, .99$
$p = .046$

Model 2: $OR = .71$
$CI = .47, 1.07$
$p = .100$

New-onset depression

Figure 4. Analyses testing mediator effect of social network on the relationship between having direct experiences of God and new-onset depression.

Behaviors were associated with reduction in depression risk. No evidence was found for moderator effects of gender or prior depression history on the religiosity/depression association. There is evidence of a moderate degree of mediator effect of social network on the association between attending worship service, reading scripture and other holy writings, volunteering in one’s religious group, and having direct experiences of God, respectively, with new-onset depression.
CHAPTER V
DISCUSSION

Overview

The purpose of this study was to investigate an association between religiosity and new-onset depression in a population-based study of elderly individuals whose religious affiliation is the LDS church. The belief system as set forth in the doctrines and covenants of the LDS church, and reified by the existence of a critical mass of adherents to the LDS religious faith, is predominant in the surrounding community culture.

Evidence for social networks was analyzed for potential mediator effects on the relationship between religiosity and new-onset depression in the interval. Extrinsic (or public) forms of religiosity, such as frequency of church attendance, church-based youth groups, choir, and the LDS women’s organization, the Relief Society, contain social aspects which suggest to some scholars that extrinsic forms of religiosity may simply be an innate form of social support within the larger social fabric of public life (Ellison et al., 1989; Idler & Kasl, 1992) and when tested was found to produce inconclusive results (Braam et al., 1997, 1998; Husaini et al., 1999; Idler & Kasl; Koenig et al., 1997). Other researchers have found evidence for religiosity as an independent variable that has a unique effect on a dependent variable (e.g., new-onset depression in the interval) that acts apart from social support (Wink et al., 2005).

The potential mediating effect of social network on the relationship between
religiosity and new-onset depression was tested in this study. Also, the potential moderating effects of both gender and prior depression history on the association between religiosity and new-onset depression in the interval were tested.

The research questions at the focus of this study included: (a) What are the latent constructs for religiosity within an elderly population? (b) To what extent is religiosity (defined according to the latent constructs identified in the preceding question) associated with new-onset episodes of late-life depression, over a subsequent four-year interval? (c) Does gender moderate the relation between religiosity and depression? (d) Does prior depression history moderate the relation between religiosity and depression? and (e) Does social network have a mediating effect on the association between religiosity and late-life depression? Next a summary of the results and the interpretation of findings follow that corresponds to the above research questions using Baltes’ life span development perspective. Conclusions will be drawn from the resultant findings of the study by discussing them in the context of existing literature. The discussion will then focus on final general conclusions, limitations of the study, and suggestions for future research.

Latent Constructs for Religiosity Within an Elderly Population

Based on previous research on religiosity, it was hypothesized that the questions from the modified Religious Background and Behavior Scale used by the Cache County Study on Memory Health and Aging (CCSMHA) are driven by two underlying latent
constructs, specifically public and private religiosity. Gordon Allport, a main proponent of the differentiated factors involved in religiosity, labeled the two factors he found “intrinsic religiosity” (a private form of religiosity) and “extrinsic religiosity” (a public form of religiosity; Allport & Ross, 1967). The methodology needed to study religion and health is particularly daunting due to the “multifactorial processes through which religion affects individual and population health” (Chatters, 2000, p. 336).

Baltes’ lifespan development perspective is a particularly apt conceptual framework from which to study the relation between religiosity and depression in an elderly population. Chatters brings new understanding to the relation between religion and health, and by extension to late-life depression and religiosity, through a seminal work that suggests new onset depression in late-life as a non-normative event and religiosity as multidimensional, containing both a “behavioral component” (single item indicators of public religiosity or private religiosity) and a “subjective dimension.” Chatters considers “subjective dimensions of religious involvement include attitudes, beliefs, experiences, self-perceptions and attributions...” (Chatters, 2000, p. 339).

Allport and Ross (1967), Baltes (1987), and Chatters provide evidence for the multidimensional, multifactoral nature of religiosity. Therefore, it was reasonable in this thesis to assume that multiple factors may be involved in the RBB scale for religious involvement.

Although this study hypothesized the existence of two factors in the religious scale, factor analysis did not bear out a clean demarcation between precisely two factors for the religious variables. Results did not support the hypothesis for the existence of
two distinct constructs namely public and private religiosity in this thesis. The two factors that emerged explained only 56% of total variance among the ten items. Further, two of the religious variables in the scale had factor loadings that were split evenly between the private religiosity factor and the public religiosity factor. A third religious variable, scripture study, could be considered on face validity to be either a form of public religiosity or a form of private religiosity. Due to the modest explanation of total variance found in the two factors and the circumstantial nature of these three religiosity variables, the decision was made to treat each of the religious variables as separate entities throughout the analyses of data.

A number of reasons may account for why the Religious Behavior and Background (RBB) items did not fall clearly into two factors, public and private religiosity, in this population. They may include the religious experiences interpreted through family, church, and culture. They may be due in part to the need for a sense of belonging, or for a psychological need to not draw attention to oneself. This may be accomplished by not setting oneself apart from the flock, which leads to social desirability bias. The inscrutable character of single construct items such as “having direct experiences of God” may cloud the interpretation and results derived from factor analysis.

Hence, the single item religious variables did not clearly align themselves along the two hypothesized factors, private and public religiosity. This may be further accounted for by the differing mental constructions of the single religious constructs among participants, particularly for the item “having direct experiences of God.” The
bias of social desirability may have played a role based on the need for belonging and acceptance, a central concept of public religiosity. Each participant brings his or her own knowledge and needs to the interpretation of the questions relating to individual religious behaviors, based on personal or otherwise known experience. Philosophers, theologians, and common people have grappled with the multidimensional character of religious experience as they strived to bring meaning to life’s experiences in the private and public spheres. Human interpretation of God as ineffable, as ever-present, or as non-existent has been shaped by spiritual and religious experiences as they are steeped in the cultures of the times.

Additionally, the two factors that emerged through factor analysis (albeit with low total percent variability explained) were found to be negatively related (i.e., factor loadings were positive on one factor while being negative on the other factor). This could possibly be due to individuals who are more introspective relying more on private behaviors, tending to not utilize the more public behaviors, while more extroverted individuals may look to more public behaviors that place them with others who can validate their sense of spiritual identity.

Data reduction techniques such as those used in the creation of indexes or scales of a concept (e.g., religiosity) present their own potential whitewashing of individual response items. The potential problem with summative scores, such as a religious index scale, is that they can obscure the complexities of behavior patterns; whereas, analysis of individual items may be more informative by providing richer details of the specific behavioral response category. Therefore, data analysis of religiosity’s effect on new-
onset of depression consisted of ten religious involvement variables, rather than latent constructs of religiosity, for this study.

Due to the multidimensionality of the social construction of religiosity, results among studies on religiosity and depression are particularly difficult to compare. In a study on religion, spirituality, and health in medically hospitalized older patients (N = 838), Koenig and colleagues (2004) identified five measures of religiosity. They included organizational religious activity, non-organizational religious activity, intrinsic religiosity, self-rated religiosity, and observer-rated religiosity. Religious activities were found to be inversely associated with depressive symptoms and positively associated with social support (Koenig et al.). Although Koenig identified five separate types of religiosity, church attendance continues to be the mainstay for measuring the association between religiosity and depression in multiple studies. The study of the association between depression and religiosity becomes more complex as additional independent variables such as social stressors, social support, or social network size are added into the equation. One such article found that a lack of contact with relatives and insufficient instrumental, emotional, or financial support was positively associated with late-life depression, whereas religiosity and participation in religious activities was unrelated to depression (Robison et al., 2003).

Extent of Religiosity’s Association with Subsequent Depression in Late-Life

The odds ratio of .62 found in this thesis study compares favorably to findings
of other studies that show an inverse association between church attendance and late-life depression. Conclusions among studies of depression and church attendance may be uniform due to the objective quality of church attendance, despite differences in methodology or sample characteristics. An objective quality that can be counted is much easier to define and measure than a subjective quality, such as religious beliefs, attitudes, or values. An inverse association between worship service attendance and depression symptoms has been found in studies on religiosity and depression under differing circumstances and diverse populations throughout the United States, Europe, and other countries.

Volunteering in your religious group (OR = .64, 95% CI: .44, .93; p = .019), a form of extrinsic religiosity (e.g., public religiosity), was both statistically and practically significant. Two previous studies, one a cross-sectional study and the other a longitudinal study (between baseline and follow-up), found significant inverse associations between formal volunteer participation and subsequent depression (Li & Ferraro, 2005; Morrow-Howell, Hinterlong, & Rozario, 2003). Although, Li and Ferrarro found in their longitudinal study that by the end of the second follow-up (Wave 3), the benefit from formal volunteer activities were no longer significantly and inversely associated with late-life depression. They suggested that the longitudinal results from follow-up 1 to follow-up 2 were due to nonrandom selection and attrition. A second longitudinal study found a curvilinear association between volunteer participation and depression in elderly people. Those who volunteer between 100 hours per year and less than 5 days per work were less likely to become depressed as quickly
as other elderly individuals who either volunteered less than or more than the described amounts (Lum & Lightfoot, 2005). The beneficial effects of volunteering may be attenuated when the numbers of hours are stretched to nearly a 40-hour work week.

The bivariate association between reading scriptures depression met statistical significance criteria, but not practical significance criteria. Reading scriptures and other holy writings can be an ambiguous form of religiosity in terms of being both an extrinsic and intrinsic form of religiosity. The ambiguity turns on the possibility of reading scriptures and other holy writings as a private endeavor versus reading scriptures and other holy writings acting in unison with others as a public religious activity in affirmation of one’s public pronouncement of religious faith. Only one other study was found that examined the effect of scripture reading on mental health. Koenig and colleagues (1997) found in a sample of elderly, community-dwelling people, aged 65 and over, ($N = 4,000$) that Bible reading was positively correlated with social support, but unrelated to depression (Koenig et al.).

“Having direct experiences of God,” based on the factor analysis in the present study, was a religious behavior that could have had ambiguous meanings to respondents, evidenced by the split factor loadings. Nevertheless, its association with depression was found to be similar to the aforementioned behaviors ($OR = .66, 95\% CI: .44, .99; p = .046$) at trend level for the .01 level of significance. Potentially, the meaning of this finding to the LDS participants in this study might be a sense of God’s spirit communicating with them through religious devotions during the vicissitudes of life. Contemplation of God may be a salient factor in confronting the variety of issues
that come with aging. These may include bereavement due to the loss of a spouse, the loss of contemporaries including family, friends, and a familiar popular culture, the loss of a confidant and their surrounding social network, the loss of mobility and autonomy, and financial strain accompanied by social role loss. However, it cannot be gleaned from the present data whether “having experiences of God” was perceived to occur more often in a private meditative setting or in a more public setting such as Sunday School class. No results were found in a literature search of terms which could be construed to be similar to “having direct experiences of God.” The four remaining religious involvement variables attending scripture study group, thinking about God, researching family genealogy, and visiting with people from your religious group were not significant at the .01 level of significance.

In summary, the second hypothesis concerned both public and private religiosity and their association with reduced risk for depression. This hypothesis was tested at the level of the individual religious behaviors. In logistic regression analyses, public behaviors of church attendance and volunteering supported this hypothesis, as did private behaviors of scripture reading and direct experiences of God.

Gender as a Moderator

The hypothesis stated that “religiosity will be significantly associated with risk for subsequent depressive episode for women, but not for men.” The results of the study did not support the hypothesis that religiosity will be significantly associated with risk for subsequent depressive episode for women, but not for men. No statistical
significance was found for interaction effects between gender and religiosity. All eight religious involvement variables had a non-significant two-way interaction with gender. In other words, gender is not a moderator for the effect of religious involvement and new-onset depression. The effect of religious involvement on depression, across all eight dimensions measured in this thesis, was equivalent for men and women. Gender in other studies is almost exclusively included only as a covariate. Only two studies were found that examined the moderating effect of gender on the association between religiosity and depression, one of which addressed depression remission. Therefore, there is almost no evidence in the literature to suggest that gender is a moderator, or evidence to the contrary.

Prior Depression History as a Moderator

The hypothesis of this study stated that “religiosity will be significantly associated with risk for subsequent depressive episode for individuals with a prior depression history, but not for individuals without a prior depression history.” The results of this study did not find evidence for prior depression history having moderator effect between religiosity and new-onset depression. All eight religious involvement variables had a nonsignificant two-way interaction with prior depression history. In other words, prior depression history is not a moderator for the effect of religious involvement and new-onset depression. The effect of religious involvement on depression, across all eight dimensions measured in this thesis, was equivalent both for respondents with prior depression history and for respondents with no prior depression.
history. Prior depression history in other studies is only included as a covariate, is never tested for moderating effects, so we have no evidence in the literature suggesting that prior depression history is a moderator, nor evidence to the contrary.

Social Network as a Mediator

The hypothesis for this thesis study stated, "Social support will not have a mediating effect on the association between religiosity and depression. An inverse association between religiosity and depression will remain the same after adjusting for social support." Of the eight religious behaviors studied in this thesis, for three behaviors: attending worship service, reading scriptures or other holy writings, and volunteering in your religious group, after controlling for social network there was a reduction in the association of religious behavior and subsequent depression, thereby demonstrating a mediator effect of social network. Such mediator effects were not demonstrated for the remaining five behaviors, namely attending scripture study groups, having direct experiences of God, researching family genealogy, visiting with people from your religious group, researching family genealogy. These results are consistent with two studies that demonstrated a mediator effect of social support, one that found social support mediated the effect of public religiosity on depression among African Americans and the effect of private religiosity on depression among Whites (Husaini et al., 1999). These results are in contrast to studies that show social support does not mediate the association between religious coping (Bosworth et al., 2003) and depression severity or worship service attendance (Koenig et al., 1997) and depression. Results
vary across studies in large part because of methodological differences such as which aspect of religious involvement is studied, whether the measurement instruments for depression and religious involvement differ between studies, as well as the various populations studied.

Limitations

The results of this thesis study may be limited in their ability to generalize to other populations, due to the sample's ethnic homogeneity including predominantly Caucasian and religiously and politically conservative individuals. The social and cultural history of the town has been largely molded around the history and beliefs of the LDS faith from early times forward. The ability of this study to be generalized to other studies or populations is hampered by the very characteristics that members of the LDS church, find most endearing to the religious ethos of the LDS church. Somewhat similar to their religiously Conservative Protestant counterparts, daily activities of LDS members ideally revolve around the needs of the religious community. Daily activities that sustain the religious community revolve around a commitment to worship service attendance and related church activities. Members of the church body are actively involved in providing and partaking of both spiritual and earthly sustenance in the religious community. A close social network of family and community ties is developed within a small geographical area. Social networks are formed by a social structure that consists of several formal organizational structures. The statewide organizational structures are similar to concentric circles that lead outward to
increasingly complex religious entities. They begin with ward on the neighborhood level that develop into stakes (a collection of wards). The organizational structures incrementally link increasingly outward into the larger social fabric of public life. Results of the present study may generalize, however, to other studies whose sample populations are likewise drawn from homogenous communities characterized by a strong, rather politically and religiously conservative base. Nevertheless, these findings could benefit from replication in communities including several other religious affiliations to gain a better understanding of the impact religious behaviors have on late-life depression, including the possible mediating effect of social network on the relationship.

Another potential limitation is that depression was not assessed by the gold standard of clinical diagnosis by a psychiatrist. Both self-report and skip-out protocols have a potential for under diagnosis; however, the report of antidepressant use reduced this somewhat.

Social desirability is a threat to the internal validity of the results in any sample of highly religious individuals, such as with the present study’s sample of members of the LDS church. The cultural reproduction of ways of knowing and being within families and the community define the expectations of individual and family life in both the public and private spheres. These culturally defined expectations of behavior and belief may place limitations on the internal validity of self-reports of religious behaviors in such highly religious respondents. This may be particularly true for behaviors that involve the provision of social support and the upholding of principles that delineate the
seminal importance to the community in helping others and volunteering of one's time and talents in the social network in the ward.

The combination of potential under-diagnosis of depression and over-estimation of religious behaviors may have a compounding effect on this study's internal validity. Specifically, to the extent that the inverse association between high religious behaviors and low depression rates may be due to respondent's sensitivity to social stigmas (of wanting to conform to socially desirable religious behaviors and to be free of scrutiny regarding mental health), the internal validity of this study may be compromised.

Selection bias is a threat to the internal validity of any longitudinal, population-based study. Selection bias at the beginning of a study, selective refusal throughout the several aspects of the study, and death of the study participants is a major concern of population-based longitudinal studies. Selective refusal due to potential subject burden is common in population-based studies of frail, older adults. Family members protect frail older adults from the perceived potential for stress and fatigue in epidemiologic assessment. In the present study, attrition was associated with older age, being initially widowed at the beginning of the study, and lower frequencies of religious behaviors. The fact that more widows and widowers than any other marital status group dropped out of the study before follow-up interview implies that these findings may not generalize well to widowed individuals because they are underrepresented in the follow-up interview in this study. On a positive note, results indicated that attrition bias due to gender or prior depression history was not a concern in this study.

Threats to internal validity may have occurred due to history and maturation.
Maturation over time is another potential threat to the internal validity of the results in this longitudinal study because the respondents are elderly, and are subject to increasing cognitive and functional impairments, in addition to increased mortality and morbidity with increasing age. The use of CCSMHA protocol to select out and delete incident dementia cases diminishes this concern. History effects, including both personal and societal events, are potential threats to internal validity in longitudinal studies such as this. For example, depression measurements taken immediately after the aftermath of 9-11 or financial strain due to personal or national economic events may have interfered with results. Skewed results such as this in a large, longitudinal population-based study may be of less concern due to the sheer numbers of respondents and a two-year follow-up period when results were collected. Threats to internal validity may also be of concern in this longitudinal study since repeated testing using the same measurement instruments (e.g., DIS-D to measure depression) may sensitize respondents because they would become too familiar with the testing protocol.

Directions for Future Research

Thesis findings need to be replicated in other religious affiliations. LDS members who live in Utah may be much more culturally and religiously homogeneous than members outside of Utah. Their surrounding social and biophysical environment influences the social and cultural reproduction of knowledge inherent in any population. Therefore, replications of the study in other religious affiliations and geographic locations will add to the knowledge base of the association between religious behaviors
and subsequent depression in the elderly.

The complexity of the relationship between religious behaviors and late-life depression may lead to the need to explore the pathways in which individual aspects of social network mediate these associations. Future research may therefore expand upon the increased dimensions of religiosity in terms of previously unexplored religious behaviors and the moderating effects of gender and prior depression history on the various interactions. Suggested future research endeavors include an investigation into: (a) the role of functional impairment in the association between religiosity and new-onset late-life depression; and (b) an assessment of whether religious behaviors moderated the effect of stressful life events. Recommendations for further research include the employment of ethnographic research techniques to complement the use of face-to-face structured interviews. The combined utilization of both quantitative and qualitative research strategies may provide richer data collection.

Collection of data may be improved through the development of standardized instrument scales that measure the multidimensional character of religiosity and spirituality, as these social constructs develop further with the advance of theory construction. The relationship between religiosity and social network needs to be assessed further under multiple contexts. The association between religious coping and late-life depression may be examined in response to multiple stressful life events. The association between religious support and late-life depression may be examined as it relates to the role of functional impairment in mitigating incidence, remission, and recurrence of late-life depression.
Conclusions

The purpose of this study was to investigate the association between religiosity and new onset late-life depression in a population using secondary extant data from the CCSMHA. The population studied was comprised of a community sample of members of the LDS church who reside in Cache County, Utah.

The study examined eight individual religiosity variables for their association with new-onset depression over the subsequent 4-year interval. The above findings were shown to be consistent for men and women, and for those with and without prior depression history. Each religious behavior includes at least some component of social network enhancement and this study demonstrated that the religiosity-depression association was at least partially explained by social network strength.

The motivation to stay in a large epidemiologic study requires expenditure of greater amounts of effort to complete the series of questions and responses involved in a study over a lengthy period of time from year to year. As the years pass by, the testing format exacts a higher toll on the motivation and endurance levels of elderly people as they develop functional and/or cognitive impairments or become increasingly frail with advancing age. Elderly respondents who possess greater social resources in the form of meaningful social contact with family and friends may be more likely to be in a position to continue in a longitudinal study, both physically and psychologically. Access to quality medical care depends in part on mobility issues for transportation to and from high quality medical treatment centers. With a larger social network, respondents are more likely to build and maintain a relationship with a trusted confidante.
A history of previous religious involvement and greater salience of religious devotion during the lifetime of an elderly person provides a deep well of spiritual resources constructed over time from an accessible and understood format. Having experienced a contemplative life in relation to one's sense of God is akin to saving money in a trust fund throughout one's lifetime. "Spiritual currency" can be accessed through forms of religious coping and religious devotion during conversation with one's sense of God. However, how strong is the sense of the divine as the end of life closes in? Does one experience the ebb and tide of religious devotion as the end approaches? Will the life force be subsumed under the cloud of depression and angst? Will God continue to exist in one's spiritual essence apart from one's relationships to others?

LDS lay clergy may find results from this study useful as they counsel elderly church members who suffer from a late-life depressive episode, along with their families. Individuals who read this study may elect to utilize different aspects of the findings (e.g., equivalent effects for men and women, the importance of engagement in specific religious behaviors). Based on their own needs and life experiences, individuals may interpret or use results from this study in the context of their own personal life histories in different ways. This may enhance understanding of the disease process and alleviate fear and angst rising from misunderstanding and stigmatization. Positive religious behaviors such as volunteering in one's religious group may provide novel communication pathways that interface with an individual's various social networks. Using study results, LDS lay clergy and others may develop methods of positive religious coping to stem recurrence of late-life depression in their members.
REFERENCES


APPENDICES
Appendix A

Glossary of Terms
Glossary of Terms

Activities of Daily Living (ADLs): Activities of daily living (ADLs) are basic activities that support survival, including getting in and out of bed, dressing, eating, bathing, and toileting. Individuals are considered to have a disability if they report receiving help or supervision, or using equipment, to perform the activity, or not performing the activity at all.

Baseline: The first interview of the CCSMHA when an individual participant reported both a current and a lifetime depression history.

Bereavement: “Bereavement is the period after a loss during which grief is experienced and mourning occurs. The time spent in a period of bereavement depends on how attached the person was to the person who died, and how much time was spent anticipating the loss.”

Comorbid Anxiety: Comorbid anxiety and depression meets the DSM-IV Diagnostic Criteria for Mixed Anxiety-Depressive Disorder. For this diagnosis to be given, there must be the presence of persistent or recurrent dysphoric mood lasting 4 weeks and accompanied by 4 of the following symptoms: concentration or memory difficulties, sleep disturbances, fatigue or low energy, irritability, worry, being easily moved to tears, hypervigilance, anticipating the worst, hopelessness or pessimism about the future, low self-esteem or feelings of worthlessness. Symptoms are not due to a medication, drug abuse, or a medical condition and cause significant distress or impairment in social, occupational, or other important areas of functioning. Symptoms do not meet criteria of any other mental disorder (American Psychiatric Association, 1994).

CES-D: Center for Epidemiological Studies – Depression Scale.

Depression: A condition lasting two or more weeks characterized by behavioral and somatic disturbances that may include feelings of sadness, irritability, loss of interest in activities usually enjoyed, feelings of guilt, and/or inability to sleep or early morning awakening.

DIS-D: Diagnostic Interview Schedule-Depression Scale.

DSM-IV: Diagnostic and Statistical Manual of Mental Disorders, Version IV, created by the American Psychiatric Association, 1994.

Gateway Questions: A set of questions in an interview, one of which must be answered in the affirmative in order to proceed with the interview.
Geriatric Depression Scale (GDS): A 30-item yes/no inventory of depressive symptoms that can be administered in oral or written form.

Incidence: The number of new cases of disease or other events that occur during a specified period of time in a population at risk.

Incidence Rate: Incidence is often expressed as a rate and is calculated as follows:

\[
\text{Incident rate} = \frac{\text{Number of new cases of a disease}}{\text{Total person-time of the disease}}
\]

Instrumental Activities of Daily Living (IADLs): IADLs are indicators of functional well-being that measure the ability to perform more complex tasks than the related activities of daily living (ADLs). In the National Long Term Care Survey, IADLs include light housework, laundry, meal preparation, grocery shopping, getting around outside, managing money, taking medications, and telephoning. Individuals are considered to have an IADL disability if they report requiring assistance or using equipment to perform the activity or not performing the activity at all because of their health or a disability.

Major Depression: DSM-IV criteria states that for a major depressive episode to be diagnosed an individual must experience at least five of the nine symptoms for the same two weeks or more, for most of the time almost every day, and this is a change from prior level of functioning. One of the symptoms must be either depressed mood or loss of interest. Five of the nine possible symptoms must include either: (a) depressed mood; (b) significantly reduced level of interest or pleasure in most or all activities; (c) considerable loss or gain of weight (e.g., 5% or more change of weight in a month when not dieting). An increase or decrease in appetite is included; (d) difficulty falling or staying asleep (insomnia), or sleeping more than usual (hypersomnia); (e) observable behavior that is agitated or slowed down; (f) fatigue, or diminished energy; (g) thoughts of worthlessness or extreme guilt (not about being ill); (h) reduced ability to think, concentrate, or make decisions; or (i) frequent thoughts of death or suicide (with or without a specific plan), or a suicide attempt (American Psychiatric Association, 1994).

Mean: The mean (M) is an average of \( n \) numbers computed by adding the numbers and dividing by \( n \).

Moderating Factor: A moderating factor is a variable that influences the strength of association between a predictor variable and an outcome variable. For example, the gender of a sample population may influence the strength of association between a predictor variable, such as the extent of the social network, and the outcome variable, onset of late-life depression in an interval.
**Morbidity Rate:** The number of cases of an illness, injury or condition within a given time, usually one year. It is also the ratio of sick persons to total population studied.

**Odds Ratio:** The ratio of the percent of the population with a risk factor who have a disease or condition, divided by the percent of the population without the risk factor who have the disease or condition.

**Period Prevalence:** Number of existing cases of disease in a population over a defined period of time.

**Person Time:** The product of the number of people followed, \(x\), and the number of years \(y\) or \(xy\) person years.

\[(\text{e.g., 100 people followed for one year each } = 100 \text{ person years}) \text{ (or)}\]
\[(\text{e.g., 10 people followed for ten years each } = 100 \text{ person years}).\]

**Person-years:** For those without depression, calculated as the time between baseline and follow-up examinations or, in the case of death, the date of death.

**Point Prevalence:** Number of existing cases of disease in a population at a period in time.

**Population:** A group of people with a common characteristic (e.g., age, race, sex).

**Prevalence:** Prevalence is the number of cases of a disease, infected people, or people with some other attribute present during a particular interval of time. It is often expressed as a rate (e.g., the prevalence of depression per 1,000 people during a year).

**Protective Factor:** A factor that tends to reduce an individual’s risk of a specific disease or condition.

**Risk Factor:** A factor that tends to increase an individual’s risk of a specific disease or condition.

**Seasonal Affective Disorder (SAD):** A mood disorder characterized by recurring episodes of depression that are usually associated with decreased levels of available sunlight depending on the season of the year.

**Young-old:** The three age cohorts of older adults defined in the literature of gerontology include: the young-old (ages 65-74), the old-old (ages 75-84), and the oldest-old (aged 85 and over).
Appendix B

Flowchart of Sample Selection
Appendix C

Depression Interview Protocol
Lifetime Gateway Questions: Sadness, loss of interest, irritability 2 weeks +

3 “NO” responses

Set all current Dx variables to 0 for current, recent, typical, and lifetime

At least 1 “YES” response

Obtain # episodes, onset ages

Currently in an episode?

NO

Set all current Dx variables to 0 and current symptom variables to missing

YES

Obtain 9 symptoms, duration, and bereavement for recent episode; Determine Dx for current episode

Dx Variables:
Major depression w/bereavement
Major depression w/o bereavement
Dysthymia
Dysphoria
Subsyndromal
Bereavement w/o major

Obtain 9 symptoms for typical episode; Determine whether it meets major depression

> 1 Episode?

YES

NO

Set lifetime major depression if diagnosed in current, recent, or typical episode

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Appendix D

Attrition Analyses
Table D1

Attrition Analysis of Selected Categorical Measures at Initial Interview and Participation Status at 4-Year Follow-up Interview

<table>
<thead>
<tr>
<th>Variable</th>
<th>Self</th>
<th>Proxy</th>
<th>Deceased</th>
<th>Refused</th>
<th>Moved</th>
<th>Test Statistic, df, p-value</th>
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<td>Gender</td>
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<td>n, %</td>
<td>n, %</td>
<td>n, %</td>
<td>n, %</td>
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<td>606 70.2</td>
<td>22 2.5</td>
<td>133 15.4</td>
<td>80 9.3</td>
<td>22 2.5</td>
<td>df = 4 p = .115</td>
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<tr>
<td>Female</td>
<td>833 70.7</td>
<td>24 2.0</td>
<td>151 12.8</td>
<td>145 12.3</td>
<td>26 2.2</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1439 70.5</td>
<td>46 2.3</td>
<td>284 13.9</td>
<td>225 11.0</td>
<td>48 2.4</td>
<td>n = 2042</td>
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<td>37 2.7</td>
<td>178 13.1</td>
<td>154 11.3</td>
<td>31 2.3</td>
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<td>106 15.6</td>
<td>71 10.4</td>
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<td></td>
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<td>46 2.3</td>
<td>284 13.9</td>
<td>225 11.0</td>
<td>48 2.4</td>
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<td>31 2.0</td>
<td>186 11.9</td>
<td>168 10.8</td>
<td>36 2.3</td>
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<td>88 21.3</td>
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<td>10 2.4</td>
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<td>Separated/ Divorced</td>
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<td>1 2.1</td>
<td>4 8.5</td>
<td>7 14.9</td>
<td>2 4.3</td>
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<tr>
<td>Never Married</td>
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<td>1 6.3</td>
<td>2 12.5</td>
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<tr>
<td>Total</td>
<td>1438 70.6</td>
<td>46 2.3</td>
<td>280 13.7</td>
<td>225 11.0</td>
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Table D2

Attrition Analysis of Selected Continuous Measures at Initial Interview and Participation Status and 4-Year Follow-up Interview

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<th>Variable</th>
<th>Self</th>
<th>Proxy</th>
<th>Deceased</th>
<th>Refused</th>
<th>Moved</th>
<th>F</th>
<th>df</th>
<th>p - value</th>
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<td>RBB&lt;sup&gt;a&lt;/sup&gt;</td>
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<td></td>
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<tr>
<td>n</td>
<td>1439</td>
<td>46</td>
<td>284</td>
<td>225</td>
<td>48</td>
<td>F</td>
<td>df=4</td>
<td>p &lt; .001</td>
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<tr>
<td>M</td>
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<td>3.62</td>
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<td>3.62</td>
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<td>n</td>
<td>1439</td>
<td>46</td>
<td>284</td>
<td>225</td>
<td>48</td>
<td>F</td>
<td>df=4</td>
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<td>M</td>
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<tr>
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<td>6.77</td>
<td>6.76</td>
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<td>46</td>
<td>284</td>
<td>225</td>
<td>48</td>
<td>F</td>
<td>df=4</td>
<td>p &lt; .001</td>
</tr>
<tr>
<td>M</td>
<td>13.74</td>
<td>12.83</td>
<td>13.38</td>
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<tr>
<td>SD</td>
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<td>2.69</td>
<td>2.82</td>
<td>2.29</td>
<td>3.09</td>
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<td>1439</td>
<td>46</td>
<td>284</td>
<td>225</td>
<td>48</td>
<td>F</td>
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<td>1.56</td>
<td>1.31</td>
<td>1.30</td>
<td>1.19</td>
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<sup>a</sup> RBB is the mean score from the ten questions from the Religious Behavior and Background (RBB) scale (each coded as 1 = never, 2 = less than once a month, 3 = once or twice a month, 4 = once a week, or 5 = more than once a week).

<sup>b</sup> Social Network is the mean score from the five questions on social network in face-to-face structured interviews developed by the CCSMHA.
Appendix E

Bivariate Associations
Table E1

Bivariate Associations Between Categorical Demographic Characteristics and New Onset Depression over Subsequent 4-Year Interval in a Community Sample of Members of The Church of Jesus Christ of Latter-Day Saints (LDS)

<table>
<thead>
<tr>
<th>Demographic characteristics</th>
<th>No</th>
<th>%</th>
<th>Yes</th>
<th>%</th>
<th>Total</th>
<th>%</th>
<th>χ²</th>
<th>df</th>
<th>p - value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
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<td></td>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td>Male</td>
<td>548</td>
<td>90.4</td>
<td>58</td>
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<td>833</td>
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<td>.001</td>
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<td>Total</td>
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<td>100.0</td>
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<tr>
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Table E2

*Bivariate Associations Between Continuous Demographic Characteristics and New Onset Depression Over Subsequent 4-Year Interval in a Community Sample of Members of The Church of Jesus Christ of Latter-Day Saints (LDS)*

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<tr>
<td>$SD$</td>
<td>1.24</td>
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<td>1.26</td>
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</table>
Appendix F

Association between Individual Religious Behaviors

and Interval Depression
### Table F1

**Frequency and Percent of Subjects Reporting Interval or No Interval Depression, Within Categories of Religious Behavior Frequencies**

<table>
<thead>
<tr>
<th>Category</th>
<th>No interval depression</th>
<th>Interval depression</th>
<th>$\chi^2$</th>
<th>$df$</th>
<th>$p$ - value</th>
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<tr>
<td>Thinking about God ($N = 1,423$)</td>
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<td></td>
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<tr>
<td>Never</td>
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<td>3</td>
<td>$\chi^2 = .11$</td>
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<td>Less than once a month</td>
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<td>Once or twice a month</td>
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<td>Once a week</td>
<td>50</td>
<td>12</td>
<td>19.4</td>
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<tr>
<td>More than once a week</td>
<td>1,149</td>
<td>168</td>
<td>12.8</td>
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<tr>
<td>Total</td>
<td>1,238</td>
<td>185</td>
<td>13.0</td>
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<tr>
<td>Praying ($N = 1,418$)</td>
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<tr>
<td>Never</td>
<td>25</td>
<td>3</td>
<td>$\chi^2 = .30$</td>
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<td>6</td>
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<tr>
<td>Meditating ($N = 1,328$)</td>
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<td>Never</td>
<td>152</td>
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<td>21</td>
<td>10.3</td>
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</tr>
<tr>
<td>More than once a week</td>
<td>355</td>
<td>38</td>
<td>9.7</td>
<td></td>
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<tr>
<td>Total</td>
<td>1,199</td>
<td>180</td>
<td>13.1</td>
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<th>Interval depression</th>
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<th>p - value</th>
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<td>23  13.9</td>
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<td>More than once a week</td>
<td>306   89.7</td>
<td>35  10.3</td>
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<td>956  86.7</td>
<td>147  13.3</td>
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<td>Researching family genealogy</td>
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<td>(N = 1,374)</td>
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<td>52  15.3</td>
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<td>Less than once a month</td>
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<td>More than once a week</td>
<td>147   84.5</td>
<td>27  15.5</td>
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<td>Total</td>
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<td>175  12.7</td>
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<td>Visiting with people from your</td>
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<td>religious group</td>
<td>(N = 1,418)</td>
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<td>Never</td>
<td>17   73.9</td>
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<td>69   82.1</td>
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<td>Once or twice a month</td>
<td>902  87.1</td>
<td>134  12.9</td>
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<td>Once a week</td>
<td>80   88.9</td>
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<tr>
<td>More than once a week</td>
<td>166   89.7</td>
<td>19  10.3</td>
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<td>1,234  87.0</td>
<td>184  13.0</td>
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<th>Interval depression</th>
<th>$\chi^2$</th>
<th>df</th>
<th>$p$-value</th>
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<td>Frequency of church attendance (N = 1,411)</td>
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<td>Total</td>
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<td>180</td>
<td>12.8</td>
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<td>Reading scripture or holy writings (N = 1,422)</td>
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<td>19.5</td>
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<td>81</td>
<td>10.8</td>
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<tr>
<td>Total</td>
<td>1,239</td>
<td>87.1</td>
<td>183</td>
<td>12.9</td>
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</tbody>
</table>

*Note.* Although the above table shows frequencies of religious behavior including all five original response categories, Chi-square tests were run on dichotomized religious behavior variables (weekly or less often versus more often than weekly) because cells were too sparse with the full complement of five categories for accurate Chi-square $p$-values.
Appendix G

USU IRB Approval Letter
MEMORANDUM

TO: Maria Norton
Ly nn Marie Franklin

FROM: True Rubal, IRB Administrator

SUBJECT: Gender as a Moderator of the Relation Between Religiosity and Depression in a Community Study of the Elderly

Your proposal has been reviewed by the Institutional Review Board and is approved under exemption #4.

X There is no more than minimal risk to the subjects.

There is greater than minimal risk to the subjects.

This approval applies only to the proposal currently on file. Any change in the methods/objectives of the research affecting human subjects must be approved by the IRB prior to implementation. Injuries or any unanticipated problems involving risk to subjects or to others must be reported immediately to the IRB Office (797-1821).

The research activities listed below are exempt from IRB review based on the Department of Health and Human Services (DHHS) regulations for the protection of human research subjects, 45 CFR Part 46, as amended to include provisions of the Federal Policy for the Protection of Human Subjects. June 18, 1991.

Research, involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.