

**TIME TRENDS IN THE ASSOCIATIONS OF RELIGIOUSNESS AND  
DEPRESSION: FINDINGS FROM THE STIRLING COUNTY STUDY**

**By**

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Submitted in partial fulfilment of the requirements  
for the degree of Master of Science

at

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DALHOUSIE UNIVERSITY  
DEPARTMENT OF COMMUNITY HEALTH AND EPIDEMIOLOGY

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## **DEDICATION**

For Dr. Alexander Leighton, whom I did not have the opportunity to meet but whose work and writings served as an inspiration for this thesis.

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## **ABSTRACT**

**Objective:** To estimate the associations between measures of religiousness and depression and to determine if these associations have changed over the period 1952 to 1992.

**Methods:** Data were drawn from 2,398 individuals from the 1952 and 1992 cross sectional surveys of the Stirling County Study as a means of studying time trends. For this thesis, questions about frequency of religious worship attendance, frequency of saying grace, religious importance were employed to develop a scale of secularism. The individual questions and the scale were analyzed in terms of the prevalence of depression at each time point. Logistic regression was used to determine associations of depression with religion variables, adjusted for demographic and other covariates.

**Results:** Individuals who attended religious services weekly were over two times less likely to meet criteria for depression than infrequent attenders and this relationship did not change over time. Associations between religious attendance and depression were stronger among women and the medically healthy compared to men and those with a medical condition. Being more secular was associated with higher odds of depression among females.

**Conclusions:** Religious attendance has consistently been associated with lower depression over a forty year period, irrespective of marked declines in population-level religious behaviors. Associations between religiousness and depression may be stronger in females than in males.

## **LIST OF ABBREVIATIONS USED**

ANOVA	Analysis of Variance
CI	Confidence Interval
DIS	Diagnostic Interview Schedule
DPAX	Depression Anxiety
DSM	Diagnostic and Statistical Manual
ECA	Epidemiologic Catchment Area Study
MMPI	Minnesota Multiphasic Personality Inventory
NCS	National Comorbidity Survey
OR	Odds Ratio
RR	Response Rate

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## CHAPTER 1 - INTRODUCTION

Major depression is the most common of all the mental disorders. Worldwide estimates indicate that up to 330 million individuals may suffer from this disorder (1), although prevalence rates differ widely across countries (2,3). Major depression is estimated to be a leading cause of disability worldwide as measured by “disability adjusted life years,” and some projections suggest depression will be second only to heart disease by 2020 (1). In 2006 in Canada, approximately 5% of individuals age 15 and over reported symptoms consistent with major depression over a 12-month period (4). In addition to being at higher risk of social, interpersonal and substance use problems, individuals with major depression are at higher risk of developing chronic health conditions, such as diabetes and heart disease (4). Major depression is associated with psychosocial impairment (5), mental health comorbidity (6,7), poor general health and higher mortality (8,9). In a survey of 60 countries, depression caused a greater decrement in overall health than all other chronic diseases studied, including angina, arthritis, asthma and diabetes (10). Major depression also increases the risk of suicide (1).

Major depression has a potentially serious economic impact. The total estimated cost of depression in the United States was \$83 billion in 2000 (11). In Canada, the most recent estimates of economic burden of depression are based on 1996 data, where researchers estimated that the indirect costs of depression were \$6 billion (4,12). In 1998, between 62% and 76% of short term disability episodes related to mental disorders in Canada were due to depression.

The development and persistence of major depression is theorized to arise from complex interactions between biological, psychological and social factors (13). One potentially protective social factor is religiousness. Clinical observations and systematic research since the

time of Kraeplin in 1899 (14) have noted that religion and depression are related, but empirical study of these relationships has grown significantly only over the past fifteen years (15).

Recent meta-analyses have shown that measures of religiousness are, overall, associated with lower likelihood of depression, although this may differ based on the dimension of religion measured (16,17). While most studies examining these relationships have been conducted in the United States, Baetz et al. showed in a nationally representative sample of Canadian adults that individuals who attended religious services had lower odds of current major depression (18).

The interest in the association between religiousness and depression is not surprising since over 90% of the world's population is involved in some form of religious or spiritual practice (19). While attendance at religious services is declining in Canada and the percentage of individuals with no religious affiliation is increasing, over half of Canadians still have a religious affiliation or attend services (20,21). A survey of 42 Canadian psychiatrists in 2002 showed that 80% often or always inquired about their patients' religious beliefs. For patients with religious beliefs, 60% of psychiatrists considered prayer by the patient as an adjunct to treatment and 31% often or always considered referrals to clergy (22). Researchers have argued that an understanding of depression as it relates to a patient's spiritual context is crucial to clinicians, as those practitioners who do not understand this context may be less than optimally effective (23). The American Psychiatric Association recently identified religious and spiritual issues as an important area for its research agenda in relation to the development of the fifth version of the *Diagnostic and Statistical Manual of Mental Disorders* (23,24). The World Psychiatric Association has also created a section of Religion, Spirituality and Psychiatry to identify research development in the area of religion and mental disorders (25).

The observed associations between measures of religiousness and lower depression have led researchers to speculate on the mechanisms of these associations. A number of mechanisms through which religious practice could lead to lower depression have been proposed including the effects of social supports (15,26,27), improved physical health (27), lower divorce rates, lower substance use (17,28) and more effective coping mechanisms (29). In addition, researchers have suggested that depression could lead individuals to be less interested in religion and to decrease their religious practice (17).

In summary, research indicates that major depression is a common disorder with significant negative social, interpersonal and health outcomes. Recent studies have shown that religiousness is associated with lower likelihood of depression, but further elucidation of these relationships is important to understanding how religion may impact depression. In particular, understanding whether associations between depression and religion have changed over a time period during which religious importance and attendance declined among individuals can shed light on these complex relationships.

### *1.1 The Definition And Measurement Of Major Depression*

Major depression is presently defined as at least two weeks of persistently low mood and/or decreased enjoyment of activities as well as four other symptoms including disrupted sleep, change in appetite, change in energy levels and thoughts of suicide (24).

Understanding the population prevalence of depression and whether the prevalence has been changing over time has been an important focus in psychiatric epidemiology research. The field expanded greatly after the third revision of the *Diagnostic and Statistical Manual of Mental Disorders* was produced in 1980, thereby providing a systematic set of criteria for the

diagnosis of mental disorders. The Epidemiologic Catchment Area Study (ECA), the National Comorbidity Survey (NCS), the Edmonton Psychiatric Epidemiology Study, and the Ontario Psychiatric Epidemiology Study all provided a wealth of data about depression, and some suggested that prevalence of depression might be increasing (30-33). Some researchers used the lifetime prevalence rates from the ECA to show that such rates were higher among younger individuals than older persons, suggesting that the depression was rising among younger individuals (34,35). Lifetime reporting of depression required individuals to recall the timing and experience of their first episode of depression (32). The National Comorbidity Survey showed a higher prevalence of major depression than was seen previously in the ECA studies (31), although it was recognized that some of the discrepancy might have been related to methodological differences between the two studies. The Epidemiologic Catchment Area Study used the Diagnostic Interview Schedule (36) whereas the National Comorbidity Survey used the Composite International Diagnostic Interview (37).

There are a number of reasons to exercise caution when using lifetime approaches to determine time trends in the prevalence of major depression. A important criticism of these studies has been the issue of recall bias (38). Some of these studies used past year prevalence (31) but more commonly, lifetime prevalence was used (30,32); both of these require individuals to recall past episodes of depression. These approaches have been called into question (39-41). For example, cross sectional analysis of a single time-point in the ECA sites found that the 18-24 age group had a higher lifetime prevalence of major depression, schizophrenia, panic disorder, obsessive compulsive disorder, antisocial personality, agoraphobia and simple phobia than individuals older than 65 (32), even though the oldest age group had considerably more years at risk. Giuffra et al. conducted a simulation study to assess

the potential impact of diminished recall on the reported lifetime prevalence of major depression (39). They showed that even a small annual “forgetting rate” of an episode could result in a “cohort like” effect of higher lifetime prevalence of depression among younger cohorts compared to older ones. Simon and colleagues used a large multinational dataset to examine evidence for increasing depression risk (40). They found that across all countries, younger respondents had higher lifetime depression prevalence. However, the authors noted that the youngest age groups also had the highest lifetime prevalence for other disorders, including schizophrenia, something that longitudinal data does not corroborate (42). The authors also noted a clustering of reported “first onset” depressive episodes within the last 5 years across all ages, which they hypothesized was due either to better recall of recent episodes or a ‘telescoping’ effect where more remote episodes are remembered as occurring more recently. In addition, the ratio of lifetime prevalence of depression to current depression ranged from 1.8 to 2.2, indicating that about half of individuals with a lifetime history of depression were currently depressed. The authors cautioned against interpreting changes in depression prevalence based on single time-point cross sectional data. The observed effects, they argued, could be due to recall failure on behalf of older respondents and/or more liberal attitudes to reporting among younger respondents.

A separate strategy used to understand the distribution of depression has been re-assessing the same group of individuals over time. The Lundby study followed a group of individuals from a region in rural Sweden from 1947 to 1997. Early studies showed an increase in mild and moderate depression incidence between periods of 1947-1957 and 1957-1972(43). More recent analysis determined that the rise in incidence rates of depression did not continue subsequently in the most recent time period 1972 to 1997 (44). These findings were limited

because follow-up measurements of depression required individuals to recall episodes that occurred in rather long intervening periods. Thus, recall bias could also affect these estimates. In addition, the Lundby study used an unstructured method to diagnose depression, which makes it difficult to compare to more structured contemporary methods in psychiatric epidemiologic investigations (44).

The ECA study followed a cohort of individuals from 1981 to 2004 and did not find an increase in incidence of depression in between 1993-04 compared to 1981-93. The overall prevalence of past year major depression at the three time points was similar, ranging from 2.4% to 2.8%, but there was trend towards higher prevalence among young women in the most recent surveys (45).

### *1.2 Repeated Sampling and Trends over Time*

To accurately determine whether trends in prevalence rates exist, repeated sampling of the same population using consistent methods of measurement can overcome limitations of single time-point cross sectional studies and incidence studies. However, there are differences across studies that have used this approach in developing estimates in time trends of prevalence of depression. The Stirling County Study, which provides the data for this study, used repeated sampling and has the historical depth to provide an opportunity to study the prevalence of depression over time. In contrast to the single time point cross sectional studies mentioned above, the Stirling County Study measured *current* depression and impairment in 3 samples drawn approximately 20 years apart (1952, 1970, 1992), minimizing recall bias. Furthermore, structured interviews were used, using consistent definitions of depression that are comparable to contemporary standards. Findings indicated that there was not an increase in overall

depression prevalence over time, but a consistent overall current prevalence of about 5% (46). A redistribution of depression prevalence was noted in the most recent sample drawn in 1992. The study showed a higher prevalence of depression among women younger than age 45 when compared to women of the same age group from 1952 and 1970.

Since the Stirling County Study was conducted, there have been three other studies that have used repeated sampling of a population. The above mentioned NCS conducted in 1990-92 was replicated in 2000-02 and showed a slight decrease in the prevalence of current twelve-month depression from 10.1% to 8.7% (11,31). However, the extent of comparability of these two studies has been questioned (47), as the original NCS used DSM-III-R criteria for depression (which does not include clinical impairment as a criterion) and only surveyed individuals up to age 54 (older populations may have lower prevalence of depression) whereas the replication used DSM-IV criteria and individuals of ages fifteen years and older (48).

Another nationally representative study in the United States sampled individuals in 1991-92 and 2000-01 using similar methods of depression diagnosis and showed that the prevalence of past year depression increased from 3.33% to 7.06%, and this increase was seen across almost all demographic subgroups examined. While questions about depression were similar at both time points, in the earlier study, all individuals were asked all questions about depression whereas in the follow-up only individuals who answered affirmatively to depression screening questions were subsequently asked the remained depression questions. However, there was a steady prevalence of individuals endorsing the stem question about depressed mood (47). The authors suggested that a doubling of prevalence could be related to cultural, historical, or social factors. In addition, the authors noted that direct to consumer advertising regarding depression

had increased during this time, so that it may have led to increased awareness of the symptoms of depression, leading to increased reporting.

More recently in Canada, a series of nationally representative cross sectional studies done every two years showed a steady prevalence of past year depression over the time period 1994 to 2007. Women had a consistently higher prevalence of depression than men (6-7%, while men had a prevalence of 3-4%) (49). This study used the CIDI to measure depression, which is the same measure used by the NCS, yet the prevalence estimates are lower in these Canadian samples. These Canadian prevalence estimates are similar to those seen in the Stirling County Study, despite different measures being used. Bearing in mind the limitations of differing measurement and Stirling County being a sub-population in Canada, these findings may indicate that the prevalence of depression in Canada has been relatively consistent over the past fifty years.

### *1.3 Potential Causes of Major Depression*

A major question for researchers and clinicians has been identifying the causes of and factors associated with major depression (8). An understanding of the causes of this illness could aid in forming preventative strategies to reduce the burden of disease (8,50). The development and persistence of major depression is theorized to result from complex interactions between biological, psychological and social factors (13,50). Biological factors such as genetic make-up (51), as well as physical illnesses and differences in brain structures (13) have been linked to the development and persistence of depression. Psychological factors such as coping strategies, intelligence, and personality type have also been linked with depression (52,53). Social factors such as exposure to stressful life events (54), socioeconomic

status (55), marital status and social supports (56) have all been identified as risks or protective factors for development of depressive disorders.

Broad social trends such as secularization have been identified as factors that may improve our understanding of the development of mental disorders (46,57). Demographic shifts, increasing urbanization, greater geographic mobility with decreased face-to-face relationships, changes in family structure, alterations in the roles of women in society, increasing divorce rates and decline in religion orientation have all been identified as changes that could potentially have contributed to changes in the distribution of depression (34,45,57). Interest in social risks for depression has increased in part because the above-mentioned studies suggested a possible increase in the prevalence of depression. While the limitations of these studies were outlined and doubt was cast on the idea that depression is rising, the findings of the Stirling County study showed a redistribution of depression prevalence, notably an increase in prevalence among women younger than 45 years old (5,34,35,57,58). Authors suggested that investigating the factors that were associated with this rise could prove to be extremely fruitful in unraveling the underlying risks for major depression (45,58).

Most social trends occur gradually and across generations but most contemporary epidemiologic investigations of psychiatric illnesses have short follow-up periods, which can be powerful in understanding proximal risk factors (such as stressful life events), but do not have the scope to be able to study long-term trends such as changing patterns of religiousness. Other investigations have longer follow-up periods, but do not go back far enough in time to be able to provide an historical perspective on factors associated with depression. In contrast, the Stirling County study used sampling techniques on the same population over a forty-year period, allowing for the observation of trends in associations of religiosity and depression.

#### *1.4 Definition, Epidemiology and Measurement of Religion*

Over 90% of people worldwide regularly engage in some form of religious or spiritual practice (19). Presently in Canada, however, only 20% of individuals attend religious services weekly, and 32% attend at least monthly (21). This is considerably lower than the 67% of Canadians who attended religious services weekly in 1946. However, 43% of Canadians reported engaging in weekly private prayer, and another 22% reported engaging in private prayer at least a few times per year (21), indicating that a significant portion of Canadians still engage in religious practices.

Religion has been defined as an “organized system of beliefs, practices and rituals designed to facilitate closeness to the sacred or transcendent...” (15). Religion is widely recognized as a multidimensional concept. Pulling together work from Allport and Ross (59), Glock (60), King and Hunt (61), Paloutzian and Ellison (62) and Pargament (63), Koenig identified separate, overlapping domains of religion (15). These domains are: i) religious belief; ii) religious affiliation (denomination); iii) organizational religiosity; iv) non-organizational religiosity; v) subjective religiosity; vi) religious commitment/motivation; vii) religious ‘quest’; viii) religious experience; ix) religious conversion; x) religious well-being; xi) religious coping; xii) religious knowledge and; xiii) religious consequences. The most commonly measured domains in the health literature are: organizational religiosity (which is usually measured through frequency of religious attendance); non-organizational religiosity (which includes private religious activities); and subjective religiosity (which reflects the individual’s personal importance of religion) (15,64). A more recent study by Kendler et al. used a sample of twins to empirically determine the dimensions of religiosity through factor analysis (65). Based on the items in

their questionnaires, they identified seven distinct dimensions of religiosity. According to their results, measures of non-organizational religiosity and personal importance of religion are part of a “general religiosity” domain, while organizational religiosity loaded on the “social religiosity” domain.

Researchers have previously noted, however, that while these domains are separate, they also need to be interpreted in light of an individual’s religious affiliation. It has been argued that ‘context free approaches’ to the study of religiousness and mental health are vulnerable to over-generalization (66,67). Interactions of a religious measure such as religious attendance with an individual’s religious affiliation could provide greater depth of understanding. For example, being a member of a Baptist church means something quite different (it includes active identification with and participation in church) from being a member of the Catholic Church (where membership alone may have less meaning attached to it and does not necessarily have same level of participation) (15).

### *1.5 Associations between Religion and Depression*

A large body of empirical research has linked religious activity with lower rates of depressive disorders (68). Measures of organizational religious activity have consistently been associated with decreased depressive symptoms (69,70). A recent meta-analysis of 147 studies found that greater religiousness (using a variety of measures spanning numerous domains) was weakly associated with fewer depressive symptoms (71). The vast majority of studies have been conducted in Western countries using mainly Judeo-Christian samples (27), but several studies have more recently been conducted in the Middle East using Muslim populations. A

review article found that the majority of these studies also found an inverse relationship of higher religiousness and lower likelihood of depression (72).

Different aspects of religion seem to be associated with depression in different ways. The above meta-analysis showed that the associations of religiousness with depression varied based on the measured domain. Measures of religious attendance are consistently associated with decreased depression (16,26,68), while those of private religious activity are not (73-75). Self-rated religious importance has been associated with decreased depression but only to a small degree (17). Meta-analyses and reviews have found that different aspects of religiousness and mental health outcomes differ across domains in terms of magnitude of their effect (14) and at times the direction of association with mental disorders (16,17,71). This has led researchers to recommend that, where possible, investigations examine the domains individually to better understand the relationships of religiousness and mental disorders (15,66).

### *1.6 Potential Confounders in the Associations of Religion and Depression*

A number of factors have been identified that may influence both religiousness and depression and these are considered important to include as covariates when examining associations between these two variables (74,76). Females report higher interest in religion than men, have stronger religious commitment, and attend religious services more often. Moreover, this appears to hold true over the life course and is independent of religious affiliation (77). It has also been theorized that religious individuals are more likely to be married than single and marriage may confer protection against depression through the impact of improved social support (78). Studies have shown that religiousness is associated with

lower divorce rates and increased marital satisfaction in community and nationally representative samples (18,79).

Some of the most robust associations between measures of religiousness and depression have been found among older adults (80). A meta-analysis examining associations of religiousness in general with depression showed that the protective association between religiousness and depression was highest at retirement age (>65), though this age difference was only marginally statistically significant (17). It is important to note that 84% of the subjects included in the meta-analysis were from American samples. A higher proportion of individuals in the U.S. are religious compared to other Western countries and it has not experienced the same decline in markers of religiousness (15,21,27,74,81,82). Assuming this age difference is real, researchers have speculated that the observation of a stronger association among the oldest individuals may be due to a “cohort effect” where this association has always been present among the group of individuals currently aged greater than 65. The other possibility is that the association between religiousness and decreased depression is actually stronger at older ages (80,83). However, most studies in the area of religiousness and depression have been conducted in the past twenty years, so it is unclear whether the association is unique to old age, or an emerging trend in these associations among more recent cohorts (15,17). However, given that religious attendance and self-rated religious importance rise with age (20,82), and the observation that religiousness may be more strongly associated with lower depression at older ages, consideration of age in the analysis of associations between religiousness and depression is important.

It has also been suggested that the relationships between religiousness and lower odds of depression among older individuals may be related to physical health. This hypothesis centres

on two potential pathways. The first is that individuals who are healthier may be more able to attend religious services and practice their religious faith (78). The second is that individuals who are religious during their lifetime may engage in health practices, such as decreased alcohol and drug use, that protect them from physical illness (13), which is strongly associated with depression (84). Physical illness has been identified as a potential confounding factor that should be included as a covariate in examination of the association between religiousness and depression (76).

Lower rates of substance use have been consistently associated with higher levels of religiousness (68,85). More recently, the results of three national surveys showed that adults who did not consider religion very important or were less frequent religious attenders were more likely to use alcohol, cigarettes, and illicit drugs compared to individuals who reported religion as important and who attended religious services (86). Heavy alcohol use is thought to be causally related to depression (87).

A further consideration for a deeper understanding of the associations between religiousness and depression is the overall religious climate in a population. A recent systematic review found that associations of higher levels of religion and lower levels of depression appeared to be stronger in areas that have a high prevalence of religious involvement and low socioeconomic standing (15). However, comparing these associations across countries has a number of potential limitations such as language differences in depression measurement (88).

Another way to understand whether there is an interaction of overall religious climate on the association between religion and depression is to study these relationships in a single, defined population over a period of secularization. While secularization is considered a multidimensional concept, on a population based level, it has been described as societal decline

in levels of religiousness (89). Declines in religiousness have been witnessed in Canada over the past half century (21). However, previous research has been limited by not having the historical scope to examine the associations of religiousness and depression over time.

### *1.7 Limitations in the Literature*

There are limitations in the literature that restrict our knowledge of the relationships between religion and depression. Canadian society has become more secular over the past fifty years, with a smaller proportion of the population attending religious services today. The vast majority of literature focuses on data gathered in the past twenty years (17). However, it is possible that the relationships between religiousness and mental disorders have changed over time. No study has been able to examine time trends in these relationships, but if documented this would provide information on mechanisms of association that could guide future research. In addition, most studies have been cross sectional, involving a sample from a given population at one period in time without repeat measurement in either individuals or populations. In the case of a social factor such as religion, studies examining long-term trends may be more informative than studies with a smaller scope. Another limitation noted in the literature is the measurement of an individual's religiousness. Various measures have been utilized and often studies utilize one measurement (for example frequency of religious attendance), which may not capture the full picture of the influence of religion on a person (15,26). The majority of studies have examined populations in the United States, which has a different religious landscape from that of Canada (20,27,81). There have been no studies that have used repeated sampling over time to examine the time trends in the associations between religiousness and depression.

This investigation proposes to overcome some of these limitations by using data from the Stirling County Study, the longest ongoing study of the epidemiology of psychiatric disorders in a general population in North America. It is the only one of this historical depth to use repeated sampling of the population as well as follow-up of each earlier sample.

The overall objective of this proposal is to examine whether religiousness is associated with the prevalence of depression and whether this association has changed over time. The specific research objectives are to:

Objective 1. Determine the population level trends in measures of religiousness over time.

Objective 2. Determine the demographic characteristics of individuals in relation to their religiousness

Objective 3. Determine whether there are changes in the associations of religiousness and major depression over time.

## CHAPTER 2 - THE STIRLING COUNTY STUDY

### *2.1 Preliminary Research: Questions about Psychiatric Symptoms*

A preparatory study was conducted in 1950-51 to develop a set of questions about psychiatric symptoms. Agreed upon criteria for psychiatric diagnoses did not exist at the time. In addition there were no instruments that had been used in the general population to identify psychiatric illnesses.

Initially, a 75-item inventory of questions was developed. It mainly used items from the United State's Army's Neuropsychiatric Screening Adjunct (90) and the Eysenck Inventory which had also been constructed for service personnel (91). At the time, these "military" instruments were the only inventories available that approximated what might be appropriate for the general population in contrast to psychiatric patients. Another well-known instrument considered in this preparatory work was the Minnesota Multiphasic Personality Inventory (MMPI) (92,93). The MMPI group was visited and they advised against using any of their items. Their reason was that the questions had been developed for seriously ill patients. Because depression was usually thought of as a psychotic disorder in those years, the MMPI researchers believed that questions focused on disturbed mood would be threatening and inappropriate in a general population study. In view of this the 75 items mainly represented autonomic anxiety and the associated symptoms of depression dealing with disturbances of sleep, appetite, and energy but not with lowered mood.

The 75 items were administered to patients being treated in psychiatric services located in the provincial capital as well as to community residents from a part of the province some distance from "Stirling County". It was possible to identify a smaller number of items when the patient group was limited to those diagnosed as "neurotic" and compared to the "presumed

normals" of the community sample. The procedure that made this separate possible was an early form of the statistical method known as "discriminant function".

The preparatory work was not completely finished when the interview schedule for the 1952 survey in Stirling County was being constructed. For that purpose, the study's psychiatrists were dissatisfied with the omission of reference to disturbed mood. Thus they added a question about "being in poor spirits" which was then a common form of inquiry during "intake" interviews in psychiatric facilities. Later, the questions that had been selected by the procedures described above were published and named the "Health Opinion Survey"(94).

The first edition of the Diagnostic and Statistical Manual (DSM-I) was published in the same year as the first wave of the Stirling County Study, but diagnoses were not equivalent to current definitions. While anxiety was the hallmark of neurotic disorders in the DSM-I, a section of neurotic disorders did include milder forms of depression. In addition, DSM-I diagnoses were "etiologically based", rather than on observable criteria, which contemporary diagnoses are based on. One of the original goals of the Stirling County Study was to investigate the relationships between social experience and psychiatric disorders, including loss events that DSM-I stated precipitated depression. To avoid building into the definitions of disorders the very relationships of interest (social phenomena and depression) context free approaches to symptomatology were required.

## *2.2 Study Site*

Data for this thesis come from the archives of the Stirling County Study. 'Stirling County' is a fictitious name of a region in Atlantic Canada. The County has had a consistent population number of about 20,000 during the period of data collection. At the start of the study in 1952,

Stirling County was largely rural, but over the course of the next fifty years major changes occurred that have characterized many other places in North America. Primary industries have declined and service and information industries have grown. Women have become a large part of the labor force, educational levels have risen, health care has undergone a transition from private to provincial insurance, the standard of living has risen, increased access to the media and personal travel have widened knowledge, and racial tension, the use of illicit drugs, and criminal activity have all increased. Family size has decreased and the bonds of marriage and community have weakened. While it is not urbanized in the sense of being densely populated, the area has undergone most of the changes that characterize industrial societies generally (57).

### *2.3 Research Design*

New samples were drawn from the Stirling County population at different points in time, which makes it possible to examine differences in social factors and mental disorder across generations. The Stirling County Study consists of successive samples of the population of Stirling County as well as longitudinal follow-up of individuals from previous samples when a new sample was drawn. This approach was used to provide follow-up of the population as a whole as well as individuals within it. However, for the purposes of this study, only the new cross sectional samples from two time points will be examined. The first sample was drawn in 1952 (N=1,003; response rate [RR]=91%) and new samples were selected in 1970 (N=1,201; RR=88%) and 1992 (N=1,396; RR=86%) (53). The samples represent adults aged 18 and older. In 1970, the question regarding religious attendance was not asked of the entire sample. As religious attendance is a key variable, the current study only uses data from the 1952 and 1992 samples.

## *2.4 Sampling*

The procedures of sampling in 1952 involved the creation of a research census of adults. The county was divided into strata based on common social environmental features. Variable sampling rates were used for each stratum. The household was the unit of probability sampling and each household was assigned a number. The starting household in each stratum was randomly selected and every *n*th household was selected thereafter. Male and female heads of household were chosen in an alternating fashion. Headship of a household was defined as being the main breadwinner or main meal-preparer. Single gender households were accepted without changing the sequence between male and female heads. The sample was compared to the 1951 Canadian census and showed a high level of congruence for total population, number of households and demographic factors (95). In 1992, the census was updated by the Stirling County investigators and individuals 18 years and older were randomly selected by computer within each strata. Comparison to the 1992 census also indicated good congruence.

The influence of variable sampling rates has been assessed. Findings showed a small degree of variation such that most recent reports from Stirling County focus on unweighted samples (96-98).

To assess potential systematic differences due to the differences in the sampling techniques between 1952 and 1970 (where only heads of households were sampled in 1952 versus all members in 1970), the investigators for the Stirling County Study examined the prevalence results of heads of households in 1970 and found that inclusion of individuals other than heads of household did not affect findings about the prevalence of disorders (99). Examination of the samples indicated that, with the exception of a higher completion rate among women compared

with men, the demographic features of the population as a whole are proportionately represented.

### *2.5 Collection of Data*

Subjects were interviewed in their homes by trained lay interviewers. Subjects were informed of the purpose of the research and gave informed consent to be interviewed. The procedures for informed consent were approved by government and academic committees for ethical research in both the US and Canada.

The interview involved a highly structured format using questions about depression, anxiety and impairment in everyday functioning. Questions about psychiatric symptoms were obtained from questionnaires as discussed above in *Preliminary Research* (94). Questions about demographics, general health, social conditions and life experiences were also asked.

In 1992, in addition to the Stirling questions about psychiatric symptoms, the Diagnostic Interview Schedule (DIS) was also used. The DIS was a diagnostic interview developed in the United States as part of the ECA Studies (100).

### *2.6 Analyzing Psychiatric Data*

A case of depression was identified through DPAX (DePression-AnXIety) procedures. DPAX is a computerized algorithm that determines the likelihood of an individual being a 'case' of depression based on responses to the interview schedule. The computerized algorithm was developed to replace and replicate the human judgements about whether an individual represented a 'case' of depression as was carried out by psychiatrists in 1952. As indicated above, the original interview schedule in 1952 contained only one question about dysphoric

mood (using the word “spirits” to represent mood) and one about functional impairment. For the schedule developed for the 1970 data gathering, two additional questions about mood were added (“feeling low and hopeless” and “wondering if things are worthwhile”). Questions on functional impairment were also expanded: not being able to “get going”, not being “healthy enough to do things”, interference with work, family, social activities. The questions on associated symptoms (disturbances of appetite, sleep, and energy) were asked in all schedules. In terms of defining a psychiatric ‘case’ of depression, two algorithms were developed: DPAX-1 and DPAX-2. For the initial sample, because of the limited number of questions asked, only DPAX-1 can be applied. For the subsequent samples, DPAX-1 or DPAX-2 can be applied. The DPAX algorithms, described in detail elsewhere (101,102), take a different approach than newer diagnostic schedules. The first step of diagnosis in more recent interview schedules usually includes asking essential feature of a disorder and only if the response is positive will they be asked the later questions about the disorder. DPAX makes use of the total body of responses and uses discriminant function weights to reproduce psychiatrist ratings through a series of steps. The general outline of the algorithms can be seen in Table 1. Both the DPAX-1 and DPAX-2, while not exact, approximate the DSM-IV-TR definition of major depression (24). While the required duration of impairment is 1 month, subjects tended to give much longer durations, averaging 8 to 11 years (46). As a result, the DPAX depression diagnosis most closely resembles a combination of the prevalence of acute episodes of depression as well as more chronic episodes, including DSM-IV-TR dysthymic disorder (24).

Changes to the algorithm and questions were made mainly due to concerns about a change in how individuals described depression. In particular, it was noted responses to feeling in poor spirits declined over time while reporting feeling low, hopeless or wondering if things

were worthwhile increased. In addition, comparing the diagnostic algorithms across the three time points led to four important observations that relate to time trend studies:

1. DPAX-1 gave a steady prevalence between 1952 and 1970, while DPAX-2 gave a steady prevalence between 1970 and 1992.
2. The same results about the prevalence of depression and its relationship to gender and age were produced for 1970 irrespective of which DPAX version was used;
3. Agreement between DPAX-1 and DPAX-2 was good in 1970 but not very good in 1992;
4. DPAX-1 showed a decline in depression prevalence, which was likely due to a change in vernacular.

As a result, it appeared that 1970 was a transitional time where either DPAX-1 or DPAX-2 could be used. In previous studies carried out by the Stirling Study investigators, DPAX-2 has been used for 1992. In the work proposed here, the same strategy will be employed.

### *2.7 Validity of Psychiatric Assessment*

Assessments of the validity of the depression diagnosis have been conducted in several ways and described in detail elsewhere (57). A validity study was conducted as part of the HOS study. A psychiatrist interviewed 64 individuals, and his clinical decisions about whether the subject suffered from a psychiatric disorder or not served as a gold standard against which to judge the validity of the questions. This validity study resulted in a sensitivity of 83% and specificity of 76%. A similar study was conducted prior to data collection in 1970 and resulted in a sensitivity of 93% and specificity of 83%. Towards the end of the 1992 study, a validity

study was conducted where psychiatrists and psychologists administered the Structured Clinical Interview for DSM Diagnosis (SCID) (103). The results were not as good as the previous assessments, resulting in a sensitivity of 69% and specificity of 91% (57). The Epidemiologic Catchment Area Study conducted a similar validity study in the 1990s comparing their interview (the Diagnostic Interview Schedule) to another clinician administered interview, the Schedules for Clinical Assessment in Neuropsychiatry (SCAN) (104) and showed poor sensitivity of 29% and a specificity of 96% (100,105). The exact meaning of these results is not known, but it is possible that the threshold for determining ‘caseness’ are discrepant and account for the low sensitivities.

The prevalence rates of the Stirling County Study are in line with other epidemiologic investigations of mental disorders. In the earliest work, the Stirling County Study showed an overall prevalence of all mental disorders of 20%, in line with the Epidemiologic Catchment Area study, the Ontario Study of Psychiatric Disorders and the Edmonton Epidemiology of Psychiatric Disorders Study (30,33,45). The National Comorbidity Survey showed a higher rate of about 30% (35). Using the Diagnostic Interview Schedule (DIS), the Epidemiologic Catchment Area Study and the Stirling County Study showed similar rates of one-month prevalence of Major Depression of 2.2% and 2.6% respectively (58).

### *2.8 Archive of the Stirling County Study Database*

This investigation uses data currently available in from the Harvard-Massachusetts Data Center. The archive is prepared in line with contemporary standards for the protection of human subjects through preventing the identification of individuals. The procedures were approved by the Human Subjects Research Committee of the Massachusetts General Hospital.

Variables used in the current study are described below. The current study has been approved by the Dalhousie Health Sciences Research Ethics Board.

## CHAPTER 3 - METHODS

### *3.1 Measures of Religiousness*

Religion is a multidimensional concept. Respondents' answers to four questions spanning four domains regarding religious orientation are available in the archived Stirling County dataset. These domains are: (i) organizational religious involvement, which were determined by frequency of religious service attendance; (ii) non-organizational religious involvement, which were determined by the frequency of saying grace at meals; (iii) self-rated religious importance; and (iv) religious affiliation. The categories of the original variables were collapsed in some cases because of low response to certain potential responses. For example, due to fewer than five percent of respondents endorsing religion being of no importance to them in 1952, the response categories of 'no importance' and 'some importance' were collapsed.

I. The following question was used as a measure for the Domain of Organizational Religious Involvement:

"On average, how often do you attend religious services?" The original 6 level categorical responses were categorized into four levels to maintain appropriate cell sizes.

Responses: (1) Weekly or more; (2) about once per month (3) once or twice per year to every few months;

(4) hardly ever or never.

II. The following question was used as a measure of the Domain of Non-Organizational Religious Involvement: "How often do you say grace at meals?" The original 4 level categorical responses were categorized into three levels to maintain appropriate cell sizes.

Responses: (1) Regularly or often (2) on special occasions (3) never.

III. The following question was used as a measure for the Domain of Religious Importance:

“How important would you say religion is to you?” The original 3 level categorical responses were categorized into two levels to maintain appropriate cell sizes.

Responses: (1) Very important; (2) of some importance or no importance at all.

IV. Religious affiliation was categorized into three categories: (1) Catholic; (2) Protestant; (3) Other religion/no religion. ‘Other’ and ‘no’ religion were combined into a single category because of low cell sizes. The “other religion” category consisted of forty-four endorsed religious affiliations.

### *3.2 Other variables (covariates)*

Age was included as a three level categorical covariate <45 years, 45-64 years and >65. The cut off of age 45 is used as past research from the ECA study and the Stirling County Study have shown a higher prevalence of depression among individuals younger than 45 (32,46). The group for >65 was included because of literature suggesting that the associations between religiousness and depression may be stronger in older adults (80). Gender was also included as a binary covariate. Level of smoking was used as a covariate because of its associations with both major depression and religiousness as well as its associations with other substance use (96,106,107). While archives of Stirling County data do not currently provide information on alcohol use, smoking is used here as an alternative. Smoking habits were determined by two questions: “Do you smoke? Would you say ‘a lot’, ‘some’, or ‘not at all’?” Individuals who reported smoking were then asked the amount of smoking: “more than 20 cigarettes a day” or “less than twenty cigarettes a day”. Smoking was dichotomized into any smoking versus no

smoking. Presence of a medical condition was determined from the check list of medical conditions included in the interview schedule. The conditions were coded as involving infection, neoplastic, endocrine, hematologic, neurological, cardiovascular, respiratory, digestive and genitourinary disorders as well as injuries and surgery. These were coded as “having a physical illness” versus “no medical illness”. Marital status was categorized as (1) married or common law; (2) divorced, separated, widowed; (3) never married. Education level was included as a covariate and was divided as available in the archived Stirling County dataset into  $\geq 11$  years of education and  $< 11$  years of education.

### *3.3 Analysis*

All analyses were carried out using statistical application software SAS 9.2. The following outlines the approach to the analysis for each research objective:

#### *Objective 1: Determine the population level trends in measures of religiousness over time.*

The current prevalence of religiousness (religious attendance, frequency of saying grace at meals, religious importance, religious affiliation) and corresponding 95% confidence intervals of the categorical religious variables were computed for the 1952 and 1992 samples. Chi square values with corresponding p-values were computed to determine statistically significant differences ( $p < 0.05$ ) at each time point.

#### *Scale of Secularism*

To measure the overall level of religiousness of individuals as well as to achieve greater power in regression than through individual categorical religious items, a continuous scale of

secularism was developed. The scale was meant to represent an individual's overall level of religious activities, orientation, and attitudes. A higher score on the scale represents a higher level of secularism. Secularism can be conceptualized as the reverse of religiousness (67). Researchers have suggested that conceptualizing overall religious measures as secularism may lead to a more precise measurement, as worldviews commonly considered secular may actually have more in common than worldviews of the multitude of existing religious traditions (67). In addition, conceptualizing religious orientation in general as secularism has a somewhat different psychological interpretation. Given that the majority of North American populations are at least somewhat religious and interpreting inverse correlations between religiousness and health as religion being protective of health it might be meaningful to interpret these findings as secularism being a risk factor for poor health. Using this paradigm, the scale of secularism was created based on the three religiousness variables (religious attendance, religious importance, frequency of saying grace). A high level of secularism was conceptualized as never attending religious services, never saying grace, and not finding religion important at all. The original religion variable categories were included. Frequency of religious attendance had six possible options (scores in parentheses): More than weekly (1), weekly (2), monthly (3), 1-2 year (4), hardly ever (5), never (6). Self-rated importance of religion had three options for responses: Very important (1), of some importance (2), of no importance (3). Frequency of saying grace had four response categories: Frequently (1), often (2), on special occasions (3), never (4). Internal consistency (Cronbach's alpha) of the scale was 0.65. Though the scale's internal consistency is below the widely accepted .70 cutoff, it is acceptable by Loewenthal's standard, which indicates that a Cronbach's  $\alpha \geq .60$  is adequate for short scales (108).

Because all variables were scaled differently, each variable was individually standardized to z-values in 1952. This was done because raw data showed that, in each measure, the population was more religious in 1952, and that there were decreases in religious measures over the forty years. Thus standardizing them across both time points would obscure such changes. Because the individual variables were not normally distributed, the natural logarithm of each variable was computed first. Z-values were calculated for the logarithm of each religious measure in 1952 and corresponding z-values for each corresponding religious measure were imputed for 1992. The z-values of the three variables were then summed giving an overall value which is termed the scale of secularism (higher score=lower religiousness). The range of the scale was -4.51 (least secular) to 4.69 (most secular) (M=0.63, SD=2.29). A higher score of secularism means a lower level of religious involvement, orientation and attitude. For example, a score of 4.69 would represent an individual who reported never attending religious services, never saying grace, and religion not being important to them. A score of -4.51 would represent an individual who reported attending religious services more than weekly, saying grace regularly at meals, and religion being very important to them.

For the scale of secularism, mean values and standard deviations were determined for 1952 and 1992. Differences in these two time points were determined using an independent sample t-test.

*Objective 2: Determine the association between demographic characteristics of individuals and their religiousness.*

To investigate the descriptive characteristics of individuals as a function of their religiousness associations between scores on secularism and each of the covariates were

computed (gender, age, marital status, education, smoking status, presence of a medical condition and religious affiliation). Religious affiliation was also included as a covariate.

The mean score and standard deviation of the scale of secularism was examined for each category of covariates. Differences in secularism scores across covariates, for each year, were tested using one way analysis of variance (ANOVA) in SAS procedure PROC GLM.

More detailed cross tabulation between the covariates (gender, age, physical health status, marital status) and the religious variables listed above (religious attendance, private religious activity, self-rated religious importance) were used to investigate the relationship of demographic characteristics and religiousness of individuals. Logistic regression was used to compute associations between religious variables and covariates at  $p < 0.05$  as well as 95% confidence intervals at each time point in each study sample (1952, 1992).

*Objective 3: Determine whether there were changes in the association between measures of religiousness and depression over time.*

In each sample (1952, 1992) and the combined sample, the prevalence (and associated confidence intervals) of depression for each category of religious variables was computed. Binary logistic regression was used to investigate the associations between each religious variable and depression in the samples. For regressions involving religious attendance, the “never/hardly ever” category was the reference group; for grace at meals “never” was the reference category; for importance “of some/no importance” was the reference category. Multiple logistic regression analysis was used to calculate adjusted odds ratios. The first odds ratio adjusted for gender and age. A second adjusted odds ratio adjusted for the remaining covariates: marital status, health, smoking, religious affiliation and education. Sample year

was included as a covariate in the combined analysis. Odds ratios and 95% confidence intervals were computed. A p-value of  $<0.05$  were used as an indicator of a statistically significant relationship. For all logistic procedures involving categorical predictor variables, Deviance and Global Chi Square (Pearson) statistics were used to assess goodness of fit using p values of  $<0.05$ .

To assess change in the association between religiousness and depression over time, the two samples were included in a single analysis and study year was used as a variable in the model. Four models were created, one for each religious variable with depression being the outcome variable. Study year, the religious variable and an interaction between religious variable and study year were used as predictors to determine the presence of a time trend.

In the combined analysis, interaction of religious variables and the covariates were each individually examined. If interactions were statistically significant, the analysis was stratified by the covariate.

## CHAPTER 4 - RESULTS

Between 1952 and 1992 there were highly significant changes in each of the three measures of religiousness (Table 3). For example, as weekly attendance at religious services decreased, infrequent attendance increased. Much the same pattern applied for the importance of religion. With respect to grace at meals the proportion of those who never said grace remained steady. However, the proportion who limited grace to special occasions increased at the expense of more regular practice.

In both 1952 and 1992, women, older individuals, and non-smokers were more religiously oriented than were men, younger individuals and smokers in both (Table 4). In 1952 Catholics and Protestants were more religiously oriented than people from other religions, but this reversed in 1992 when people from other religions were more religiously oriented than Protestants and Catholics. In 1992, people who were separated, widowed or divorced were more religiously oriented than married or never married individuals. More detailed associations between individual religious variables and covariates are available in the Appendix.

As expected from earlier reports from the Stirling County Study, the prevalence of depression did not change significantly across the two time periods but remained close to 6% (Table 5). There were, however, differences in prevalence according to the measures of religiousness. For example in both 1952 and 1992, close to 9% of those who hardly ever or never attended services were currently depressed.

In 1952 and 1992, Individuals who attended religious services weekly or more had significantly lower prevalence of depression than those who never attended and this was independent of the effects of demographic factors, health, or religious affiliation (Table 6). In

1992, monthly attendance was also associated with lower odds of having depression. The associations between attendance and depression did not differ between 1952 and 1992 overall ( $p=0.19$ ) but did for monthly attendance ( $p=0.04$ ). Gender was found to interact with religious attendance ( $p=0.0005$ ). Stratified analysis by gender (table 6A) showed that among males attending worship services at least once a week was associated with lower odds of depression. Among females, both weekly and monthly attendance were associated with lower odds of depression. Having a medical condition was found to interact with religious attendance as well ( $p=0.037$ ). Stratified analysis by presence of a medical condition (table 6B) showed that among those with a medical condition, weekly attendance was associated with lower prevalence of depression compared to those who did not attend religious services. Among healthy individuals, attendance at each level of frequency was associated with lower prevalence of depression compared to people who did not attend. Interactions of attendance with each of age, marital status, and affiliation were examined to determine whether associations with depression differed in these groups but these were not significant ( $p>0.1$ ).

In 1952, saying grace often was marginally associated with lower prevalence of depression in unadjusted regressions ( $p=0.09$ ) but was significant when adjustments were added (Table 7). Testing for a time trend in the association of grace and depression was not significant ( $p=0.62$ ). Testing for interaction effects between saying grace and each of gender, age, marital status, medical condition and religious affiliation was not statistically significant ( $p>0.1$ ).

Religious importance was not significantly associated with depression in 1952 or 1992 (Table 8).

For each point on the scale of secularism, the odds of having depression increased by approximately twenty percent in 1952 and thirteen percent in 1992 after adjusting for

covariates (Table 9). Examining the interaction effect of score on secularism and sample year on depression indicated that the relationship between secularism and depression in 1992 was not significantly different from secularism and depression in 1952 ( $p=0.55$ ). Testing for interaction effects between secularism score and each of the covariates indicated that gender interacted with scores of secularism ( $p=0.10$ ). Stratified analysis (Table 9A) by gender showed higher scores on secularism were associated with higher prevalence of depression among females.

## CHAPTER 5 - DISCUSSION

Using data from the 1952 and 1992 waves of the Stirling County Study this study has examined the associations between religious behaviors/attitudes and depression in each year and investigated changes in these associations over time. In line with previous work from the Stirling County Study, this study has shown that the prevalence of depression has remained stable from 1952 to 1992. As expected, over the forty year period, there were marked decreases in religious attendance, frequency of saying grace at meals and the importance placed on religion.

Frequent religious attendance was associated with lower odds of depression. At the beginning of the study in 1952, the majority of people attended religious services regularly and identified religion as very important in their lives. By 1992, marked decreases in religious indicators were evident. In spite of these changes, the protective association between religious attendance and depression did not change over time. People who reported saying grace regularly in 1952 also had a lower prevalence of depression. Higher scores on secularism were associated with greater odds of depression among women and this also did not change over these forty years. Religious importance was not associated with depression at either time-point in this study.

Frequent religious attendance was consistently negatively associated with depression over a period of time that had seen decreasing rates of religious attendance. A number of studies conducted in the past twenty years have also shown inverse associations between religious attendance and depression. A meta-analysis of 147 studies showed that of commonly used religious measures, attendance at religious services was most consistently associated with lower odds of depression (109). Using recent, nationally representative data from Canada,

Baetz et al. found that higher frequency of religious attendance was associated with lower odds of past year major depression(18). The current findings are also in line with those from a study in the Netherlands, which used national data to study the associations between religious attendance and depressive symptoms in repeated cross sectional samples over the period of 1975-1996 (110). The researchers found that lower frequencies of religious attendance were associated with greater likelihood of having depressive symptoms and that this did not change over the study period. The Netherlands is a country that has undergone a more marked secularization process compared to North America (15,74). This study extends findings from the literature by showing that associations between religiousness and depression are related independent of marked changes in the levels of religiousness in the population.

There are a number of possible explanations for these findings. Religious attendance may reduce the likelihood of developing depression or the duration and recurrence of depressive episodes. Using a United States community sample of 6,928 adults, Strawbridge and colleagues showed that individuals who were depressed at baseline (as measured by threshold level of depressive symptoms) and attended religious services weekly were less likely to be depressed twenty-nine years later (111). However, it is also possible that being depressed, of which a core symptom is anhedonia, or lack of interest or desire to engage in activities, may lead to a decline in motivation to attend religious services, accounting for the observed cross sectional associations. In a sample drawn from the North Eastern United States, Maselko et al found that among females, developing major depression prior to age 18 predicted a decline in religious attendance in adulthood (112). The observation that depression leads people to attend religious services less frequently could explain the consistent associations of lower odds of depression among people who attend religious services more regularly.

Among people without a medical condition, any reported religious attendance was associated with lower odds of depression, whereas for people with a medical condition, only weekly attendance was associated with lower odds of depression. Medical illness is a risk factor for depression (113). It may be that individuals who had a reported a physical health problem but attended religious services weekly on average had less debilitating illness and were more able to attend religious services. Functional impairment is associated with increased risk of depression, thus it is possible that severity accounts for the observed interaction effect of medical condition and religious attendance on prevalence of depression. In addition, depression is associated with additive functional impairment in individuals with medical illness (114). Equally, however, considering that religious attendance has been associated with better preventative health practices and better outcome in physical illness (17,70,115), it may be that religious activity promotes physical health and decreases the likelihood of being depressed.

A mechanism of the observed association between regular religious attendance and lower odds of depression may be due to effects of social capital. Social capital has been conceptualized as the resources individuals can access through their social networks (116). Recently, researchers have suggested that religious social capital - the resources available to individuals and groups through their connections in a religious community – may help understand the associations between religion and improved health outcomes (117). In a small sample, the researchers showed that individuals who attended religious services more regularly also scored higher on a measure of religious social capital. Higher levels of social capital have been shown to be associated with lower depressive symptoms and depression (118). It may be that individuals who attend religious services are more integrated into a community and as a

result have greater access to social resources which may buffer against the effects of stressful life events, leading to lower depression.

Developmental factors may also play an important role in the religiousness/mental health relationship. Early life experiences are crucial to the development of an attachment style (119) and attachment styles have been shown to be differentially associated with risk of a variety of mental disorders in adulthood, including depression (120). Being born into a religious family may increase the likelihood of developing a secure attachment style. U.S. studies have shown that parental religious attendance showed significant benefits for young children in cognitive, emotional, behavioral and interpersonal domains (79,121). Adults who report having been sensitively cared for by their parents also score higher on measures of religiousness if their parents were religious compared to individuals who report not being sensitively cared for by their parents (122). In addition, the best predictor of a child's religiosity is his or her parents' religiosity (20,123). Thus, religious attendance in childhood may make it more likely that one attends religious services in adulthood *and* has secure attachments (with resultant lower risk of mental disorders).

Genetic factors may also play a role in the observed associations between higher religious attendance and lower odds of depression. Findings from twin studies have shown that in adulthood, individual level factors rather than shared environmental influences play a large role in individual's religious activity (115). While the Kendler twin study examined the shared genetic effects on the associations of religious attendance and substance use, depression is theorized to have genetic underpinnings (124). It is possible that a genetic, temperamental predisposition may make it more likely that an individual attends religious services and has lower likelihood of developing depression.

Saying grace at meals was associated with lower prevalence of depression, although not as strongly or consistently as attendance. Saying grace has generally been included as a measure in the domain of private religiousness (125). Measures of private religiousness have been less strongly associated with depression than measures of organized religious activity (15) and reviews have suggest that the associations may be most consistent with null effects (71). While saying grace at meals has been included in the domain of private religious activity, to my knowledge, no study has specifically examined the association between saying grace and depression, making direct comparison difficult. It is possible that grace might reflect a different underlying process than more commonly used measures of private religious activity such as frequency of private prayers. Grace is often said as part of a ritual before a meal, with the family or group and may be less of a solitary activity than other private religious activity such as private prayer. It may be that saying grace is more a reflection of a familial religious orientation. Religious orientation in the family has been shown to improve marital functioning and traditional family bonds (79), which could reduce or buffer stress and lead to lower likelihood of depression.

Religious importance was not significantly associated with depression even though there were marked decreases in the percentage of individuals stating that religion was very important to them between 1952 and 1992. Reviews of depression and religion literature have shown that the relationship between measures of more subjective, non-organizational religiousness such as religious importance and depression are inconsistent (126). A nationally representative sample in Canada found that higher religious importance was associated with more depressive symptoms (127). In his twin sample, Kendler found that the dimension of social religiosity (a factor on which religious attendance loaded) was associated with lower depression prevalence

whereas the dimension of general religiosity (a factor on which religious importance loaded) was not associated with depression (65). It may be that finding religion important alone does not necessarily lead to active practice in an organization and the potential benefits of social integration. Alternatively, the distribution of the original religious importance variable required merging individuals who identified religion as 'not' important to them and individuals who identified religion as 'somewhat' important to them. This merged category was then compared to those who identified religion as 'very' important to them. It is possible that this obscured differences between the groups, particularly by not being able to compare individuals who found religion 'very' important to those who found religion to be 'not' important.

With regard to overall levels of secularism (reverse scored measure of religiousness) we found that among women, but not men, higher levels of secularism were associated with greater prevalence of depression. Overall measures of religiousness have been associated with lower depression and better mental health (16,71) even though individual domains of religion may have different magnitudes of correlation with depression. A meta-analysis has shown that gender was not a significant moderator of the religion-depression association (17). However, a number of individual studies that have specifically investigated gender differences have shown that the association of greater religion and lower depression is stronger among women than men (128,129,130). These findings may be related to gender socialization. This theory, posited by Beit-Hallahmi, suggests that boys are more likely to be socialized to be aggressive and independent whereas girls are more likely to be taught to be nurturing, obedient and social (131). These traits in women are in line with traits valued in religion and thus make it more likely that women are attracted to religion. Women are more likely to have stronger and extensive social supports in religious and secular settings than men (132). Studies have shown

that women who regularly attended religious services reported greater derived benefit from social supports than men (133). It may be that women are more drawn to religion and are also able to derive greater benefits from integration into a religious group than are men, which could account for some of the gender differences.

Stress buffering may be another potential mechanism of the associations between greater religiousness and lower odds of depression (64). Using a meta-analysis, authors showed that the higher scores on measures of religiousness were associated with lower odds of depression across all levels of psychosocial stress, but that the association between religiousness and depression was stronger at higher levels of psychosocial stress (17). This suggested that religion exerts a main effect on protection from depression, but also a stress buffering effect.

Consistent with previous studies from Stirling County, the prevalence of depression remained constant at about six percent. The difference between the current study and previous publications is that the current study focused on unweighted estimates of depression. Keeping in mind differences in instrumentation in the measurement of depression across studies, the finding of a relatively consistent overall prevalence of depression has been shown in studies conducted since the end of the Stirling County Study in Canada (49) and in England (134). Since prevalence reflects both the incidence of depression as well as its duration or recurrence, it is possible that incidence had increased but that increases in treatment of depression (49,135) had reduced the duration and recurrence of episodes. However, no data on treated depression was available in the current study.

This study has several limitations. While the repeated sampling in the investigations permitted examination of the population over time, the two samples were cross sectional, preventing this study from drawing any conclusions about the directionality of the associations

of religiousness and depression. Second, the samples were drawn forty years apart and do not provide information on the associations of religiousness and depression during this intervening period. Third, there also is no information on the population of Stirling County since the most recent sample in 1992. Given evidence from other studies that secularism has increased, particularly among the youngest age groups (20), combined with the observation in Stirling County of an increase in the prevalence of depression among young women raises the possibility that associations may have changed since the end of the investigation. Fourth, information was not available about alcohol use. Fifth, only four measures of religiousness were used, and while they measured different conceptual domains, they do not necessarily capture all of the nuances of an individual's religiousness.

In conclusion, individuals in Stirling County have become less religious over time. Overall religiousness is associated with lower prevalence of depression. Regular religious attendance is a consistent indicator of lower likelihood of depression over a forty-year period, independent of population level decreases in religiousness. Clinical providers should be aware of the greater likelihood of depression among individuals who are more secular and who do not attend religious services and that this likelihood is greatest among women.

Further investigation into the directionality of these associations is important to understanding how religion interacts with mental health. Because current prevalence as it is used in this study reflects incidence, duration as well the number of episodes, future longitudinal studies should aim to understand the impact of religiousness on individuals with and without a history of depression. In addition, bi-directionality of the association should be explored. Once longitudinal associations are better understood the next step would be to understand how it is that religion and depression interact. Potential mechanisms to be

explored include social supports and social capital, psychological coping mechanisms, and positive health practices. Should religion be shown to be longitudinally protective against the development of depression, its persistence or recurrence, this would raise the possible utility of “religiously-informed therapy” and primary preventative practices among individuals who identify themselves as religious.

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## APPENDIX A

Table 1. Description of Depression Diagnosis in DPAX-1, DPAX-2 and DSM-IV

	1952	1970**	1992	
	DPAX-1*		DPAX-2	DSM-IV
Components	Poor Spirits + 3 Associated Features + Impairment	1 Essential Feature + 3 Associated Features + Impairment	1 Essential Feature + 4 Associated Features + Impairment	
Essential Features	Poor Spirits	Poor Spirits	Low mood	
		Low/hopeless	Decreased interest	
		Wonder if things worthwhile		
Associated Features	Trouble Sleeping	Trouble Sleeping	Disrupted sleep	
	Tired Mornings	Tired Mornings	Low energy	
	Loss of appetite	Loss of appetite	Change in appetite	
	Food tasteless	Food tasteless		
	Many ailments	Many ailments		
			Sluggish or agitated	
			Poor concentration	
			Guilt	
			Suicidal thinking	
Impairment in Functioning	Going easy on work	Cannot get going	Impairment in Functioning	
		Not healthy to do things		
Duration	At least 1 month	At least 1 month	At least 2 weeks	

\* Note: DPAX-1 requires only 2 associated features if the individual reported being frequently in poor spirits \*\* Either DPAX-1 or DPAX-2 can be used reliably for the 1970 sample

Table 2. List of variables in Analysis

<b>Variable</b>	<b>Operationalization</b>
Current Depression (dependent)	Yes/no based on DPAX procedures
Religious Attendance (covariate)	Four Level Variable: (1) Weekly or more; (2) Once per month; (3) 1-2 times per year; (4) hardly ever/never
Private Religious Activity (exposure)	Frequency of saying grace: (1) Regularly/Often; (2) on special occasions ; (3) never
Religious Importance (exposure)	(1) Very important; (2) of some Importance/no importance
Religious Affiliation (covariate)	(1) Catholic; (2) Protestant; (2) other/ none
Age (covariate)	(1) $\leq 45$ ; (2) 45-64; (3) $\geq 65$
Marital Status (covariate)	(1) Married, common law; (2) Separated Widowed divorced (3) Never married
Medical Condition (covariate)	Presence of current physical illness
Smoker (covariate)	(1) smoker; (2) Non smoker
Education (covariate)	$\geq 11$ years; (2) $< 11$ years

Table 3. Religious measures among respondents drawn in 1952 and 1992<sup>1</sup>

		1952 n (%)	1992 n (%)	Chi Sq/ t-test	Df	P value
Frequency of Religious Attendance	Weekly or More	513 (51.2)	427 (30.6)	143.78	3	0.0001
	Monthly	155 (15.5)	165 (11.8)			
	1-2 time per year	138 (13.8)	269 (37.6)			
	Hardly ever or Never	196 (19.6)	428 (30.7)			
Frequency of Saying Grace at Meals	Sometimes/Often	256 (25.6)	179 (12.8)	115.67	2	<0.0001
	Special Occasion	126 (12.6)	388 (27.8)			
	Never	620 (61.9)	828 (59.4)			
Religious Importance	Very Important	697 (69.8)	629 (45.1)	143.45	1	<0.0001
	Of Some or No Importance	302 (30.2)	766 (54.9)			

1. Age, gender, and depression results were available for 1003 subjects in 1952 and 1402 in 1992. In a few instances the religion variables had missing values. Because of this the effective sample sizes for different analyses varied slightly (for 1952, they were never below 999, and for 1992 never below 1395).

Table 4. Associations of secularism and covariates<sup>1</sup>

		Secularism 1952			Secularism 1992		
		Mean (SD)	F Value (df)	<i>P</i>	Mean (SD)	F Value (df)	<i>P</i>
Gender	Male	0.41 (2.17)	34.13 (1)	0.0001	1.56 (2.05)	50.87 (1)	0.0001
	Female	-0.42 (2.29)			0.74 (2.23)		
Age	65+	-0.59 (2.28)	10.78 (2)	0.0001	-0.08 (2.56)	104.14 (2)	0.0001
	45-64	-0.10 (2.28)			0.87 (2.11)		
	<45	0.27 (2.19)			1.92 (1.91)		
Education	≥11	-0.17 (2.29)	0.71 (1)	0.39	1.20 (2.26)	1.83 (1)	0.18
	<11	-0.01 (2.26)			1.04 (2.12)		
Marital Status	Married/ Common Law	-0.06 (2.26)	0.35 (2)	0.70	1.24 (2.10)	17.54 (2)	0.0001
	Separated, Widowed or Divorced	-0.02 (2.09)			0.42 (2.25)		
	Never Married	0.17 (2.54)			1.50 (2.54)		
Tobacco	Yes	0.50 (2.17)	60.81 (1)	0.0001	1.76 (1.80)	65.61 (1)	0.0001
	No	-0.58 (2.26)			0.78 (2.29)		
Medical Condition	Yes	-0.15 (2.31)	0.85 (1)	0.36	0.80 (2.15)	8.11 (1)	0.01
	No	0.00 (2.47)			1.21 (2.19)		
Affiliation	Catholic	-0.68 (1.88)	61.46 (2)	0.0001	1.24 (1.88)	51.82 (2)	0.0001
	Protestant	0.74 (2.40)			0.74 (2.40)		
	Other	0.01 (2.35)			-1.46 (2.94)		

		Secularism 1952			Secularism 1992		
		Mean (SD)	F Value (df)	<i>P</i>	Mean (SD)	F Value (df)	<i>P</i>
	None	2.86 (1.70)			3.10 (1.27)		
Overall <sup>3</sup>		-0.04 (2.26)			1.11 (2.19)	-12.56 (2387)	0.0001

1. Secularism is measured on a continuous scale, range -4.06 to 10.45 with higher scores indicating higher secularism and lower scores indicating greater religiousness.
2. Because 'no religious affiliation' formed part of the secularism scale, for analysis including secularism, other religious affiliation was included as a separate category.
3. Overall secularism represents the mean score in each sample. F-values represent differences in secularism between the two time points.

Table 5. Prevalence of Depression in Categories of Religious Attendance, Frequency of Saying Grace and Religious Importance<sup>1</sup>

		1952 (n=1,002)	1992 (n=1,396)
		Depression Rate per 100	Depression Rate per 100
Religious Attendance	Weekly or More	4.1	3.8
	Monthly	9.0	3.6
	1-2 time per Year	5.1	7.7
	Hardly or Never	9.2	9.4
Grace	Sometimes	3.5	5.6
	Special Occasions	6.4	6.2
	Never	6.9	6.9
Importance	Very Important	5.9	7.5
	Of Some or No Importance	6.3	5.7
Overall Total		6.0	6.5

1. The prevalence of current depression did not change over time ( $\chi^2 (2, 2398)=0.26, p=0.61$ ). The rates of 6.0 and 6.5 are approximately one percentage point higher than those previously published because the latter were standardized to the age/gender characteristics of the total population at each time point (Murphy et al., 2000). The figures for the total population from which the samples were drawn are not available in the archived data base and thus the rates in this table are not standardized.

Table 6. Associations between Depression and Frequency of Religious Attendance <sup>1</sup>

Sample Year and Frequency of Religious Attendance	Number with Depression	Number without Depression	OR1 (95% CI)	OR2 (95% CI)	OR3 (95% CI)
1952 (n=1,002)					
Weekly or more	21	492	0.42* (0.22-0.81)	0.38* (0.19-0.73)	0.34* (0.15-0.76)
Monthly	14	141	0.98 (0.47-2.03)	0.94 (0.45-2.00)	0.73 (0.30-1.76)
1-2 times per year	7	131	0.53 (0.21-1.32)	0.52 (0.21-1.29)	0.48 (0.17-1.31)
Hardly or Never	18	178	1	1	1
			1	1	1
1992 (n=1,396)					
Weekly or more	16	411	OR1 (95% CI)	OR2 (95% CI)	OR3 (95% CI)
Monthly	6	159	0.38* (0.21-0.69)	0.29** (0.15-0.54)	0.47* (0.24-0.94)
1-2 times per year	29	347	0.37* (0.15-0.88)	0.32* (0.13-0.76)	0.47 (0.19-1.20)
Hardly or Never	40	388	0.81 (0.49-1.34)	0.77 (0.46-1.23)	0.97 (0.55-1.71)

\*p<0.05 \*\*p<0.01 \*\*\*p<0.001

1. OR1 [odds ratio] is unadjusted; 95% CI is the 95 % confidence interval; OR2 is adjusted for age and gender; OR3 is adjusted for age, gender, marital status, education, smoking, medical condition, and religious affiliation. Analysis involving the combined samples (not shown) was also adjusted for study year and interactions with each of gender, age, marital status, health and religious affiliation were investigated. Stratified analysis for the significant interactions are shown here.

Table 6A. Associations between Depression and Frequency of Religious Attendance across Gender<sup>1</sup>

Frequency of Religious Attendance	Females (n=1,308) OR (95% CI)	OR Males (n=1,092) OR (95% CI)
Weekly or more	0.31* (0.18-0.53)	0.46* (0.22-0.95)
Monthly	0.29* (0.13-0.63)	1.50 (0.72-3.12)
1-2 times per year	0.80 (0.47-1.35)	0.48 (0.21-1.10)
Hardly or Never	1	1

\*p<0.05

1. OR [odds ratio] is unadjusted; 95% CI is the 95 % confidence interval; Stratification was done in the total sample, combining individuals from 1952 and 1992. Interaction of study year with religious attendance was not significant (>0.5) for both men and women.

Table 6B. Associations between Depression and Frequency of Religious Attendance across Presence of a Medical Condition<sup>1</sup>

Frequency of Religious Attendance	Medical Condition (n=576) OR (95% CI)	No Medical Condition (n=1,824) OR (95% CI)
Weekly or more	0.42* (0.23-0.74)	0.41* (0.21-0.82)
Monthly	1.05 (0.54-1.99)	0.09* (0.04-0.63)
1-2 times per year	1.12 (0.62-2.00)	0.44* (0.21-0.93)
Hardly or Never	1	1

\*p<0.05

1. OR [odds ratio] is unadjusted; 95% CI is the 95 % confidence interval; Stratification was done in the total sample, combining individuals from 1952 and 1992. Interaction of study year with religious attendance was not significant (>0.5) for both men and women.

Table 7. Associations between Depression and Frequency of Saying Grace at Meals<sup>2</sup>

Sample Year and Frequency of Saying Grace	Number with Depression	Number without Depression	OR1 (95% CI)	OR2 (95% CI)	OR3 (95% CI)
1952 (n=1,002)					
Often	9	577	0.49 (0.24-1.02)	0.43* (0.21-0.91)	0.36* (0.16-0.79)
Special Occasions	8	118	0.91 (0.42-1.99)	0.84 (0.38-1.85)	0.89 (0.38-2.08)
Never	43	247	1	1	1
1952 (n=1,395)					
Often	10	169	0.80 (0.40-1.60)	0.71 (0.35-1.44)	0.57 (0.27-1.23)
Special Occasions	24	364	0.89 (0.55-1.46)	0.87 (0.53-1.42)	0.77 (0.46-1.31)
Never	57	771	1	1	1

\*p<0.05 \*\*p<0.01 \*\*\*p<0.001

1. OR1 [odds ratio] is unadjusted; 95% CI is the 95 % confidence interval; OR2 is adjusted for age and gender; OR3 is adjusted for age, gender, marital status, education, smoking, medical condition, and religious affiliation. Analysis involving the combined samples (not shown) was also adjusted for study year and interactions with each of gender, age, marital status, health and religious affiliation were investigated. Stratified analysis for the significant interactions are shown here.

Table 8. Associations between Depression and Religious Importance<sup>1</sup>

Sample Year and Importance of Religious	Number with Depression	Number without Depression	OR1 (95% CI)	OR2 (95% CI)	OR3 (95% CI)
1952 (n=999)					
Very Important	41	656	0.93 (0.53-1.63)	0.83 (0.47-1.48)	0.70 (0.37-1.33)
Of Some or No Importance	19	283	1	1	1
1992 (n=1,395)					
Very Important	47	582	1.32 (0.87-2.03)	1.26 (0.80-1.98)	1.11 (0.69-1.80)
Of Some or No Importance	44	722	1	1	1

\*p<0.05 \*\*p<0.01 \*\*\*p<0.001

1. OR1 [odds ratio] is unadjusted; 95% CI is the 95 % confidence interval; OR2 is adjusted for age and gender; OR3 is adjusted for age, gender, marital status, education, smoking, medical condition, and religious affiliation. Analysis involving the combined samples (not shown) was also adjusted for study year and interactions with each of gender, age, marital status, health and religious affiliation were investigated. Stratified analysis for the significant interactions are shown here.

Table 9. Secularism and Depression

1952 Means Secularism Scores			1992 Mean Secularism Scores		
Mean (SD) Depressed	Mean (SD) Not Depressed		Mean (SD) Depressed	Mean (SD) Not Depressed	
0.43 (2.01)	-0.07 (2.28)		1.41 (2.04)	1.09 (2.20)	
1952 Odds Ratios			1992 Odds Ratios		
OR	AOR-1	AOR-2	OR	AOR-1	AOR-2
1.15* (1.00-1.34)	1.14* (1.01-1.29)	1.20* (1.04-1.38)	1.16* (1.01-1.33)	1.12** (1.00-1.25)	1.13* (1.01-1.27)

\*p<0.05 \*\*p<0.01 \*\*\*p<0.001

1. OR1 [odds ratio] is unadjusted; 95% CI is the 95 % confidence interval; OR2 is adjusted for age and gender; OR3 is adjusted for age, gender, marital status, education, smoking, and presence of a medical condition. Analysis involving the combined samples (not shown) was also adjusted for study year and interactions with each of gender, age, marital status, health and religious affiliation were investigated. Stratified analysis for the significant interactions are shown here.

Table 9A. Secularism and Depression by Gender<sup>1</sup>

	Females (n=1,305) OR (95% CI)	OR Males (n=1,091) OR (95% CI)
Secularism	1.15** (1.04-1.26)	1.04 (0.92-1.18)

\*p<0.05 \*\*p<0.01

1. OR [odds ratio] is unadjusted; 95% CI is the 95 % confidence interval; Stratification was done in the total sample, combining individuals from 1952 and 1992. Interaction of study year with secularism was not significant (>0.5) for both men and women.

**APPENDIX B**

Table 10. Associations of religious attendance and other predictor variables

		Religious Attendance 1952					
		≥Week	Once/month	1-2 / year	Never/Hardly	χ <sup>2</sup> or t-test (df)	P
Gender	Male	46.7	12.3	15.1	25.9	27.03 (3)	0.0001
	Female	55.0	63.9	12.6	14.3		
Age	65+	59.6	11.0	11.0	18.4	12.78 (6)	0.05
	45-64	51.8	14.2	14.8	19.2		
	<45	46.6	18.6	14.4	20.4		
Education	≥11	52.5	18.1	11.9	17.5	2.14 (3)	0.56
	<11	50.9	14.9	14.2	20.0		
Marital Status	Married/ Common Law	51.8	16.8	13.4	18.1	14.78 (6)	0.02
	Separated/ Widowed/ Divorced	50.0	11.4	17.4	21.2		
	Never Married	47.2	8.3	11.1	33.3		
Tobacco	Yes	43.0	15.1	16.9	25.1	35.57 (3) *	0.0001
	No	58.3	15.9	10.7	14.1		
Medical Condition	Yes	47.4	18.2	13.0	21.5	3.62 (3)	0.3049
	No	52.6	14.5	14.1	18.9		
Affiliation	Catholic	72.5	11.2	8.6	7.7	363.32 (6)	0.0001
	Protestant	40.8	21.7	19.8	17.7		
	Other /None	6.5	-	6.5	83.9		

		Religious Attendance 1992					
		≥Week	Once/month	1-2/ year	Never/Hardly	χ <sup>2</sup> or t-test (df)	p
Gender	Male	25.0	10.7	27.8	36.5	26.35 (3)	0.0001
	Female	35.3	12.8	26.2	25.8		
Age	65+	55.3	12.0	15.9	16.8	184.40 (6)*	0.0001
	45-64	35.6	11.8	25.7	27.0		
	<45	14.2	11.8	33.5	40.5		
Education	≥11	30.6	13.0	27.6	28.9	2.78 (3)	0.42
	<11	30.6	10.8	26.3	32.2		
Marital Status	Married/Common Law	28.6	12.4	28.9	30.2	24.29 (6)	0.0005
	Separated/Widowed/Divorced	40.2	11.5	21.8	26.4		
	Never Married	26.7	8.4	22.1	42.8		
Tobacco	Yes	13.6	9.4	32.3	43.7	123.30 (3)	0.0001
	No	39.4	13.1	23.6	23.9		
Medical Condition	Yes	31.1	10.8	26.1	22.9	0.71 (3)	0.87
	No	30.5	12.1	27.2	30.3		
Affiliation	Catholic	34.2	13.7	31.7	20.5	175.91	0.0001
	Protestant	27.6	11.4	25.5	35.6		
	Other /None	19.2	-	-	76.8		

Table 11. Associations of religious importance and other predictor variables

		Religious Importance 1952				Religious Importance 1992			
		Very	Some/ Not	$\chi^2$ or t- test (df)	<i>P</i>	Very	Some/ Not	$\chi^2$ or t- test (df)	<i>p</i>
Gender	Male	62.4	37.6	21.42 (1) *	0.0001	36.7	63.3	33.62 (1)	0.0001
	Female	75.9	24.1			52.2	47.8		
Age	65+	80.2	19.8	18.21 (2)	0.0001	65.6	34.4	132.76 (2)	0.0001
	45-64	70.6	29.4			53.2	46.9		
	<45	64.0	36.0			28.5	71.5		
Education	≥11	70.8	29.2	0.10 (1)	0.75	39.1	60.9	17.51 (1)	0.0001
	<11	69.5	30.5			50.3	49.7		
Marital Status	Married/Common Law	69.8	30.2	4.03 (2)	0.13	42.7	57.3	34.83 (2)	0.0001
	Separated/Widowed/Divorced	74.6	25.4			60.4	39.6		
	Never Married	61.1	38.9			32.2	67.8		
Tobacco	Yes	61.2	38.8	34.68 (1)	0.0001	39.0	61.0	10.89 (1)	0.0001
	No	78.3	21.7			48.3	51.7		
Medical Condition	Yes	74.6	25.4	4.10 (1)	0.043	55.1	44.9	15.77 (1)	0.0001
	No	68.0	32.0			42.3	57.7		
Affiliation	Catholic	74.3	25.7	30.99 (2)	0.0001	41.3	58.7	18.7 (2)	0.0001
	Protestant	70.5	29.5			53.1	47.0		
	Other/None	45.2	54.8			38.9	61.1		

Table 12. Associations of saying grace at meals and other predictor variables

		Frequency of Grace 1952			$\chi^2$ or t-test (df)	P
		Often	Special	Never		
Gender	Male	20.7	11.4	67.9	13.64 (2) (p=0.001)	0.001
	Female	29.6	13.5	56.9		
Age	65+	32.9	15.5	51.6	17.31 (4) (p=0.002)	0.02
	45-64	25.8	13.7	60.5		
	<45	21.8	10.3	67.9		
Education	$\geq 11$	25.3	19.1	55.6	8.67 (2)	0.01
	<11	25.6	11.2	63.2		
Marital Status	Married/Common Law	24.2	13.8	62.0	10.62 (4)	0.03
	Separated/Widowed/Divorced	27.3	9.9	62.9		
	Never Married	37.5	4.2	58.3		
Tobacco	Yes	19.5	11.9	68.6	21.73 (2)	0.0001
	No	31.5	13.3	55.3		
Medical Condition	Yes	27.5	12.3	60.2	0.74 (2)	0.69
	No	24.8	12.7	62.5		
Affiliation	Catholic	34.0	11.4	54.6	43.17 (4)	0.0001
	Protestant	21.3	14.8	64.0		
	Other/None	8.7	6.5	85.0		

		Frequency of Grace 1992				
		Often	Special	Never	$\chi^2$ or t-test (df)	<i>p</i>
Gender	Male	8.9	27.7	63.4	17.29 (2)*	0.0001
	Female	16.1	27.9	56.0		
Age	65+	24.0	30.2	45.8	58.43 (4) *	0.0001
	45-64	12.5	27.6	59.9		
	<45	7.5	26.8	65.7		
Education	$\geq 11$	13.0	30.8	56.3	5.73 (2)	0.057
	<11	12.7	25.3	62.0		
Marital Status	Married/Common Law	10.7	27.8	61.6	18.81 (4)	0.0001
	Separated/Widowed/Divorced	20.4	27.3	52.3		
	Never Married	14.5	29.0	56.5		
Tobacco	Yes	7.1	30.0	62.9	21.06 (2)	0.0001
	No	15.8	26.7	57.5		
Medical Condition	Yes	16.0	30.4	53.6	6.22 (2)	0.045
	No	11.9	27.1	61.0		
Affiliation	Catholic	7.2	24.8	68.1	85.26 (4)	0.0001
	Protestant	20.5	34.6	44.9		
	Other /None	19.8	21.4	58.7		